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SMALL ANIMAL

Short Communications

Small Animal Orthopedic Surgery

ASSESSMENT OF DIFFERENT IMPLANTS FOR LATERAL PLATING IN FELINE ILIAL FRACTURES AND THE IMPACT ON PELVIC CANAL NARROWING AND ITS CLINICAL RELEVANCE

Knell SC*[1], Schmierer PA[1], Hartnack S[2], Kircher P[3]. [1]Vetsuisse Faculty University of Zurich Clinic for small animal surgery, Zurich, Switzerland, [2]Vetsuisse Faculty University of Zurich Section of Epidemiology, Zurich, Switzerland, [3]Vetsuisse Faculty University of Zurich Section of Diagnostic Imaging, Zurich, Switzerland.

Introduction and hypothesis

Lateral plating is commonly used for ileal fractures in cats and has been associated with an increased implant loosening as well as with pelvic canal narrowing. The purpose of this retrospective study was to assess if pelvic canal narrowing and clinical outcome are influenced by the type of implant.

Materials and methods

Radiographs and medical records of cats with pelvic fractures between 2004 and 2013 were reviewed. Depending on the implant, the fractures were assigned to one of two groups (Dynamic Compression Pate (DCP) and Locking Plate Systemc (LPS). The sacral index (SI) was measured and the quotient between measurement at time of surgery and six weeks later was used as an indicator for pelvic canal narrowing.

A multiple regression approach was performed to assess if pelvic canal narrowing is associated with the implant system chosen.

Results

In total 34 cases were included in the study (n = 10 DCP and n = 24 LPS). In the DCP group 5/10 implants showed screw loosening and 1/24 in LPS group. The mean (95% CI) of the SI quotient were −0.114 (−0.507; 0.081) for DCP and −0.0012 (−0.199; 0.158) for LPS.Pelvic canal narrowing was significantly decreased with LPS compared to DCP ($P = 0.02$).

Neither radiologic signs of constipation nor owner reported problems with defecation were present.

Discussion and conclusion

Implant loosening and pelvic canal narrowing were reduced in the LPS group compared to the DCP group.

Pelvic canal narrowing was not associated with clinical symptoms but clinical follow up was not long enough to exclude this.

IMPACT OF GENTAMICIN AND MICROPARTICULATE SILVER ON METHICILLIN-RESISTANT STAPHYLOCOCCUS PSEUDINTERMEDIUS BIOFILM FORMATION ON POLYMETHYLMETHACRYLATE

Singh A*, Morrison S, Rousseau J, Walker M, Crawford EC, Nazarali A, Weese JS. Ontario Veterinary College, University of Guelph, Guelph, Canada.

Methicillin-resistant Staphylococcus pseudintermedius (MRSP) has rapidly emerged as a leading cause of surgical site infections (SSIs) in dogs. Biofilm formation is common in MRSP and this may be an important virulence factor. The objective of this study was to evaluate the impact of gentamicin and silver impregnated polymethylmethacrylate (PMMA) on MRSP biofilm formation

PMMA beads belonging to four additive groups were made using a standard bead mold. The groups were: 1) No additive, 2) Silver (0.5g elemental silver/40g PMMA), 3) Gentamicin (0.5g/40g PMMA), 4) Gentamicin + silver. Briefly, PMMA beads were added to standard MRSP suspensions in tryptic soy broth (TSB) and incubated overnight at 37 degrees C. The following day, beads were removed from the suspension and rinsed 3x with phosphate buffered saline to remove planktonic bacteria. The beads were placed in fresh TSB medium and sonicated for 5 minutes to remove adhered (biofilm) bacteria. Standard techniques for bacterial enumeration were then performed and colony forming units (CFUs) were recorded for each group. Ten biofilm-forming MRSP isolates were selected and gentamicin MIC determined by Etest® (bioMerieux, Inc., NC, USA). All experiments were performed in triplicate for each isolate.

None of the PMMA additives completely inhibited MRSP biofilm formation. There was a significant effect of gentamicin ($P = 0.035$) and gentamicin + silver ($P = 0.022$) compared to controls, but no impact of silver ($P = 0.94$). There was no difference between gentamicin and gentamicin + silver ($P = 0.85$). When only gentamicin resistant isolates were evaluated, there were no differences between groups (all $P > 0.48$). With gentamicin susceptible isolates, there was an impact of gentamicin and gentamicin + silver (both $P < 0.0001$), but no impact of silver alone ($P = 0.97$).

PMMA impregnated with gentamicin reduced biofilm formation on this surface by MRSP isolates susceptible to gentamicin, but not in isolates that were gentamicin resistant. It was surprising that no effect of silver was noted. Whether this is because of inadequate silver levels or silver resistance requires further study.

RADIOGRAPHIC RISK FACTORS FOR CONTRALATERAL LIGAMENT SURVIVAL IN DOGS WITH UNILATERAL NON-CONTACT CRANIAL CRUCIATE RUPTURE

Muir P*, Chuang C, Ramaker M, Kaur S, Csomos R, Kroner KT, Bleedorn JA, Schaefer SL. University of Wisconsin-Madison, Madison, USA.

Non-contact cruciate ligament rupture (CR) is a common cause of stifle instability and associated lameness in dogs. Most ruptures occur during normal activity in association with pre-existing ligament degeneration. Dogs with unilateral CR often develop subsequent contralateral CR. We hypothesized that risk of contralateral CR would be significantly influenced by radiographic severity of synovial effusion and osteoarthritis (OA) in the index and contralateral stifle at initial diagnosis in dogs with unilateral CR.

Radiographic and medical records of 513 dogs treated with tibial plateau leveling osteotomy were examined. After filtering, records of 85 dogs were examined in detail. Orthogonal radiographs of the index stifle subsequently treated with TPLO and the contralateral stifle were graded for severity of synovial effusion and OA. Clinical follow-up determined whether or not subsequent contralateral rupture developed. The chi-square test and regression models were used to assess contralateral cruciate survival. Results were considered significant at $P < 0.05$. The intraclass correlation coefficient statistic was used to assess observer reproducibility of radiographic scoring.

Severe effusion and OA were found in the contralateral stifle in 26% and 7% of dogs respectively. Severity of OA (SR = 0.39, $P < 0.0005$), but not synovial effusion (SR = 0.17, $P = 0.13$) in the index and contralateral stifles were correlated. Intra- and inter observer reproducibility of radiographic grading was excellent. Overall, 28 of 85 dogs (33%) developed a subsequent contralateral CR. At one year after diagnosis, cruciate survival was significantly influenced by radiographic effusion ($P < 0.0001$) and OA ($P < 0.05$) in the contralateral stifle. The odds ratio for development of contralateral CR in dogs with severe contralateral effusion was 13.4 and cruciate survival was significantly decreased. Breed, age, body weight, gender, and tibial plateau angle did not significantly influence contralateral cruciate survival. We conclude that synovitis and arthritic degeneration of the stifle assessed radiographically are significant risk factors for development of non-contact cruciate rupture. Radiography may provide an important predictive marker for contralateral CR risk that could be relevant to both clinical management of affected dogs, as well as trial studies of disease-modifying treatment of the underlying arthropathy.

MODIFIED CRANIAL CLOSING WEDGE OSTECTOMY FOR THE TREATMENT OF HIGH AND EXCESSIVE TIBIAL PLATEAU ANGLE

Wallace AM*[1], Anderson GA[1], Addison ES[2], Arthurs GI[3], Burton NJ[4], Langley-Hobbs SJ*[4], Smith BA[5]. [1]University of Melbourne, Melbourne, Australia, [2]University of Edinburgh, Edinburgh, Scotland, United Kingdom, [3]Royal Veterinary College, London, United Kingdom, [4]University of Bristol, Bristol, United Kingdom, [5]University of Queensland, Gatton, Australia.

INTRODUCTION

The aim of our study was to evaluate the clinical and geometrical results achieved with the modified cranial closing wedge ostectomy technique (mod CCWO) and compare them to a cohort of cases that received standard cranial closing wedge ostectomy (std CCWO)

MATERIALS & METHODS

Medical records from three University teaching hospitals were searched for dogs that had surgical treatment for cranial cruciate ligament rupture (CCLR) with either std CCWO or mod CCWO. Patient and surgical data were sourced from the medical records. Radiographic and geometric data were sourced from pre and postoperative radiographs.

RESULTS

For both the std and the mod CCWO groups, the most common breed was the West Highland White Terrier. Non-locking and locking implants were variously used. Mean post operative tibial plateau angle (TPA) was 13.3 $\pm$ 5.3 degrees for the Std CCWO group and 9.1 $\pm$ 3.3 degrees for the Mod CCWO group. ($P = 0.014$). When expressed as a percentage of the original tibial length, median reduction in tibial length was 1.8 (0–6.8) for the std CCWO group and 1.0 (-0.4 to 1.8) for the mod CCWO group ($P = 0.0050$). Mean tibial long axis shift was 4.00 $\pm$ 0.97 degrees for the std CCWO group and 2.74 degrees $\pm$ 0.36 degrees for the mod CCWO group ($P = 0.0001$). The mean level of the distal osteotomy, expressed as a ratio of tibial long axis length was 0.21 $\pm$ 0.03 for the std CCWO group and 0.18 $\pm$ 0.02 for the mod CCWO group ($P = 0.0008$). Four out of 23 (21.7%) dogs in the std CCWO group developed major complications. None of the mod CCWO dogs developed major complications.

DISCUSSION/CONCLUSION

The higher major complication rate for the std CCWO may reflect implant systems used rather than technique as 83.3% of osteotomies in the mod CCWO group were stabilised with locking TPLO plates compared with only 13.8% in the std CCWO group. In conclusion, the mod CCWO technique is an effective technique for treating dogs with high or excessive TPA. In this multi site restrospective comparison, mod CCWO was associated with superior tibial plateau levelling compared with std CCWO. A further advantage with the mod CCWO technique is that it facilitates a more proximal osteotomy location, allowing the use of locking TPLO plates. Due to small case numbers, no conclusions can be made regarding outcome and complication rate in comparison to standard technique.

CANINE SYNOVIAL FLUID: RELATIONSHIP BETWEEN AUTOMATED TOTAL NUCLEATED CELL COUNT AND ENUMERATION OF CELLS ON DIRECT SMEARS

Muir P*, Dusick A, Young KM. University of Wisconsin-Madison, Madison, USA.

The total nucleated cell count (TNCC) in synovial fluid is an important test for assessment of joint disease in dogs, but cannot always be obtained owing to insufficient volume of synovial fluid. Estimation of the TNCC in synovial fluid by visual assessment of a direct smear has been attempted but not validated. We hypothesized that rigorous manual enumeration of nucleated cells in synovial fluid smears would accurately reflect the automated TNCC obtained using a laser-based analyzer.

Synovial fluid specimens from 44 dogs were collected; repeated sampling of the same joint on a different day or sampling of a different joint from the same dog was not a criterion for exclusion. For 53 synovial fluid specimens, automated TNCC were obtained and direct smears were prepared and stained with Wright-Giemsa stain. For each specimen, a mean manual nucleated cell count/400X field was determined by averaging counts from 15 fields on an area of the smear predetermined in a pilot study. The relationship between automated and direct smear manual counts was examined using linear regression. Results were considered significant at $P < 0.05$.

Automated and mean manual counts ranged from 60 to 118,100 cells/μL and 0.7–172.7/400$\times$ field respectively. There was a significant positive correlation between the number of nucleated cells/400$\times$ field and the automated TNCC ($R^2 = 0.77$, $P < 0.001$). This relationship was more variable at higher cell counts. Using a regression equation to predict TNCC from the mean number of nucleated cells/400$\times$ field and categorize the nucleated cell count as within the reference interval, mildly to moderately increased, or markedly increased, TNCC category was predicted correctly in 79% of samples. We conclude that manual nucleated cells counts in synovial smears have good to excellent agreement with automated TNCC and can be used to estimate TNCC in the absence of an automated TNCC.

DESIGN, SYNTHESIS, IMAGING, AND BIOMECHANICS OF A SOFTNESS-GRADIENT HYDROGEL NUCLEUS PULPOSUS PROSTHESIS IN A CANINE LUMBAR SPINE MODEL

Kranenburg HC[1], Koole LH[2], Van der Veen AJ[3], Smolders LA[1], Dhert WJA[4], Hazewinkel HAW*[1], Tryfonidou MA*[1], Meij BP*[1]. [1]University of Utrecht, Faculty of Veterinary Medicine, Dep.Clinical Sciences of Companion and Small Animals, Utrecht, Netherlands, [2]Maastricht University, Faculty of Health, Medicine and Life Sciences, Department of Biomedical Engineering/Biomaterials Science, Maastricht, Netherlands, [3]VU University, University Medical Center, Department of Physics and Medical Technology, Amsterdam, Netherlands, [4]Utrecht University, University Medical Center Utrecht, Department of Orthopaedics, Utrecht, Netherlands.

The intervertebral disc consists of an outer ring of collagenous fibers, the annulus fibrosus, and a soft inner gel-like structure, the nucleus pulposus. The combination of the soft nucleus and the firm annulus fibrosus allows for flexibility, stability, and cushioning, which contribute to the biomechanical properties of the spine. Age-related or pathological degeneration of the annulus fibrosus and/or in the nucleus pulposus lead to degenerative disc disease. A hydrogel nucleus pulposus prosthesis (NPP) was designed to swell in situ, have intrinsic radiopacity, and restore intervertebral disc height and biomechanical functionality. These features were examined using an ex vivo canine lumbar model. Nine NPPs were implanted in 5 spines and their visibility was assessed on radiography, computed tomography (CT), and magnetic resonance imaging (MRI). The NPPs were visible on all imaging modalities and 8/9 NPPs stayed intact and in situ. Six other NPPs were tested biomechanically in 6 canine lumbar spines. Removal of the nucleus pulposus (nuclectomy) caused significant changes in biomechanical parameters compared to the native state. After implantation and swelling of the NPP, values were not significantly different from the native state for range of motion (ROM) of flexion-extension (FE) and lateral bending (LB), the neutral zone (NZ) of all motion directions and the neutral zone stiffness (NZS) of FE. Biomechanical restoration by the NPP compared to the nuclectomized state was significant for the ROM of FE and axial rotation, the NZ of FE and LB, and the NZS of FE and LB. Disc height was significantly restored and 6/6 NPPs stayed intact and in situ after the biomechanical evaluation. In conclusion, the NPPs swell in situ, have intrinsic radiopacity and restored disc height and aforementioned biomechanical properties. However, before in vivo testing of the NPP the closure of the annulus fibrosus must be optimized.

COMPARISON OF RADIOGRAPHIC MEASUREMENTS OF THE PATELLAR TENDON-TIBIAL PLATEAU ANGLE WITH ANATOMICAL MEASUREMENTS IN DOGS

Bismuth C[1], Ferrand FX[1], Millet M[1], Labrunie A[2], Marin B[2], Pillard P[1], Deroy C[1], Fau D[1], Carozzo C*[3], Cachon T*[3], Viguier E*[3]. [1]Departement of Surgery, VetAgro Sup, Small animal campus vétérinaire of Lyon, Marcy L'Etoile, France, [2]CHU Limoges, Pôle Santé Publique, Service de l'Information Médicale et de l'Evaluation, Unité fonctionnelle de Recherche Clinique et de Biostatistiques, Limoges, France, [3]Surgery Department and Unite ICE UPSP 2011-03-101, National Veterinary School of Lyon, VetAgro Sup-Campus Vétérinaire de Lyon, Université de Lyon, Marcy L'Etoile, France.

Objectives: To evaluate the validity of the common tangent (CT) and the conventional tibial plateau angle (TP) methods to evaluate the patellar tendon angle (PTA) in dogs.

Methods: Twenty hind limbs were harvested from dog cadavers weighing >15 Kg by hemipelvectomy. Exclusion of the specimen was done if there were open physis, osteoarthritis, cranial cruciate disease or meniscal damage. Each leg was fixed at 135° with a custom made external skeletal fixator. The radiographic beam was then centered over the stifle joint after positioning the joint in true lateral position. A K-wire was then inserted perpendicularly to the patellar tendon at its attachment. This permitted to further disarticulate the stifle to identify the tibial plateau by inserting two K-wires. A photograph of the proximal tibia was finally taken after positioning the proximal tibia in true lateral positioning. Each PTA was measured with computer software by six blinded observers with either the common tangent or the conventional method (PTA_{CT} and PTA_{TP} respectively) on three separate occasions. The cadaveric PTA (PTA_A) was measured by an independent blinded observed on three separate occasions by measuring the angle obtained between a line joining the 2 K-wires materializing the plateau and the axe of the K-wire materializing the perpendicular to the patellar tendon. Agreement was interpreted with an intraclass correlation coefficient (ICC) as follows: poor (ICC < 0.50), moderate (ICC 0.51 to 0.70), good (ICC 0.71 to 0.90), or very good (ICC > 0.91).

Results: The global ICC for the common tangent method ($ICC_{CT} = 0.44$) and for the conventional method ($ICC_{PT} = 0.4$) between the six observers indicated that either the global validity of the PTA_{CT} and the PTA_{TP} is poor. Moreover, it was found

that PTA_{CT} method yielded measurements systematically below and that the PTA_{TP} method yielded measurements systematically above, those obtained with the PTA_A. The reproducibility of the PTA_A measurements was found to be very good with an ICC (ICC_A) of 0.98.

Conclusions and clinical relevance: Both methods have poor agreement with the anatomic patellar tendon angle with an underestimation and an overestimation with the common tangent and the conventional method respectively. However, the clinical significance of an underestimation or an overestimation of the PTA_A is actually unknown. Yet, one could think that when the amount of advancement calculated fell in between two cage sizes, it could be judicious to use the smaller one when using the conventional method and the larger one when using the common tangent method. More studies are necessary to confirm the results of the present study, the impact on the advancement and the cage size used, and the clinical implications.

PATHOLOGICAL CHANGES IN THE LATERAL COMPARTMENT IN ELBOWS OF DOGS AFFECTED WITH MEDIAL COMPARTMENT DISEASE: PRELIMINARY RESULTS

Bielecki MJ, Scharvogel S*. Tierklinik Haar, Haar, Germany.

Objective – To describe changes seen in the lateral compartment in dogs presented with medial coronoid disease, to define those changes and categorize them according to location and severity.

Materials and Methods – Retrospective analysis of arthroscopic videos from 53 canine elbows presented for diagnosis and treatment of medial coronoid disease. The scoring system included degree of synovitis within the lateral compartment, shape and Outerbridge score of the lateral coronoid process, gross appearance and Outerbridge score of the ulnar trochlear notch within the lateral compartment, visible osteochondrosis on the lateral humeral condyle, and divergence between the lateral coronoid process and the radial head.

Results – Synovitis and pathological changes within the lateral compartment were present in all elbow joints. The mean Outerbridge score of the lateral coronoid process was 1.4. The shape of the lateral coronoid process was pointed in 29 elbows (60.4%), square in five elbows (10.4%) and rounded in 14 elbows (29.2%).

The edges of the lateral coronoid process were regular in 18 elbow joints (37.5%) and irregular in 30 joints (62.5%).

In three dogs, there was visible fissuring of the lateral coronoid process.

The mean Outerbridge score of the trochlear notch within the lateral compartment was 2. When looking at the appearance of the trochlear notch, there was an indentation visible in 30 elbow joints (62.5%). The contour of the trochlear notch was regular in 16 joints (33.3%) and irregular in 32 joints (66.7%).

Osteochondrosis of the lateral humeral condyle was visible within the lateral compartment in 42 joints (87.5%). Divergence between the lateral coronoid process and the radius was mild in 11 joints (22.9%), moderate in 19 joints (39.6%) and severe in 11 joints (22.9%). No divergence was noted in only five joints (10.4%).

Conclusion – Pathological changes of variable degrees were found in all elbow joints. Further studies need to be conducted to evaluate the clinical significance of our findings and to assess the contribution of changes within the lateral compartment towards persisting lameness in dogs with medial coronoid disease.

The lateral compartment should be carefully evaluated before performing humeral or ulnar osteotomies in dogs with medial compartment disease.

DEVELOPING AN INDEXED TESTING BATTERY FOR MEASURING STIFLE FUNCTIONALITY AND REHABILITATION OUTCOME; THE FINNISH CANINE STIFLE INDEX, FCSI

Hyytiäinen HK[1], Mölsä SH[1], Junnila JT[2], Laitinen-Vapaavuori OM[1], Hielm-Björkman AK[1]. [1]Department of Equine and Small Animal Medicine, Faculty of Veterinary Medicine, University of Helsinki, Helsinki, Finland, [2]Oy 4Pharma Ltd., Espoo, Finland.

Introduction: The aim of the study was to develop a testing battery to be used as an outcome measure for dogs with stifle problems. A testing battery, the Finnish Canine Stifle Index (FCSI), was generated by combining previously validated, sensitive physiotherapeutic evaluation methods.

Material and methods: 43 dogs with surgically treated unilateral cranial cruciate ligament rupture and 21 dogs with no known musculoskeletal problems were included. Symmetry of lying and sitting positions and thrust in hind limbs when rising from those positions, static weight bearing, stifle flexion and extension, and atrophy were scored and summed to an index: the FCSI. Sensitivities and specificities were calculated by comparing the FCSI score to the results of the orthopaedic examination, radiological evaluation, force platform analysis and conclusive assessment. Differences between the two groups' FCSI scores were evaluated through a one-way ANOVA. The Cronbach's alpha for internal consistency and principal component analysis for evaluation of the structure of FCSI were calculated.

Results: The range of the FCSI score was 0–263. A cut-off point between "adequate" and "challenged" performance was proposed to be 60. Sensitivity and specificity of FCSI was 90% and 90.5%, respectively, at best. The Cronbach's alpha for internal reliability of the FCSI-score was 0.727. An estimate of the surgically treated and the control dogs' FCSI-scores were 104.5 (95%CI 92.9–116.1) and 20.2 (95%CI 3.6–36.9), respectively. The difference between groups was significant ($P < 0.001$).

Conclusion: A quantitative testing battery consisting of eight tests was generated, and a score range including definition between "adequate" and "challenged" performance was set.

INTRAMEDULLARY PIN SIZE SELECTION FOR OPEN AND CLOSED NORMOGRADE PINNING OF THE DISTAL HUMERUS

Milgram J*, Shati S. Koret School of Veterinary Medicine, Rehovot, Israel.

The aims of this study were to compare open and closed normograde pinning of the distal humeral fragment and to determine the maximum diameter of intramedullary pin that could be placed safely into the medial epicondyle of the canine humerus. Sixteen pairs of forelimbs were harvested from cross-breed dogs weighing between 20 kg and 40 kg. Mediolateral and craniocaudal radiographic views of all the humeri were obtained immediately after harvesting the forelimbs. The diameter of the medullary cavity proximal to the humeral condyles, at 80% of the humeral length, was measured on the lateral radiographic view for each humerus. One forelimb from each pair was allocated to the closed pinning group by the flip of a coin. The contralateral forelimb was allocated to the open pinning group. Both the open and closed groups were divided into three subgroups based on the diameter of the IM pin used. The diameter of the IM pin was selected relative to the diameter of the medullary cavity of the humerus on the lateral radiographic view. The relative size of the IM pin calculated as a percentage of the diameter of the medullary canal of the humerus for the 25%–35% group, the 35%–45% group and the 45%–55% group were 31.04% $\pm$ 2.34%, 40.60% $\pm$ 2.40%, and 49.82% $\pm$ 3.59%, respectively. No damage was caused to the medial epicondyle when placing the pins in the 25%–35% and the 35%–45% groups. In 70% (7/10) of specimens in the 45%–55% group there was fracture and/or blanching of the medial/lateral cortex of the medial epicondyle. There was no significant difference in the exit points on the proximal humerus when the results were divided by group or size of pin. The largest diameter pin which could be placed without damaging the medial epicondyle was 53% of the medullary cavity of the distal humerus. However, in the 45%–55% group it became, subjectively, more difficult both to aim and advance the pins. In addition, the six pins with the most distal exit points were in this group. We recommend that an IM pin of 40% of the medullary cavity of the distal humerus be selected when driving an IM pin normograde into the distal humerus.

MOTION CAPTURE ANALYSIS OF THE MECHANICAL PERFORMANCE OF A NOVEL PEDICLE SCREW-ROD FIXATION SYSTEM FOR THE CANINE LUMBOSACRAL JOINT

Zindl C[1], Litsky AS[2], Crawford NR[3], Fitzpatrick N[4], Allen MJ[1]. [1]Veterinary Clinical Sciences, The Ohio State University, Columbus, OH, USA, [2]Davis Medical Research Center, The Ohio State University, Columbus, OH, USA, [3]Spinal Biomechanical Laboratory, Barrow Neurological Institute, Phoenix, AZ, USA, [4]Fitzpatrick Referrals, Eashing, Surrey, United Kingdom.

Introduction

The lumbosacral joint is the most mobile functional spinal unit (FSU) in dogs and is prone to several pathologies, often leading to surgical management by lumbosacral stabilization. Pedicle-screw systems have been shown to be effective in restoring stability of single FSU in-vitro but traditional monoaxial screws lack versatility. We have developed a novel spinal system that consists of the Fitz Intervertebral Traction Screw (FITS) and polyaxial screws with connecting rods (Fitzateur). The hypothesis was that use of the new instrumentation would result in significant reduction in lumbosacral instability as compared with a destabilized (post-laminectomy) control.

Materials and methods

Four cadaveric lumbosacral spines (L4-Cd1) were harvested and prepared for mechanical testing. Specimens were mounted on a 4-point bending jig and tested in flexion, extension and lateral bending using axial loads of between 0 and 150N. Angular displacement was recorded from optical trackers rigidly secured to L6, L7 and S1. Data were collected sequentially from intact spines, after dorsal laminectomy at L7-S1, and after surgical stabilization with the new implant system.

Results

Data was collected from 4 specimens of mature male dogs, 2 years of age, weighing 25.0–33.7 kg. Dorsal laminectomy resuled in a modest increase in range of motion at L6-L7 and L7-S1 compared to the intact spine. Application of the spinal instrumentation at L7-S1 significantly eliminated motion at this level, irrespective of loading direction compared to the intact and dorsal laminectomy spine. Instrumentation of L7-S1 was associated with a non-significant increase in motion at L6-L7 as compared with the destabilized specimen.

Discussion

Conservative management of degenerative lumbosacral stenosis alone may not be effective in relieving pain. Data from this study support the hypothesis that instrumentation with the recently developed novel spinal system results in measurable

significant reduction in lumbosacral movement in extension, flexion and lateral bending. Our results are consistent with an earlier report on data from a more traditional pedicle screw-rod system. Potential advantages of the novel implant system described herein over standard pedicle screw-rod constructs are polyaxial screws allowing greater versatility and the interbody spacer permitting distraction to restore the neuroforamenae and prevent collapse of the interbody space. Although there was evidence of an increase in motion at the adjacent intervertebral space after instrumentation of the L7-S1 junction, this effect was not significant. We conclude that the combination of a polyaxial pedicle screw-rod system and interbody spacer provides a versatile solution for surgical stabilization of the LS joint following surgical decompression in dogs.

Small Animal Soft Tissue Surgery

IS EXTRADURAL PRESSURE AN INDICATOR OF VALUE IN THORACOLUMBAR DISK DISEASE? A PRELIMINARY PROSPECTIVE STUDY IN CLINICAL CASES

Moissonnier P*, Sfez D, Vallefuocco R, Mannassero M, Jeandel A, Decambron A, Zilberstein L. Department of Surgery, Veterinary Teaching Hospital, Veterinary School of Maisons Alfort, Maisons Alfort, France.

Introduction: Thoracolumbar disk disease results from a spinal cord trauma secondary to acute/chronique displacement of Hansen I or II degenerative disk material in the vertebral canal. The volume of the disk material and the velocity of the displacement play an important role in the spinal cord trauma severity, and these factors are considered to be prognostic factors. New devices facilitate peridural pressure measurment. We designed a prospective study in dogs undergoing surgery for the treatment of disk disease to:

- Evaluate the feasibility of Intracanalar Peridural Pression Measurement (IPPM)
- Assess the variation of IPP after naturally occuring disk disease
- Obtain a distance-related curve of IPP. Is extradural pressure an indicator of value in thoracolumbar disk disease?

Materials and methods: Two preliminary studies were conducted: 1. Measurement of pressure in 5, 10, 15 and 20 cm of water by the sensor, 2. Ex-vivo study in 6 fresh cadavers to assess the feasibility of sensor introduction into the peridural space without damaging the spinal cord. Dogs with a grade 2 to grade 5 thoracolumbar intervertebral disk disease evidenced by CT scan and in which hemilaminectomy was considered for decompressive surgery were included in the study during a 10 month period. On the CT-scan we calculated the area of the spinal canal and the area occupied by the extruded/protruded disk material every 3mm from the middle of the disk space in the caudal and cranial directions. During surgery, an ICP MicroSensor (CODMAN®) was introduced via a 3mm in diameter pediculectomy performed on the caudal vertebra of the affected disk unit. The pressure was recorded each 3mm in the caudal and cranial directions. The sensor was pushed cranially until a "normal" pressure was recorded. The pressure curve obtained was compared with the space occupying lesion curve for correlation. Data were analyzed to evaluate the relationship between the pre-operative and post operative (3 to 6 weeks) grade of the patient and the volume of extruded/protruded disk.

Results and discussion: A good correlation between the pressure measured with the sensor and the water pressure was observed, and the feasibility study demonstrated that there no lesions occurred secondary to sensor introduction in the peridural space.

Ten dogs met the inclusion criteria of the study. The peridural pressure varied from 2 to 35 mm Hg. The pressure was not correlated to pre-operative neurological grade of the dogs, even if the higher pressures were recorded in grade 5 dogs. The comparison of epidural pressure and percentage of the spinal canal occupied by the disk material are linked to the distance from the center of the disk herniation. Maximal values for pressure (15 mm Hg to 35 mm Hg) were measured close to the maximal percentage of vertebral canal occupation by the disk (25% to 65%). The pressure decreased rapidly (after 6 to 9 mm from the herniation site) to stabilize caudally and cranilally to normal values close to 1.2 mm Hg. The duration of neurological recovery was not correlated to pressure measurement. The number of cases included in this study is far to small to draw any conclusion of correlation between the various data. It is concluded that IPPM is feasible, and non time consuming method that could be helpful for the surgeon to locate the exact site of compression and give a new prognostic factor.

PULMONARY INJURY AND SYSTEMIC INFLAMMATION DURING CARDIOPULMONARY BYPASS IN A PORCINE MODEL

Chanoit G*, Rahman I, Walker L, Murison P, Hillier J, Pawade J, Dora K, Beleznei T, Angelini GD, Suleiman MS, Ascione R. Bristol Heart Institute, Bristol, United Kingdom.

Background and Objective: Cardiopulmonary bypass (CPB) is seldom used in veterinary surgery because of cost, availability issues, and complication rate. The complications classically described in dogs and cats include cardiac arrhythmias, hypotension, haemolysis, and cerebral injury, but little is known about CPB associated lung complications in the veterinary field. In humans, the incidence of pulmonary complications following cardiac surgery remains high leading to increased in-hospital mortality and costs. In this experimental trial we investigated for the first time the incidence of pulmonary dysfunction, ischemia, oxidative stress and lung tissue damage associated with cardiac surgery in a porcine experimental model of CPB and cardioplegic arrest (CA).

Methods: Under Home Office licence, pigs (~60 kg) were randomised to either median sternotomy alone (Control; $n = 6$) or with CPB (80 minutes) and CA with intermittent antegrade cold blood cardioplegia delivered at 20 minutes intervals (CPB + CA; $n = 7$). Standardised anaesthetic, surgical and perfusion protocols were used. Serial blood samples and lung biopsies were collected at baseline, prior to weaning from CPB (ischemia), and 1 hour following CPB weaning (recovery) and at similar time intervals in the control group. Lung functional, inflammatory, oxidative, histo-pathological, micro-vascular permeability and apoptosis variables were compared.

Results: The results showed marked functional deterioration (respiratory index and alveolar-arterial oxygenation gradients; both $P < 0.05$), significant pulmonary ischaemia (reduced ATP/ADP and ATP/AMP ratios; both $P < 0.05$), systemic inflammation (higher plasma release of IL-6), evidence of lung apoptosis (caspase-3 activity), increased pulmonary micro-vascular leakage and pulmonary tight junctions fragmentation (immunohistochemistry) in the CPB + CA group compared to baseline values and to control group.

Conclusions: The use of CPB and CA in a porcine model is associated with pulmonary dysfunction, ischaemic stress, systemic inflammation, pulmonary apoptosis, and marked lung tissue damage. Novel interventions of lung protection during cardiac surgery are required to minimise these detrimental effects and improve overall outcome following CPB.

THE EFFECT OF SPECIMEN PREPARATION ON POST EXCISION AND POST FIXATION SHRINKAGE, ROTATIONAL AND LATERAL TRANSLATION IN DOGS

Risselada M*, Mathews KG*. NCSU, CVM, DOCS, Raleigh, USA.

Three paired circular specimens with a 7 cm diameter were harvested from the thoracic, ventral abdominal and lateral thigh area of freshly euthanised medium to large breed dogs. Of one specimen only the four quadrants of both fascia and skin were identified (control), of the paired specimen the skin and fascia was sutured together prior to explantation ("sandwich") in addition to the identifying sutures. Specimens were measured for length (pre-excision, post-excision and post-fixation), rotation (fixed specimen), translation (fixed cut specimen) and assessed for distortion (fixed specimen).

No significant difference was found between harvested and fixed sample in the dorsoventral direction for the abdominal samples for both techniques, for the craniocaudal direction of the control thigh specimen, the dorsoventral sandwich thigh specimen, and the dorsoventral directon of the thorax control specimen.

The lateral translation between the fascial layer and skin of cut specimens post fixation was significantly different only between the two techniques for the thorax specimens. No significant difference was found for the abdominal and thigh specimens.

This cadaver study showed that surgically obtained specimens will significantly decrease in size after excision. The majority of this shrinkage will take place prior to formalin fixation. Creating a tumor sandwich will significantly improve appropriate alignment of tissue planes without an effect on specimen size or distortion.

RADICAL CYSTECTOMY AND BILATERAL SUBCUTANEOUS URETEROVESICULAR BYPASS (SUB) PLACEMENT FOR ADVANCED URINARY BLADDER CANCER IN DOGS

Weisse C*, Berent A. Animal Medical Center, New York, USA.

Canine urothelial carcinoma remains a disease with poor clinical response to therapy. Initial biological responses are non-durable and patient death typically occurs within a year or so following diagnosis. Contrary to theoretical advantages, radical surgical resections and rerouting procedures have not provided prolonged survival times and reported complications may dissuade owners from these procedures. We hypothesised that radical cystectomy with SUB placement would permit more aggressive, wider tumor resection with few associated complications.

Three dogs with extensive bladder TCC, bilateral ureteral obstructions, and incontinence were included. Comorbidities included severe azotaemia (2/3) and previous therapies included previous surgical resection (2/3) and chemotherapy (2/3). Dogs received total cystectomy, bilateral partial ureterectomies, and partial urethrectomy with placement of a bilateral SUB device (Norfolk Vet). There were no major intra-operative complications and surgical times ranged from 120–160 minutes. Post-operative complications included urinary tract infection (3/3) and a kinked urethral catheter requiring an extension added to the subcutaneous port (1/3).

All biopsies had tumour cells present at the urethral surgical margin only. Two dogs ultimately died or were euthanised for progressive azotaemia (95 days) and a transfusion reaction with no azotaemia (48 days). One dog remains alive 244 days post-operatively. SUB device flushing has confirmed patency in all three dogs. No dogs have been identified to have local tumor recurrence.

Total cystectomy with SUB placement is a potential option for dogs with extensive TCC in order to achieve wide tumor excisions. Large excisions are necessary to achieve complete tumor-free margins.

EVALUATION OF THE RENAL EFFECT OF CIMICOXIB IN MATURE DOGS SUBMITTED TO A HYPOTENSIVE CHALLENGE DURING GENERAL ANESTHESIA

Menard J[1], Roy J[2], Caldwell J[3], Hare J[3], Schneider M[4], Woehrlé F[4]. [1]Vetoquinol SA, Paris, France, [2]Vétoquinol Canada, Lavaltrie, Canada, [3]Kingfisher International, Stouffville, Canada, [4]Vetoquinol SA, Lure, France.

Introduction: Non steroidal anti inflammatory drugs are commonly used to treat dogs with osteoarthritis and those undergoing surgical procedures. One of the main concerns when administering NSAIDs to dogs undergoing surgery is the potential loss of regulatory mechanism to ensure adequate renal blood flow and glomerular filtration rate, especially during hypotensive episodes under general anesthesia. The objective of the study was to assess renal plasma flow and urinary biomarkers in mature dogs having received 10 days of cimicoxib and submitted to a 2 hour hypotensive episode under general anesthesia.

Material and methods: In a blinded, controlled, and parallel study, 12 healthy Beagle dogs, 1 male and 11 female, weighing 11.0 ± 1.2 kg and aged 7 to 8.8 years were randomly selected into one of two groups: 4 for placebo group or 8 dogs for the treatment group receiving one daily 30 mg tablet of cimicoxib (Cimalgex®; 2.80 ± 0.34 mg/kg). After 10 days of treatment or placebo administration, general anaesthesia was induced by acepromazine and thiopental sodium and maintained by isoflurane. Mean arterial blood pressure was maintained at 55–65 mmHg for 2 hours during anesthesia. Renal plasma flow (RPF) measured via P-aminohippuric acid (PAH) clearance was measured once 5 days prior administration of the drug or placebo and one hour into the hypotensive episode. Urinary protein:creatinine ratio (UPC) and N-acetyl-β-D-glucosaminidase (NAG):creatinine ratio were assessed once 5 days prior administration of the drug or placebo, the day prior the hypotensive challenge, the day following, and 3 and 5 days post challenge. Animals were euthanised on day 28 and kidneys were submitted for histological examiantion.

Results: Despite a 26 to 45% decrease compared to baseline in 4/8 cimicoxib treated dogs, no statistically significant difference in RPF ($P = 0.24$) was observed during the hypotensive challenge between groups. Neither UPC ratio ($P = 0.76$) nor NAG: creatinine ratio ($P = 0.55$) were affected by cimicoxib at either time points. Mild glomerulopathy, compatible with age-related changes, was observed post-mortem in all dogs and lesions were similar among treatment groups.

Conclusions and clinical relevance: Dogs having received labelled dosage for 10 days of cimicoxib did not show a significant decrease in renal plasma flow or increase in urinary glomerular or tubular biomarkers. A non dose related decrease in RPF was observed in some dogs, but did not lead to increases in UPC or NAG:creatinine ratio. Further studies are warranted to explain the clinical significance of these findings.

CLINICAL EVALUATION OF THE COCCYGEAL AXIAL PATTERN FLAP: A MULTI INSTITUTIONAL RETROSPECTIVE STUDY IN 13 DOGS

Montinaro V[1], Massari Federico MF[*1], Vezzoni Luca VL[1], Liptak Julius LJM[*2], Straw Rod SRC[*3], Allen Larie AL[*4], Cavanaught Ryan CRP[*5], Berg John BJ[*6], Doyle Ronald DR[*7], Buracco Paolo BP[*8], Romanelli Giorgio RG[*1]. [1]Clinica Veterinaria Nerviano srl, Nerviano, Italy, [2]Alta Vista Animal Hospital, Ottawa, Canada, [3]The Australian Animal Cancer Foundation, Brisbane Veterinary Specialist Center, Brisbane, Australia, [4]Wheat Ridge Veterinary Specialists, Wheat Ridge, USA, [5]VCA Alameda East Veterinary Hospital, Alameda, USA, [6]Department of Clinical Sciences, Cummings School of Veterinary Medicine, Tuft University, North Grafton, USA, [7]Davies Veterinary Specialists, Hitchin, United Kingdom, [8]Department of Animal Science, University of Turin, Grugliasco, Italy.

Introduction: Surgical reconstruction of large wound defects in the gluteal and ischial regions and the base of the tail can be challenging. Axial pattern flaps are local skin flaps incorporating a direct cutaneous artery and vein which are transferred as an large segment of skin in a single stage. The aim of the present study was to evaluate the coccygeal axial pattern flap to reconstruct large defects on the dorsum, gluteal and ischial area in dogs as a result of trauma or surgical excision of tumors.

Material and Methods: Clinical records of dogs treated with a coccygeal axial pattern flap to reconstruct large cutaneous defects of the dorsum, gluteal and ischial areas were retrospectively evaluated. Different incisions on the tail were performed depending on the location of the defects and started from the tail base extending distally along its length.The proportion of the flap length in comparison with the tail length, location of the skin incision (dorsal vs. ventral) for flap preparation, reason and size of the wound, and short (within 15 days postoperatively) and long term (after 15 days postoperatively) complications were recorded.

Results: Thirteen patients were included, 11 with tumors and 2 with traumatic skin loss. In 2 dogs, the defect was reconstructed with a coccygeal axial pattern flap in combination with either a caudal superficial epigastric axial pattern flap or an inguinal flank fold flap. The percentage of tail used ranged from 33% to 100% (mean, 51.76%). Four cases developed postoperative complications (30%). Two dogs (15%) had minor post-operative wound complication that did not require surgical revision, while the remaining 2 dogs (15%) required surgical revison. Two cases had distal flap necrosis, one of which had surgical revision and one was managed conservatively for a 2 cm × 2 cm necrotic lesion. The flap length used was 80% and 65% of the tail length, respectively, in these cases. At 30 days, all flaps had healed completely and in some dogs the only visible change was the different direction and colour of the hair coat in those dogs in which a dorsal tail skin incision was performed. Owner satisfication with the cosmetic appearance was rated as excellent in 6 dogs, very good in 5 dogs, and good in 2 dogs.

Discussion: Based on the results of these 13 dogs, the coccygeal axial pattern flap is a useful option to reconstruct gluteal, ischial and dorsal defects. In this series, distal flap necrosis occurred when the flap exceeded 60% of the tail length or in those with a secondary wound infection.

EXPERIMENTAL ASSESSMENT OF SEALING TIME, MAXIMUM WORKING TEMPERATURE AND THERMAL TISSUE DAMAGE FOR COMPARING THREE TISSUE-SEALING SYSTEMS IN A PORCINE MODEL

Dunay MP[1], Papp-Szekeres J[2], Solymosi N[1], Németh T[*1]. [1]Department and Clinic of Surgery and Ophthalmology Faculty of Veterinary Science Szent Istvan University, Budapest, Hungary, [2]Department of General Surgery Bács-Kiskun County Hospital, Kecskemét, Hungary.

Thunderbeat is a novel electrosurgical system integrating bipolar tissue-sealing function and ultrasonic scissors and the LigaSure and EnSeal systems have been used widely in the surgical practice. Three tissue-sealing systems (Thunderbeat, LigaSure and EnSeal) were compared regarding sealing time (ST), maximum working temperature (WTmax) and total as well as collateral thermal tissue damage caused by a 5-mm laparoscopic handpiece on 4 types of tissues (striated muscle, mesentery, liver and spleen) in an in vivo pig model. Tissue samples were taken for histopathologic measurement of the total (MTZtotal) and the collateral (MTZcollat) microscopic thermal injury zone (distance between the edge of the jaw and the edge of the thermal damage zone). Nitroblue tetrazolium chloride (NBTC) enzyme histochemistry was used to assess the width of thermal tissue damage using a SPOT Xplorer digital camera and a SPOT Advanced software.

LigaSure had the lowest mean ST (seconds ± SD) with 3.72 ± 0.51 (muscle), 3.13 ± 0.2 (spleen), 4.95 ± 0.47 (liver) and 3.65 ± 3.6 (mesentery), followed by Thunderbeat and EnSeal with significant differences ($P < 0.05$) between all types of tissues and devices. The significantly lowest mean WTmax (°C ± SD) was obtained for EnSeal in muscle (61.09 ± 5.01), liver (63.72 ± 6.15) and mesentery (59.44 ± 2.14). LigaSure and EnSeal operated at the lowest temperature in spleen (54.25 ± 9.76 vs. 57.33 ± 4.49) without a significant difference between them. The significantly lowest mean MTZtotal (mm ± SD) was caused by EnSeal and LigaSure in mesentery (4.99 ± 0.63 vs. 4.93 ± 0.67), muscle (5.3 ± 1.08 vs. 5.14 ± 1.35) and spleen (4.04 ± 0.68 vs. 3.81 ± 0.49) samples without significant differences between them, followed by the significantly higher values of Thunderbeat. Nevertheless, Thunderbeat produced the significantly lowest mean MTZtotal in the liver (4.78 ± 1.23). EnSeal produced the lowest mean MTZcollat (mm ± SD) in the liver (0.16 ± 0.23) and mesentery (0.04 ± 0.11), followed by LigaSure and Thunderbeat showing significant differences by tissue types. EnSeal and LigaSure caused lower mean MTZcollat in muscle samples (0.19 ± 0.3 vs. 0.28 ± 0.4) without a significant difference compared to Thunderbeat. EnSeal and LigaSure did not cause measurable MTZcollat (e.g. the thermal injury did not exceed the edge of the instrument jaw) in the spleen, while Thunderbeat produced a significantly different MTZcollat (0.79 ± 0.38). Based on the result of this study, Thunderbeat seems to be more invasive to tissue integrity even without the activation of ultrasonic scissor function than EnSeal or LigaSure, systems that operate at lower temperatures and were found to cause no measurable collateral thermal damage.

EVALUATION OF RADIOFREQUENCY ABLATIVE ENERGY FOR RESECTION OF OVERLONG SOFT-PALATE IN THE DOG - A PILOT STUDY

Palierne SP, Bilmont AB, Meynaud PM, Semin MOS, Delverdier MD, Autefage AA[*]. Ecole Nationale Vétérinaire de Toulouse, Toulouse, France.

Introduction

Radiofrequency ablative energy (Coblation®), which is commonly used in human ENT surgical procedures, may be useful in veterinary medicine. The objective of this study was to compare the Coblation technique with the usual incisional procedure for soft palate resection in dogs. Our hypothesis was that Coblation-assisted soft palate resection would be faster, easier and without adverse effects, compared with the incisional technique.

Materials and methods

A 5 mm resection of the soft palate was performed in ten dogs either by coblation (COB) without wound suture or incisional (INC) procedure with wound suture.

Operative time was recorded in both groups. Clinical evaluation was repeated daily throughout follow-up. Serum CRP concentration was measured at T0, 6 h and on days 1, 2, 3, 5, 7 and 14. The surgical wound was scored under general anesthesia, on days 0, 1, 3, 7 and 14 for colour and oedema of the soft palate and for colour, regularity, thickness and presence of granuloma of the surgical wound. The dogs were euthanised on day 14. A histopathological description (inflammation, fibroplasia, edema, hemorrhage, necrosis, depth of tissue damage and granuloma occurrence) was compiled from samples from each palate.

Results

No intra-operative complications occurred with either surgical procedure. Operative time was significantly shorter for the COB group (8.4 ± 2.8 min) than for the INC group (17.4 ± 3.6 min) ($P < 0.05$). Clinical assessments were unremarkable for both groups. Although all CRP values were low (< 24 mg/L), they were significantly higher for the COB group than for the INC group at 6 h post-operatively and at day 3 ($P < 0.05$). The surgical wound scores based on oedema, regularity, thickness and granulomas were less favourable for the INC group than for the COB group. A change in colour of the central part of the wound was noticed during week 1 and was significantly more pronounced in the COB group ($P < 0.05$). Colouration was normal in both groups at day 14. Histopathological findings revealed a significant difference only for granulomas, with more occurring in the INC group. Depth of tissue damage was higher for the INC group (2.5 ± 0.3 mm) than for the COB group (1.5 ± 0.1 mm) ($P < 0.05$).

Discussion/Conclusion

Resection of the soft palate by Coblation appeared feasible, simple and faster than by the incisional technique. No adverse reaction, excessive inflammation, necrosis or exuberant scar was detected. The wound created by Coblation was more regular and less oedematous than with the incisional technique, although a transient discolouration was seen. Coblation can be considered as an alternative technique for resection of elongated soft palate in dogs and this should be confirmed in clinical studies.

SURGICAL TECHNIQUES IN PREPUBERTAL OVARIECTOMY IN KITTENS

Porters N, Polis I, Moons C, Goethals K, De Rooster H*. Faculty of Veterinary Medicine, Ghent University, Merelbeke, Belgium.

Objectives—To describe and compare the feasibility, surgical time, and complications associated with 4 surgical techniques for prepubertal ovariectomy in kittens.

Study Design—Prospective, randomized clinical trial.

Animals—Female kittens (n = 197)

Methods—Kittens, aged 8–12 weeks, were randomly assigned to 1 of 4 surgical techniques for prepubertal ovariectomy: placement of ligatures (suture), application of vascular clips (haemoclip), use of a bipolar forceps (coagulation), or creation of a knot on the ovarian pedicle (pedicle tie). Abdominal approach and closure were identical in all kittens. Surgical time and peri-operative complications were recorded. For statistical analysis, a linear (surgical time) and a logistic regression (complications) model were designed. Significance was set at 0.05.

Results—All surgical techniques provided easy and reliable haemostasis during prepubertal ovariectomy. The technique used was significantly associated with the length of the surgery ($P < 0.0001$). The observed surgical times for haemoclip ($P < 0.0001$), coagulation ($P < 0.0001$) and pedicle tie ($P < 0.05$) were significantly shorter than for suture. Placement of haemoclips ($P < 0.05$) and use of coagulation ($P < 0.05$) resulted in significantly shorter surgical times compared to creation of a pedicle tie (both $P < 0.05$). In one kitten, it was not feasible to create a pedicle tie because the ovarian pedicle was relatively too short.

Few peri-operative complications were encountered (n = 7; 3.6%) and there was no difference in complication rate or type between the different surgical techniques ($P = 0.3119$). Minor bleeding at the uterine site was seen in 3 kittens and ovarian pedicle hemorrhage occurred in one. Torn tissue was observed once at the ovarian site and once at the uterus. All kittens recovered uneventfully.

Conclusion—All surgical techniques proved to be easy and safe to isolate the ovaries for prepubertal gonadectomy in kittens. The techniques could only be differentiated by significant differences in surgical time.

Clinical Relevance—The placement of haemoclips or the use of electrocoagulation significantly shortens surgical time while providing excellent haemostasis for prepubertal ovariectomy in kittens. However, in shelter medicine, the use of hemoclips will be limited by the costs of the disposable device. Notwithstanding the initial cost of the cautery device, coagulation is attractive for high volume spay conditions in shelter medicine.

COMPARISON OF PLASMA CONCENTRATIONS OF LIDOCAINE IN DOGS FOLLOWING APPLICATION OF A LIDOCAINE PATCH OVER AN INCISION COMPARED TO INTACT SKIN

Joudrey SD, Robinson DA*, Da Cunha AF. School of Veterinary Medicine, Louisiana State University, Baton Rouge, USA.

Introduction: The goal of this project was to compare the drug uptake and distribution when a commercial 5% lidocaine patch was placed on intact skin to those when the patch was placed over a surgical incision.

Materials and Methods: The study was IACUC approved. 10 purpose-bred, intact, adult, hound-mix canines were used in a crossover design. First, an incision was made and closed with absorbable suture on the right thorax followed by placement of the patch directly on the incision. After a washout, the skin on the left thorax was used and the patch was placed over intact skin. Blood samples were obtained via jugular catheter at patch placement (T = 0); 20, 40 and 60 min; and 2, 4, 6, 12, 24, 36, 48, 72 and 96 hrs. Patches were removed at 72 hrs. Dogs were examined every 8 hrs until after patch removal, and then twice daily. A modified CPS was to monitor for rescue analgesia. After patch removal the skin was graded using a subjective skin reaction classification system.

All samples were analyzed at a clinical pharmacology laboratory using HPLC. AUC, C_{MAX} and summary Pk data were calculated for each dog at each time point. A 1-way ANOVA was performed at each time point to determine a group effect. If a group effect existed, pairwise t tests were performed to determine specific group significance.

Results: No dogs required rescue analgesia and no toxicity or skin reaction was noted. Mean ± SE AUC and C_{MAX} were: Incision 1477.62 ± 186.98 ng*h/ml, 54.09 ± 4.98 ng/ml; No Incision 1098.04 ± 163.59 ng*h/ml, 44.37 ± 5.19 ng/ml, respectively. The plasma concentration of lidocaine was significantly higher in the Incision group compared to the No Incision group at 6 ($P = 0.017$), 12 ($P = 0.009$) and 48 ($P = 0.02$) hours after patch application.

Discussion: The results of the study presented here demonstrate that the systemic absorption of lidocaine in the presence of an incision is relatively low (mean ± SE C_{MAX} 54.09 ± 4.98 ng/ml), yet highly variable. The peak concentrations in our study occurred 24–48 hours after patch application (mean ± SE T_{MAX} 28.9 ± 5.66 hours (Incision) and 21 ± 7.86 hours (No Incision)) and the incision group had a significantly higher lidocaine concentration at 6, 12 and 48 hours after patch application. Contrary to our expectations, there were no significant differences in the pharmacokinetic data between groups. Following patch removal, serum lidocaine concentrations decreased quickly yet remained detectable after 24 hrs (96 hrs after patch application). Although this study did not evaluate the efficacy of a lidocaine patch as an analgesic, it did provide information on the absorption of lidocaine when a patch is used over an incision and demonstrated that when used in this manner it is well tolerated and no adverse reactions occurred.

EVALUATION OF EFFICACY OF SYSTEMIC ADJUVANT THERAPY FOR CANINE ORAL MALIGNANT MELANOMA AFTER SURGICAL EXCISION: A VETERINARY SOCIETY OF SURGICAL ONCOLOGY RETROSPECTIVE STUDY OF 151 CASES

Boston SE*[1], Lu X[1], Culp WTN[2], Montinaro V[3], Romanelli G*[3], Dudley RM[4], Liptak JM*[5], Mestrinho LA[6], Burraco P*[7]. [1]University of Florida, Gainesville, USA, [2]University of California, Davis, Davis, USA, [3]Clinica Veterinraia Nerviano, Nerviano, MI, Italy, [4]MedVet, Medical & Cancer Centers for Pets, Columbus, OH, USA, [5]Alta Vista Animal Hospital, Ottawa, ON, Canada, [6]Lusofona University, Lisbon, Portugal, [7]University of Turin, Torino, Italy.

Objective: The evaluation and comparison of outcome for canine oral malignant melanoma after surgical excision with various systemic adjuvant therapies and the evaluation of various prognostic factors.

Design: Retrospective study

Animals: 151 dogs with naturally occurring oral malignant melanoma treated with surgical excision from 2001–2012

Procedures: Case accrual was solicited from VSSO members via the VSSO listserve. Information was collected from case records on signalment, staging, tumor characteristics, type of surgical excision, histological diagnosis, adjuvant therapy and survival time.

Results: The overall MST was 346 days. Tumour size, patient age and an intralesional excision (versus marginal, wide or radical excision) were considered poor prognostic indicators in multivariate analysis. No systemic adjuvant therapy, including vaccination and systemic chemotherapy, was found to improve survival. Ninety-eight dogs had no postoperative adjuvant therapy, with no difference in survival found between dogs that did (335 days) and did not (352 days) have systemic adjuvant therapy.

Conclusions and Clinical Relevance: Increasing tumour size and age were shown to be negative prognostic factors in this study. Complete excision of all macroscopic tumor burden improved survival. Long-term survival is possible in cases of canine oral malignant melanoma with surgery alone. No systemic adjuvant therapy was shown to improve survival in this study. This could be due to type II error. A prospective study is needed to further evaluate this clinical question.

THE MYTH OF LATERAL BULLA OSTEOTOMY: LONG TERM OUTCOME FOR 160 TOTAL EAR CANAL ABLATION PROCEDURES PERFORMED WITHOUT LATERAL BULLA OSTEOTOMY

Martinoli S, Demetriou J*, Wilson C, White RAS*. Dick White Referrals, Six Mile Bottom, Newmarket Suffolk, United Kingdom.

Introduction: Canine chronic otitis externa often results in end-stage and middle ear disease requiring surgical management by means of total ear canal ablation

(TECA). Lateral bulla osteotomy (LB0) has been considered to be an essential component of this procedure (Cechner, 1982: Smeak & DeHoff, 1986) and TECA alone was thought to result in poorer outcomes and higher complication rates. The aim of this retrospective study is to evaluate a large cohort of canine cases of end-stage ear disease treated exclusively with TECA and bulla toilet but without LBO. Our hypothesis was that dogs treated with TECA / bulla toilet have comparable outcomes to dogs treated with TECA/LBO.

Materials and Methods: Clinical records of dogs undergoing TECA for end-stage otitis externa and media between 2004 and 2012 were evaluated. All cases underwent TECA without LBO but with irrigation and curettage of the tympanic bulla to remove all diseased tissue; care was taken to avoid disturbance of the dorso-medial aspect of the mesotympanic chamber. Short-term follow up was by clinical examination at a three weeks and long-term follow up (longer than 12 months) was by owner telephone questionnaire. Owners were asked to evaluate their perception of the outcome for their dogs as being excellent, good (improved), or poor.

Results: 215 dogs were surgically treated of which 110 fulfilled all of the criteria for inclusion. MRI scan was performed in 60 cases. 60 unilateral and 50 bilateral procedures were performed for a total of 160 TECA. Mean age at surgery was 6.6y. Mean hospitalization time was 3.2 days (range 2–5d). Mean follow up was 4.5y (range 8m–9y). Minor and major complications occurred in 3 (1.8%) and 6 (3.75%) dogs, respectively. Minor complications (wound dehiscence) were encountered in three cases. Major complications included onset of neurological deficits (n = 2), para-aural abscess (n = 3: 2, 3, and 6 months after surgery) and the development of cholesteatoma (n = 1: two years after surgery). Outcome was described as excellent in 145 procedures (90.6%), good in 9 (5.6%) and poor in 6 (3.7%).

Discussion: Although the retrospective nature of this study may underestimate the complication rates, they were substantially lower than has been previously reported and may reflect the reduced peri-tympanic disturbance. The development of para-aural abscessation in only 3 cases in this series, suggests that LBO is not required to achieve adequate toilet of the tympanic bulla. These results, in conjunction with the high rate of owner satisfaction, support the view that LBO is unnecessary when treating end-stage ear disease in dogs by TECA.

Resident's Forum - Small Animal Surgery

Orthopedic Surgery

IMPACT OF FEMORAL VARUS ON COMPLICATIONS ASSOCIATED WITH CORRECTIVE SURGERY FOR MEDIAL PATELLAR LUXATION

Adams RJ[1], Tewson C[2], Perry KL*[2]. [1]Davies Veterinary Specialists, Higham Gobion, United Kingdom, [2]Royal Veterinary College, Hatfield, United Kingdom.

Introduction

The objective of this study was to evaluate the association of femoral varus with postoperative complications following correction of medial patellar luxation.

Materials and methods

Medical records of dogs that had corrective surgery for non-traumatic medial patellar luxation without concomitant cranial cruciate ligament rupture were reviewed. Signalment, history, grade of luxation, operative technique and clinical outcomes were retrieved. Measurements of femoral varus including femoral varus angle (FVA), inclination angle (ICA), anatomical lateral distal femoral angle (aLDFA), and mechanical lateral distal femoral angle (mLDFA) were taken from caudocranial radiographs of the pelvic limbs by three examiners.

Results

Fifty five stifles (47 dogs) met the inclusion criteria. There were 44 stifles from dogs <20 kg, and 11 from dogs ≥20 kg. Grade I MPL was noted in 2/55 stifles (3.6%), grade II in 26/55 stifles (50.9%), grade III in 12/55 stifles (36.4%) and grade IV in 4/55 stifles (7.3%). Overall mean FVA was 17° ± 9.8°. Mean FVA for Grade I-II MPL was 16.2° ± 7.2°, grade III was 16.7° ± 9.1°, and grade IV was 27.0° ± 22.9°. No significant correlation was found between the 4 angles measured and grade of patellar luxation or patient age. There was a strong positive correlation between these angles and increasing patient weight; FVA, ICA, aLDFA and mLDFA were all significantly greater for dogs >20 kg. Overall frequency of complications was 22% with no cases requiring corrective surgery for patellar reluxation postoperatively. There was no significant association between complications and FVA or patient weight.

Discussion

Previous recommendations have advised distal femoral osteotomy for dogs with excessive femoral varus based on FVAs greater than 12° to help reduce the incidence of patellar reluxation following routine surgery. However, in this study, routine surgery was successful in the surgical correction of MPL in a population of dogs with a mean FVA of 17° ± 9.8°. Given the lack of reluxation requiring revision surgery and lack of association of FVA with complications in this population, the definition of excessive femoral varus and recommendations for distal femoral osteotomy may need to be re-evaluated. The angles at which the degree of femoral varus is likely to increase the incidence of patellar reluxation may be higher than previously thought.

BIOMECHANICAL COMPARISON OF THE DURABILITY OF TWO LOCKING PLATE CONSTRUCTS UNDER CYCLIC LOADING IN TORSION - TWO SCREWS VERSUS THREE SCREWS PER FRAGMENT

Bilmont AB, Palierne SP, Verset MV, Swider PS, Autefage AA*. Ecole Nationale Vétérinaire de Toulouse, Toulouse, France.

Introduction

The number of locking screws required per fragment during bridging osteosynthesis has not been evaluated in the dog. The purpose of this study was to measure the durability under cyclic torsion of two constructs with either two or three screws per fragment.

Material and methods

A ten hole 3.5 mm stainless steel locking compression plate (LCP®) was fixed 1 mm away from a bone surrogate with a fracture gap of 47 mm. Two groups of ten constructs were prepared with either 2 or 3 bicortical locking screws per fragment placed at the extremities of the plate and tested in cyclic torsion (range 0 to 12.5°) until failure.

Results

The cycle of failure was significantly lower for the 2-screw constructs (15,600 ± 5,272 cycles) compared with the 3-screw constructs (20,700 ± 5,735 cycles). Stiffness was significantly lower for the 2-screw constructs (23.73 ± 0.87 N.m/rad) than for the 3-screw constructs (29.65 ± 1.89 N.m/rad). Most constructs failed by screw fracture at the junction of the shaft and head. Failure in the remaining constructs was due to screw head unlocking with some of related to incomplete seating of the screw head prior to testing.

Discussion/Conclusion

Omitting the third innermost locking screw during bridging osteosynthesis reduced fatigue life by 25% and construct stiffness by 20%. Fracture of the screws is believed to occur sequentially starting with the innermost screw.

A construct with 2 screws per fragment should be used only in selected patients and when adequate insertion of each screw can be ensured.

BIOMECHANICAL COMPARISON OF PIN AND TENSION-BAND WIRE VS. NOVEL LOCKING PLATE FIXATION IN A TRANSVERSE PATELLAR FRACTURE MODEL IN THE DOG

Gibert S[1], Kowaleski MP*[2], Matthys R[3], Nützi R[3], Serck B[4], Boudrieau RJ*[2]. [1]Centre Hospitalier Vétérinaire Frégis, Arcueil, France, [2]Tufts University Cummings School of Veterinary Medicine, North Grafton, USA, [3]RISystem AG, Davos Platz, Switzerland, [4]Dierenkliniek De Saen, Amsterdam, Netherlands.

Introduction

Surgical repair of patella fractures is recommended based on results of many human experimental and clinical studies; various methods of pin and tension-band wiring fixation have been described using the mid-shaft transverse fracture as a model. Similar methods of fixation have been recommended in the dog. There currently is no published evidence in the dog that documents overall success with this method of fixation. Additionally, there is a general consensus (unpublished) that this technique is not usually successful in the dog. Our objective was to evaluate a prototype locking plate and pin and figure-of-8 tension-band wire for fixation of mid-transverse patellar fractures in an ex vivo experimental dog model.

Materials and Methods

Cadaveric canine stifle joints were obtained from 10 adult mixed breed dogs (23–36 kg). Mid-transverse patella ostoetomies were randomly stabilized (in pairs) with either pin and figure-of-8 tension-band wire or prototype locking plate system. Cyclic loads were applied at 100% body weight (90° to 135° extension) at 1 Hz for 500 cycles. Success/failure was defined as ≤2 mm/ > 2 mm distraction at the fracture gap, respectively. Number of cycles at failure and distraction gap after cyclic testing were compared between each stabilization group using a paired Student's t-tests; all constructs that survived cyclic testing were then tested in acute load to failure (stiffness and yield strength), and were similarly evaluated. Significance was set at $P < 0.05$.

Results

All 10/10 patellae (locking plate system) and 3/10 (pin and tension-band wire) survived cyclic testing; failure in the 7/10 specimens occurred at 3 ± 3 cycles ($P = 0.0013$). Distraction gap with plate fixation (0.27 ± 0.39 mm) and tension-band wire (1.70 ± 0.52 mm) was significantly different ($P < 0.0001$). Construct stiffness and yield strength were not significantly different.

Discussion/Conclusion

The prototype locking plate system demonstrated consistent and reliable fixation of transverse patella fractures with significantly better fixation during cyclic loading. Too few tension-band wire fixations survived the testing to perform an adequate

statistical analysis with destructive testing. The failure mode (distraction) with the tension-band wire fixations was consistent with the common failures observed in the clinical setting. The prototype locking plate system may offer a potential new option for fixation of these fractures, but needs to be verified clinically.

Disclosure

R. Matthys and R. Nützi are employed by RISystem AG, Davos Platz, SW.

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COMPLEX EXTRA-ARTICULAR PROXIMAL THIRD CANINE TIBIAL FRACTURES: IN VITRO BIOMECHANICAL EVALUATION OF FOUR METHODS OF FIXATION

Guerin VJ[1], Sutcliffe MPF[2], Jeffery ND*[3], Radke H*[4]. [1]The Royal Veterinary College, Hatfield, United Kingdom, [2]Department of Engineering, University of Cambridge, Cambridge, United Kingdom, [3]College of Veterinary Medicine, Iowa State University, Ames, USA, [4]Department of Veterinary Medicine, University of Cambridge, Cambridge, United Kingdom.

Objectives: To compare (1) the biomechanical performance of a 3.5 mm locking compression plate (LCP) applied to an experimentally induced canine proximal tibial gap fracture with a 3.5 mm broad low-contact dynamic compression plate-rod (DCP-R) and a 6 mm standard interlocking nail (ILN) construct, and to evaluate (2) the biomechanical performance of a novel 3.5 mm proximal medial tibia locking plate (PMTLP) in comparison with a DCP-R construct.

Study design: Biomechanical cadaveric study.

Sample population: Cadaveric canine tibiae (n = 21 pairs) from skeletally mature dogs with a 10 mm gap ostectomy in the proximal third of tibiae mimicking a 41 A-3 fracture.

Methods: Tibiae were stabilised with one of 4 implants: LCP, DCP-R, ILN and PMTLP. For (1), LCP constructs acted as reference implants and were randomly assigned against matching tibiae with either DCP-R (n = 7) or ILN (n = 7). For (2), tibiae with PMTLP (n = 7) were matched with DCP-R (n = 7) constructs. Axial gap stiffness of all constructs was determined by non-destructive eccentric compression tests. LCP, ILN and DCP-R constructs were additionally tested in torsion. Axial gap stiffness and structural torsion stiffness were compared with paired T tests between paired constructs and independent sample T tests between unpaired constructs. The significance level for all statistical analyses was set as a value of $P < 0.05$.

Results: LCP constructs demonstrated significant lower axial gap stiffness compared to DCP-R constructs (0.234 ± 0.033 kN/mm vs 0.637 ± 0.413 kN/mm, $P = 0.044$) and ILN constructs (0.230 ± 0.074 vs 1.117 ± 0.234 kN/mm, $P < 0.001$). Structural torsion stiffness of LCP constructs was not significantly different from DCP-R constructs (0.664 ± 0.115 Nm/degree vs 0.789 ± 0.226 Nm/degree, $P = 0.247$) and ILN constructs (0.547 ± 0.110 Nm/degree vs 0.467 ± 0.112 Nm/degree, $P = 0.217$). DCP-R constructs had a significantly higher structural torsional stiffness than ILN constructs (0.789 ± 0.226 Nm/degree vs 0.467 ± 0.112 Nm/degree, $P = 0.006$), but lower axial gap stiffness (0.637 ± 0.413 kN/mm vs 1.117 ± 0.234 kN/mm $P = 0.02$). Axial gap stiffness of PMTLP and DCP-R constructs was not statistically different (0.510 ± 0.087 kN/mm vs 0.723 ± 0.314 kN/mm, $P = 0.120$). Six of 14 LCP (43%) failed at the locking screw-locking hole interface although the test was initially designed to be non-destructive. None of the other implants failed.

Conclusions: LCP fixation was biomechanically inferior to DCP-R and ILN in this in vitro study. The PMTLP overcame some of the biomechanical weaknesses of the LCP. Further studies are required to assess long-term and clinical performance of PMTLP fixation.

CALCULATION OF MAGNITUDE OF PRE-OPERATIVE PLANNING OF TIBIAL TUBEROSITY ADVANCEMENT USING THE COMMON TANGENT AND THE CONVENTIONAL METHOD: A STUDY OF INTRA AND INTER OBSERVER VARIATION

Martinoli S, Jakovljevic S, Owen M*. Dick White Referrals, Six Mile Bottom, Newmarket Suffolk, United Kingdom.

Introduction: Two methods to determine pre-operative planning of Tibial tuberosity Advancement (TTA) to achieve a PTA of 90° have been described. *The Conventional Method*, defines the PTA with the stifle at 135° of flexion and uses the anatomical landmarks of the tibial plateau slope. *The Common Tangent Method* uses the line tangent to a circle overlying the medial tibial condyle and a circle overlying the medial femoral condyle. The aim of this study was to compare the magnitude of pre-operatively calculated TTA assessed by three observers using the Conventional Method (CM1) and the Common Tangent method (CTM2) and to determine intra-observer and inter observer variability.

Materials and Methods: Mediolateral digital radiographs were taken of the stifle joint positioned at 135° of flexion in 20 normal dogs, of various breeds and ages. Radiographs were anonymised and coded by an independent co-worker, facilitating blinded investigator's measurement. Three investigators performed the measurements. TTA was calculated for each radiograph using each method on three separate occasions for a total of 60 measures. A 20 day interval was used between each measurement session.

Results: Intra and inter observer reliability were measured using the interclass correlation co-efficient (ICC). For CTM2, ICC showed a very poor agreement within two observers and a fair agreement for the third observer. For CM1, a fair agreement was obtained by two observers and it was poor for one observer. Inter observer variability showed a fair to good agreement for CM1 but again it was poor for CTM2. The reliability of Reader 1 (surgical resident) was inferior to reader 3 (orthopaedic diplomate) who was inferior to reader 2 (imaging diplomate). Mean calculated TTAs were 5.9 mm and 7.8 mm respectively for CTM2 and CM1. This difference was statistically significant ($P < 0.0001$). Comparing CTM2 with CM1, a smaller advancement was selected using the CTM2 in more than half of the total readings. On two occasions using CTM2, two investigators calculated a TTA of zero for the same two radiographs.

Discussion: Intra and inter observer reliability were both higher for CM1 than CTM2. CTM2 tended to give a lower calculated TTA than CM1 raising the question as to whether CTM2 results in insufficient calculated TTA to eliminate cranial thrust. It is also evident that the process of reading radiographs for TTA planning is characterized by a learning curve, emphasizing the need for thorough training. CTM2 resulted in a calculated TTA of zero on more than one occasion, which was never observed for CM1r, this suggests the unsuitability of CTM2 for pre-surgical planning for some stifle joints. Overall our results appear to show inferiority of CTM2 over CM1.

BMP2 DELIVERED FROM A CAP/HYDROGEL CONSTRUCT CAN PROMOTE BONE REGENERATION IN A CRITICAL SIZED SEGMENTAL DEFECT MODEL OF NON-UNION IN DOGS

Minier K[1], Touré A[2], Fuselier M[2], Traverson M[2], Fellah B[2], Bouvy B*[1], Weiss P[2], Gauthier O[2]. [1]Department of Small Animal Surgery Centre Hospitalier Vétérinaire Frégis, Arcueil, France, [2]Department of Small Animal Surgery Oniris College of Veterinary Medecine, Nantes, France.

Introduction - The purpose of this study was to determine whether the addition of BMP2 to a biphasic calcium phosphate (BCP) granule/cellulosic hydrogel construct could improve bone healing in critical-sized ulnar defects in dogs compared to the same construct without any BMP2. Cancellous bone autografts were used as positive controls.

Materials and Methods - This study was conducted on 10 adult spayed female beagle dogs after Animal Welfare and Ethical committee approval. A bilateral standardized 2-cm long diaphyseal ulnar ostectomy was performed. Osteosynthesis was achieved with a 2.4 LCP plate. The lyophilisate rhBMP2 was solubilised with te aqueous phase of the polymer. Each ostectomy site was radiographically evaluated immediately after surgery and at 4, 8, 12, 16 and 20 weeks postoperatively. Bone healing was evaluated at both the proximal and distal interfaces with the host bone. Twenty weeks after implantation, constructs were explanted, preserving both proximal and distal bone interfaces. Postoperative histological analysis included microCT imaging and light and scanning electron microscopy.

Results - Clinical outcome was considered excellent in all cases. Radiographically, all proximal interfaces and 4 out 5 distal interfaces appeared healed as early as 2 months after implantation with the BMP2 loaded constructs. Only one proximal interface and no distal interface appeared healed with the unloaded constructs. Constructs without BMP2 showed limited osteconductive properties and only 50% of the bone-biomaterial interfaces appeared healed after 20 weeks. Results obtained with the autografts were similar to those from the BMP2 constructs at 20 weeks but bone regeneration appeared to develop earlier with the BMP2 constructs than with cancellous bone autografts. In one dog, the hydrogel was not adequately set at the time of implantation and eight weeks later extensive heterotopic bone formation was observed within the soft tissue surrounding the defect area, from the implantation site to the distal ulna.

Discussion and Conclusion - BMP2-loaded constructs enhanced the formation of abundant mineralized bone tissue bridging both proximal and distal interfaces as early as 8 weeks after surgery without any significant changes until 20 weeks. Addition of BMP2 to CaP ceramics in a self-setting hydrogel can promote bone regeneration in segmental critical size bone defects. Additional studies remain necessary to further improve the setting of the gel and to avoid any ectopic bone formation related to the leakage of the biomaterial and of the active molecule outside the implantation site.

THE EFFECT OF INTRAMEDULLARY PIN SIZE AND MONOCORTICAL SCREW CONFIGURATION ON LOCKING COMPRESSION PLATE-ROD CONSTRUCTS IN AN IN VITRO FRACTURE GAP MODEL

Pearson TJ[1], Glyde MR*[1], Hosgood GL*[1], Day R[2]. [1]College of Veterinary Medincine, Murdoch University, Perth, Australia, [2]Department of Medical Engineering & Physics, Royal Perth Hospital, Perth, Australia.

Objective: The aim of this study was to investigate the effect of intramedullary (IM) pin size in combination with various monocortical screw configurations on

locking compression plate-rod (LCPR) constructs. We hypothesised that the addition of IM pins of incremental size to a locking compression plate (LCP) construct with monocortical screws would result in significant, incremental increases in axial and bending stiffness and axial strength. We also hypothesised that screw configurations that decrease the working length of the LCPR construct would result in a significant increase in axial and bending stiffness.

Materials & Methods: A synthetic bone model with a 40 mm fracture gap was used. LCP constructs with monocortical screws were tested with no pin (LCPR0) and IM pins of 20% (LCPR20), 30% (LCPR30) and 40% (LCPR40) of IM diameter. Screw configurations with 3 screws per fragment modelled the shortest (4 holes) and intermediate (6 holes) plate working lengths. Screw configurations with 2 screws per fragment modelled the longest (8 holes) and shortest (4 holes) plate working length. Responses to axial compression, biplanar four point bending and axial load to failure were recorded and reported as the mean and 95% confidence interval. In the absence of significant interaction, contrasts were made across pin size and screw configurations using Scheffe's adjustment to maintain type I error at 0.05.

Results: There were significant main effects of pin size and screw configuration but no significant interaction effect. In mediolateral and craniocaudal bending, LCPR20 constructs were not significantly different from the LCP control. LCPR30 were significantly stiffer than LCPR20 constructs and the control. LCPR40 constructs were significantly stiffer than all other constructs. The addition of an IM pin of any size provided a significant increase in axial stiffness and load to failure. This increase was incremental with increasing IM pin diameter. As plate working length decreased there was a significant increase in stiffness across all constructs. There was a significant increase in stiffness when using 3 monocortical screws compared with 2 screws per fragment for the same working length in axial compression and craniocaudal bending but not mediolateral bending.

Conclusion: In mediolateral and craniocaudal bending, a pin of at least 30% of IM diameter is required to provide a significant increase in stiffness over the LCP. Additional significant stiffness is gained by the use of a 40% IM pin. A pin of any size provides a significant increase in axial stiffness and axial load to failure and this increases incrementally with increasing pin size. Screw configurations which shorten the plate working length provide maximum axial and bending stiffness.

BIOMECHANICAL EVALUATION OF THE STABILISING FUNCTION OF THREE ATLANTOAXIAL IMPLANTS UNDER SHEAR LOADING: A CANINE CADAVERIC STUDY

Riedinger B[1], Bürki A[2], Stahl C[3], Forterre F*[1]. [1]Vetsuisse Faculty, Department of clinical Veterinary Medicine, Section of Small Animal Surgery, Bern, Switzerland, [2]Medical Faculty, ISTB - Institute for Surgical Technology and Biomechanics, Bern, Switzerland, [3]Vetsuisse Faculty, Department of clinical Veterinary Medicine, Section of Diagnostic Imaging, Bern, Switzerland.

Introduction: Atlantoaxial instability leads to cranial cervical myelopathy that can induce clinical signs ranging from pain to severe neurological deficits. Considerable controversy exists in the surgical management of this condition. Final success rates for ventral procedures (85%) are comparable to dorsal procedures (89%). However, it remains difficult to assess which therapy is more adequate since, to our knowledge, no biomechanical studies analysing the effect of implant fixation on the atlantoaxial joint in dogs have been performed as yet.

The aim of the present study is to compare the biomechanical properties of a ventral trans-articular lag screw fixation technique, a new dorsal (AAI Clamp, Z Medical, Tuttlingen, Germany) and a new ventral fixation device (AAI Hook plate, ASC, Tuttlingen, Germany) under sagittal shear loading, after transection of the ligaments of the atlantoaxial joint.

Material and methods: The occipito-atlanto-axial region of 10 Beagle cadavers euthanatized for reasons unrelated to the study were used. To exclude bone abnormalities, a CT scan of each specimen was performed before testing. The atlanto-occipital joints were blocked with 2 trans-articular diverging 1.8 mm positive threaded K-wires. The occipital bone and the caudal end of C2 were secured by embedding one third of each bone in polymethyl methacrylate (PMMA) and mounted in a pure shear loading testing machine. Three cycles in dorsoventral direction with a constant speed of 0.2 mm/s up to a limiting force of 50 N were performed for each implant tested. The tests were performed and the range of motion (ROM) and the neutral zone (NZ) were determined with all atlantoaxial ligaments intact, after transection of all ligaments and after fixation with each implant. The testing order of implants was randomly assigned. After cyclic loading, the last tested implants were subjected to implant failure test in flexion. The mode and the required load for implant failure were then recorded.

Results: One dog was excluded from the statistical analysis because of abnormality observed upon CT testing and no difference in ROM between intact and severed specimens. All the three stabilisation procedures decreased ROM and NZ compared to the severed ligament specimen ($P < .0001$ for all specimens). Only stabilisation with screws produced a significant reduction of ROM compare to intact ligament ($P < .001$). ROM ad NZ were not significantly different among the 3 fixation groups ($P > .2$)

Conclusions: In this study design, trans-articular lag screws, dorsal AAI clamp and ventral AAI plate were biomechanically similar. Further cycling loading failure testing and clinical studies are mandatory prior to making clinical recommendations.

THREE DIMENSIONAL IN VIVO KINEMATOGRAPHY OF THE CANINE ELBOW JOINT IN SOUND DOGS AND IN DOGS WITH ELBOW DYSPLASIA

Schmidt TH[1], Fischer M[2], Boettcher P*[1]. [1]Department of Small Animal Medicine, Faculty of Veterinary Medicine, University of Leipzig, Leipzig, Germany,[2]Institut für Spezielle Zoologie und Evolutionsbiologie mit Phyletischem Museum, Freidrich-Schiller University, Jena, Germany.

Introduction: Radio-ulnar incongruity (RUI) is suggested to be one of the major factors in the pathogenesis of elbow dysplasia (ED), leading to overload of the medial joint compartment and subsequent fragmentation of the medial coronoid process. In 2011 Guillou et al. reported an in vivo axial movement of the radius and ulna relative to each other which occurs in sound dogs at the walk and the trot. Therefore the aim of our study was to investigate the three-dimensional (3D) kinematics of the canine elbow joint comparing sound and elbow dysplastic dogs.

Material and Methods: Using marker based biplanar fluoroscopic kinematography, the 3D kinematic pattern of 6 elbows (in 5 sound dogs) and 7 dysplastic elbow joints (6 dogs) was acquired, with the dogs walking on a treadmill. Relative axial (proximo-distal) movement of radius and ulna, as well as axial (internal-external) rotation between humerus and ulna were calculated and expressed as maximal amplitude. Furthermore the humero-ulnar joint contact pattern was calculated. Median and interquartile range was used for continuous data. Inter-group comparison was performed using Mann-Whitney test.

Results: Age and body weight did not differ significantly between groups. No difference could be found for axial movement of the radius and the ulna relative to each other. Relative humero-ulnar rotation was significantly higher in dysplastic elbows than in the controls (maximal amplitude control 2.9 mm [1.8 to 4.9] vs. dysplastic 5.2 mm [3.1 to 6.2]; $P = 0.0016$). Humero-ulnar contact at the medial coronoid process was reduced and shifted to the lateral aspect of the medial coronoid process in dysplastic elbows.

Discussion: Relative radio-ulnar motion in terms of dynamic RUI is not increased in dysplastic elbows. Dynamic RUI under in vivo loading is probably not responsible for medial coronoid disease. Nevertheless, differences in in vivo humero-ulnar contact pattern between sound dogs and dogs affected by elbow dysplasia points to joint incongruence in elbow dysplasia. The documented increase in humero-ulnar rotation could be interpreted as joint instability. Visually the increased humero-ulnar rotation in dysplastic elbows results in cranio-lateral shift of the humeral trochlea, moving the trochlea against the lateral aspect of the medial coronoid process. This visual impression is supported by the alteration in contact pattern. Having investigated axial radio-ulnar motion as well as humero-ulnar rotation only, other kinematic alterations should not be neglected. However, the fact that pathologies occur within the humero-ulnar compartment points to some sort of humero-ulnar conflict. Valgus deformity, either static or dynamic is probably the most significant differential to rotatory joint instability at this moment and this requires future investigation.

MID-ULNAR OSTECTOMY IN THE TREATMENT OF FRAGMENTED CORONOID PROCESS AND RADIO-ULNAR INCONGRUENCE IN YOUNG DOGS

Stegen L[1], De Rooster H*[2], Grussendorf C*[1]. [1]Tiergesundheitszentrum Grussendorf, Bramsche, Germany, [2]Faculty of veterinary medicine, University Ghent, Merelbeke, Belgium.

INTRODUCTION: Radio-ulnar incongruence (RUI) is often seen in combination with a fragmented coronoid process (FCP) in large breed dogs. A proximal osteotomy of the ulna is the traditional treatment for RUI but is associated with high morbidity. The objective of this prospective study was to evaluate the short-term and long-term clinical effects of a mid-ulnar ostectomy (MUO) in young patients with FCP and RUI.

MATERIALS AND METHODS: Dogs under 1 year of age presenting with arthroscopic evidence of FCP and RUI were treated with arthroscopic fragment removal and MUO (2007–2012). Clinical and radiographic reevaluation was performed at 1 to 3 months (short-term) and at more than 6 months (long-term) postoperatively.

RESULTS: Fifty-four dogs (98 elbows) met the inclusion criteria. Pre-operative mean lameness score was 2 (range 1–4 on a 5-point scale). Postoperatively, all owners reported only mild discomfort for a mean of 10 days (0–28). As early as 4 weeks postoperatively, radiographic evidence of a caudolateral shift of the proximal ulnar

fragment was present. Short-term lameness scores significantly decreased to a mean of 1 (range 0–3) ($P < 0.001$) as did long-term scores (range 0–3) ($P < 0.001$). Eighty-seven percent (87%) of dogs returned to normal activity.

DISCUSSION: Combining arthroscopic FCP removal with MUO in young dogs with FCP and RUI allows the proximal ulna to shift laterally and caudally thus creating a larger joint space at the medial compartment. Both short- and long-term follow-up examinations showed a significant decrease in lameness score compared to the pre-operative situation. When compared to the proximal osteotomy, the MUO appears to have a much lower morbidity. Based on the results of our study, MUO is indicated as an ancillary procedure to arthroscopic removal of FCP in young dogs with FCP and RUI.

Soft Tissue Surgery

COMPLICATIONS AND LONG-TERM OUTCOME OF 29 URETERAL STENTING IN CATS TREATED FOR URETERAL OBSTRUCTION SECONDARY TO CALCULI

Boland LB, Aertsens AA, Minier KM, Boursier JFB, Hernandez JH, Poncet CP*. CHV Frégis, Arcueil, France.

Introduction: The purpose of this study was to describe short-term and long-term complications and outcome of ureteral stenting for ureteral obstruction caused by ureteroliths in cats.

Materials and methods: This study was conducted between February 2011 and May 2013 on cats with ureteral obstruction caused by calculi and treated by double-pigtail ureteral stent. Cats were included if the obstruction was diagnosed by ultrasound examination and if the medical record was complete. A double-pigtail ureteral stent was surgically placed in cats in a retrograde or antegrade manner. Postoperative data included blood work, short-term and long-term complications and final outcome with a minimal follow-up of 6 months.

Results: Twenty-six of 85 cats presented with ureteral obstruction secondary to uroliths were included in the study and 3 cats had bilateral surgery. Median surgical time was 67 minutes. Median time between diagnosis and discharge was 7 days. The median survival time was not reached with 14 cats still alive (15 stents). Short-term complications were reported in thirteen cats with 61% having minor complications and 39% having major complications. These included uroabdomen (n = 2), persistent renal failure (n = 4), urinary tract infection (n = 3), lower urinary tact signs (n = 10) and anaemia (n = 5). Six cats (23%) died post-operatively before discharge at a median of 6 days after the surgery. Fifteen cats had long-term complications with 47% major complications and 53% minor complications. They included occlusions of the stent because of encrustation (n = 2), recurrent lower urinary tract signs (n = 8), acute renal failure (n = 3), feline urinary syndrome (n = 1) and pyelonephritis secondary to multidrug resistant bacteria (n = 1).

Discussion and conclusion: In this study all stents except one were implanted successfully, but the surgical technique was challenging in some cases. Only 2 cats (8%) had perioperative complications, but 50% and 75% of cats had short-term and long- term complications respectively, with an overall mortality rate of 46%. These complications were either secondary to the stent itself or to the progression of renal failure. Some of these complications have not been reported in the veterinary literature and they should be considered in the management of patients. In conclusion, although our data showed lower rates of perioperative morbidity and mortality than traditional techniques, this procedure is still technically challenging and may be associated with various complications in the short-term and long-term. Further studies with a larger number of cases and a longer follow-up are required to understand and prevent these complications.

ESOPHAGECTOMY AND GASTRIC SUBSTITUTION IN DOGS - A CADAVERIC STUDY

Bitton E, Weiss M, Milgram J*. Veterinary Teaching Hospital. Koret School of Veterinary Medicine, Rehovot, Israel.

In this cadaveric study we developed a novel surgical technique for replacement of the esophagus with a tube created from the stomach. The technique is based on the transhiatal esophagectomy which is a technique used in man for esophageal replacement. Ten canine cadavers, weighing 20 kg to 40 kg were used in this study. The dogs were divided into two groups based on the technique used to tube the stomach. The length of the sternum, the chest perimeter and the distance from the larynx to the pubis were measured. A ventral midline approach to the peritoneal cavity was performed and the perimeter of the stomach and the length of the lesser and greater curvatures was measured. The right gastric and right gastroepiploic arteries were canulated and injected with methylene blue to document the area of the stomach wall perfused by these arteries. The abdominal esophagus was freed from the esophageal hiatus of the diaphragm, cut and both ends oversewed. The esophageal hiatus was closed with a single layer continuous suture pattern. The short gastric, left gastric and left gastroepiploic arteries and veins, were identified, isolated, ligated and cut. In addition, the superficial leaf of the greater omentum, lesser omentum and gastrosplenic ligament were isolated, ligated and cut. The stomach was tubed using one of two techniques.The perimeter and length of the tubed stomach was measured. The cervical esophagus was approached ventrally and isolated at the thoracic inlet. A rigid endoscope was placed into the cranial mediastinum via this approach. The thoracic esophagus was released from the mediastinum, with a combination of endoscopic assisted blunt dissection and cranially traction of the cervical esophagus. The gastric tube was passed into the thoracic cavity via an incision in the diaphragm on the right. The tube was pulled into the cervical region and anastomosed to the cervical esophagus. Preliminary and final measurements were calculated and compared between the two groups using ANOVA ($\alpha = 0.05$). The entire stomach except for the fundus was perfused by the right gastric and right gastroepiploic arteries. The stomach tube created by removal of the fundus (27.60 cm $\pm$ 1.34 cm) was shorter than the stomach tube created by removal of the two elliptical pieces of stomach wall (30.70 cm $\pm$ 7.40 cm). All the stomach tubes were long enough to reach the neck without significant tension in all but one case. Both methods caused stomach volume reduction of $\sim$50% and were similar with respect to blood supply. The esophageal replacement procedure we developed proved successful as it allowed for complete removal of the thoracic esophagus in all dogs.

LONG TERM BILE ACID CONCENTRATIONS IN DOGS AFTER COMPLETE CONGENITAL PORTOSYSTEMIC SHUNT LIGATION

Bristow P, Tivers M*, Oritz V, Newson K, Lipscomb V*. Royal Veterinary College, North Mymms, United Kingdom.

Introduction: Complete surgical closure of a congenital portosystemic shunt (CPSS) eliminates blood flow through the abnormal vessel and is associated with an excellent long-term prognosis, but there is a lack of information on whether long-term liver function normalises. The objective of this study was to evaluate the long-term (>18 months) results of bile acid stimulation test (BAST) in dogs following complete CPSS ligation.

Materials and Methods: Medical records were retrieved for all dogs that had complete ligation of a single CPSS using a polypropylene (Prolene; Ethicon) ligature, between 2000 and 2012. Dogs with concurrent multiple acquired shunts (MAS) before, during or after surgery were excluded. Dogs that were alive had a physical examination, body condition score, biochemistry and bile acid stimulation test performed. Owners were asked to fill out a two part quality of life questionnaire. Related-samples Wilcoxon Signed Rank tests were used to make comparisons between pre- and post-prandial serum bile acid concentrations pre-operatively, short term (3 months after surgery) and long-term (>18 months after surgery). Significance for all tests was set at $P < 0.05$.

Results: 49 dogs were recruited, with short term BAST available for 25 dogs. Nine dogs had an intrahepatic shunt and 40 dogs had an extrahepatic shunt. Mean time to follow up was 158 months (SD 67). Mean age at follow up was 204 months (SD 82). At long term follow up 57% and 80% of pre- and post- prandial serum bile acid concentrations respectively were above the laboratory reference range. There was a significant reduction in the pre- and post-prandial serum bile acid concentrations at long term follow-up compared to before surgery ($P = < 0.01$ and $P = < 0.01$ respectively). There was no significant difference in pre- or post- prandial serum bile acid concentrations between short and long term follow up ($P = 0.12$ and $P = 0.15$ respectively). No abnormalities were found on physical examination in any dog. No owners reported a relapse in clinical signs since surgery. Hyperechoic urinary sediment was found in six cases on ultrasound examination.

Conclusion: The clinical outcome of all dogs was excellent. Although the majority of animals had a persistently elevated long term BAST, this was not due to MAS or persistent shunting. We therefore conclude that subclinical, abnormal liver pathology persists once the CPSS is ligated. The aetiology of the persistent liver pathology in this population of dogs is unknown but possibilities include concurrent microvascular dysplasia and/or a failure of the liver to regenerate fully after correction of the abnormal blood flow through the CPSS.

HISTOLOGICAL EVALUATION OF THE SOFT PALATE IN DOGS AFFECTED BY BRACHYCEPHALIC OBSTRUCTIVE AIRWAY SYNDROME

Crosse KR[1], Bray JP*[1], Orbell GM[2]. [1]Massey University Veterinary Teaching Hospital, Palmerston North, New Zealand, [2]New Zealand Veterinary Pathologists, Palmerston North, New Zealand.

Introduction Airway obstruction in brachycephalic dogs occurs as the shortening of the skull is not matched by the associated soft tissues. This leads to an excessive soft tissue obstruction within the nasopharynx and oropharynx with the soft palate being both overlong and thick compared to normal dogs. Increased thickness of the soft palate was the most significant difference between brachycephalic and dolichocephalic breeds when comparing sagittal CT sections of the pharynx. Previous studies

have histologically described the caudal edge however the composition of the thick portion of the soft palate is not known.

Methods and Materials The soft palates from four control dogs (2 greyhounds and 2 mixed breeds) euthanased for reasons other than respiratory disease were removed. Specimens were also preserved from brachycephalic dogs (4 English bulldogs and 3 French bulldogs) undergoing a folded-flap palatoplasty for surgical correction of a long and thick soft palate. All the clinical cases were BOAS Grade 3 prior to surgery. The excised tissue was fixed in buffered 10% formalin and qualitative histological evaluation performed on each section stained with hematoxylin and eosin (H&E).

Results Dogs with BOAS had consistent histopathological findings. Multifocal moderate to marked variation in myofibre diameter with hypertrophic fibres and small rounded fibres were seen. Degeneration was characterised by swelling, hyper-eosinophilia, fading cross striations, centralised nuclei and fragmentation. These changes were associated with concurrent acute and chronic myodegeneration. The intensely eosinophillic fibres were consistent with hyaline degneration and fragmentation indicative of Zenker necrosis. No fatty lobules were seen in the palates examined. When compared to the control dogs, less skeletal muscle mass was seen in the clinical specimens. The increased thickness of the clinical samples appeared to be due to oedema and increased matrix within the lamina propria. Distension of the glandular portion was uniformly described in all the clinically affected dogs.

Discussion/Conclusions The most striking finding in this study is myofibre degeneration and necrosis. It is clear the excessive bulk of the soft palate is not due to hypertrophied muscle. In all of our clinical specimens features of multifocal chronic and acute myodegeneration were seen. This was in comparison to very rare isolated areas of myodegeneration seen in the control dogs. The cause of this degeneration is not known, but neurogenic degeneration, myofibre degeneration and developmental myofibre hypotrophy are all possible. Further studies including muscle fibre typing and electron microscopy to evaluate neuronal degeneration may be needed to further understand the pathogenesis of these changes.

MINIMAL INVASIVE IMPLANTATION OF SODIUM CELLULOSE SULPHATE (SCS)-MICROENCAPSULATED PORCINE ISLET CELLS IN DOGS: AN EXPERIMENTAL PILOT STUDY

Haimel GH[1], Koestenbauer SK[2], Witter KW[3], Dupré GD*[1], Stiegler PS[2]. [1]Clinic for surgery and ophthalmology, Department for Small Animals and Horses, University of Veterinary Medicine Vienna, Vienna, Austria, [2]Division of Transplantation Surgery, Department of Surgery, Medical University of Graz, Graz, Austria, [3]Institute of Anatomy, Histology and Embryology, Department of Pathobiology, University of Veterinary Medicine Vienna, Vienna, Austria.

Xenotransplantation of microencapsulated porcine islet cells (PIC) could represent a possible alternative to exogenous insulin therapy in human and veterinary medicine. In this study we evaluated the surgical feasibility of a minimal invasive implantation technique at different implantation sites in dogs. Secondarily, survival of porcine islet cells and the host tissue response to microencapsulated PIC was assessed. PIC were encapsulated in sodium cellulose sulphate (SCS) microcapsules and implanted into the subcutaneous tissue, the gastric submucosa and the omentum of five healthy beagle dogs. Implantation into the gastric submucosa and the omentum was performed using a minimally invasive surgical method. The presence of microcapsules, survival of insulin-positive cells as well as a host tissue response to the implanted microcapsules could be confirmed 90 days post-implantation. Based on our results, laparoscopic assisted implantation of SCS microencapsulated PIC is feasible in dogs and does not cause any harmful side effects to the recipient. However, further strategies must be investigated to reduce the host tissue response to SCS-microencapsulated PIC to improve PIC survival.

EVALUATION OF THE TUMOR BED BIOPSY TECHNIQUE IN CANINE AND FELINE ONCOLOGIC SURGERY

Harris KP, Dobson JM, Constantino-Casas F, Ladlow J*. University of Cambridge, Cambridge, United Kingdom.

Introduction: The objective of this preliminary retrospective study was to establish the feasibility, advantages and limitations of the tumour bed biopsy technique as an adjunct to the standard vertical sectioning technique for histopathologic margin assessment in small animal oncologic surgery.

Materials and Methods: The veterinary histopathology database of the University of Cambridge was searched for cases in which tumor bed biopsies had been submitted in addition to an excised neoplasm between 2002 and 2013. The surgical margins on the vertical sections cut from the main piece of tissue excised are termed 'main margins' for the purposes of this study. Data retrieved for each case included species, tumour diagnosis, whether or not neoplastic cells were evident in the main margins, whether or not neoplastic cells were evident in the tumor bed biopsy/biopsies, surgeon and pathologist.

Results: Sixty-one cases met the inclusion criteria including 12 cats and 49 dogs. Main margin assessment agreed with tumour bed biopsy assessment in 85.2% of cases (52/61), with both being free of neoplastic cells in 70.5% of cases (43/61), and both containing neoplastic cells in 14.8% of cases (9/61). Of the 14.8% of cases (9/61) in which the main margin assessment disagreed with the tumour bed biopsy assessment, neoplastic cells were identified in the main margins but not the tumour bed biopsies in 9.8% of cases (6/61). This left 4.9% of cases (3/61) in which neoplastic cells were identified in the tumour bed biopsies but not the main margins.

Discussion and Conclusion: This study confirms that the tumor bed biopsy technique can identify cases of incomplete tumor excision in cases where no neoplastic cells are identified in the main margins after vertical sectioning. While the incidence of this was low (4.9%), the clinical significance of approximately one in twenty oncology cases being erroneously diagnosed with complete excision is potentially great. The adoption of the tumour bed biopsy technique as an adjunct to vertical sectioning can be recommended and warrants prospective research. In the authors' experience careful labelling of each tumor bed biopsy with its precise original location and use of non-ambiguous terminology are to be strongly recommended to maximise the value of the tumour bed biopsy technique in small animal oncologic surgery.

THE INFLUENCE OF THE SURGICAL OUTCOME ON BLOOD AND CEREBROSPINAL AMMONIA LEVELS IN DOGS WITH CONGENITAL EXTRAHEPATIC PORTOSYSTEMIC SHUNTS

Or M, Kitshoff A, Vandermeulen E, Bosmans T, Paepe D, Bhatti S, Dupont S, Peremans K, De Rooster H*. Dept of SA Medicine and Clinical Biology Faculty of Veterinary Medicine, Ghent University, Ghent, Belgium.

Objective—To compare ammonia in arterial blood (A), venous blood (V) and cerebrospinal fluid (CSF) in dogs with and without portosystemic shunts (PSS).

Study Design—Prospective clinical trial.

Animals—6 dogs with congenital PSS and 15 control dogs without PSS (7 clinically healthy, 8 with seizures).

Methods—A transsplenic portal scintigraphy (TSPS) was performed to confirm the diagnosis of PSS and to calculate the shunt fraction (SF). The cellophane banding technique was used with an initial shunt attenuation of 50% at the time of surgery. Three months postoperatively, TSPS was repeated. In the PSS dogs, ammonia was measured at the time of diagnosis (T0: A, V), on the day of surgery (T1: A, V, CSF) and at 1 (T2: V) and 3 months (T3: A, V, CSF) after surgery. In the control dogs, samples for ammonia measurement were collected at one occasion (healthy dogs: A, V, CSF and seizure dogs: V, CSF). For statistical analysis, nonparametric tests were used at a significance level of 0.05.

Results—At T0 and T1, blood ammonia was consistently higher in PSS dogs than in the healthy ($P < 0.01$) and seizure dogs ($P < 0.01$). At T2 and T3, blood ammonia was normal in 6/6 and 5/6 dogs, respectively. The original shunting vessel was closed in 5/6 dogs, but 2 had evidence of acquired shunting (blood ammonia was normal in one). The original shunt was patent in 1 dog (blood ammonia was normal). A correlation of 94.5% was found between A and V ammonia in the PSS dogs at any time point ($P < 0.01$). CSF ammonia at T1 was significantly higher in the PSS dogs compared to healthy ($P < 0.05$) and seizure dogs ($P < 0.05$). A significant positive correlation was demonstrated between A or V ammonia concentration and the CSF ammonia concentration ($P < 0.01$) in PSS patients. The CSF ammonia concentration at T3 was lower compared to T1 in all PSS dogs with exception of the dog with the persistent shunt.

Conclusion—Ammonia in the CSF of PSS dogs is remarkably higher than that of healthy dogs as well as of seizure dogs and is positively correlated to A and V blood ammonia. Normalisation of the blood ammonia levels after cellophane banding does not necessarily indicate the absence of portosystemic shunting (persistent or acquired).

Clinical Relevance—Ammonia is thought to be one of the key factors in the etiopathogenesis of hepatic encephalopathy in PSS dogs. The correlation between CSF and blood ammonia might suggest increased permeability of the blood-brain barrier to ammonia in PSS patients. Postoperative blood ammonia is not a predictor for the degree of postoperative shunting, whereas scintigraphy is a more objective tool for postoperative evaluation of PSS patients.

ISOLATED TURBINECTOMY OF CAUDAL ABERRANT TURBINATES IN BRACHYCEPHALIC DOGS

Schuenemann R[1], Pohl S[2], Oechtering G[2]. [1]Tierärztliche Klinik Augsburg, Augsburg, Germany, [2]Kleintierklinik Universität Leipzig, Leipzig, Germany.

Malformed and hypertrophic turbinates blocking nasal airflow are a common problem in brachycephalic dogs. Many dogs also suffer from turbinates that grew retrograde into the meatus nasopharyngeus and even the nasopharynx, so called caudal aberrant turbinates (CATs). Reported prevalence of CATs in the literature

ranges from 21% to 32% in brachycephalic dogs but is highly dependent on the breed. In pugs, up to 53% of the animals show CATs. Laser-assisted turbinectomy (LATE) has been shown to be able to remove the obstructing turbinates from the nasal cavity. However, some dogs with significant CATs show well-shaped intranasal turbinates at the same time. For these dogs, our goal was to develop a technique that retains intranasal turbinates, only removing caudal aberrant turbinates. Twenty-five brachycephalic dogs (24 pugs, 1 English bulldog) with CATs and proper air gaps between their intranasal turbinate branches were included in the study. An endoscopically guided diode laser fibre was used to dissect CATs. Xylometazoline was used in all dogs before surgery to shrink intranasal turbinates and make access to the CATs possible. Grasping forceps were used to extract the CAT after dissection. Thirty-five CATs were found in the 25 dogs. The origin was from the concha nasalis media (CNM) in 29 nasal cavities, from the third endoturbinale in 2, the concha nasalis ventralis (CNV) in 2 and from both, CNM and CNV in 2 cavities. Dissection was not possible with this technique for CATs deriving from the CNV so that a total of 32 CATs could be removed. In 28 nasal cavities, extraction was achieved with a grasping forceps from normograde. In 4 cavities size of the CAT prohibited this so they were pushed through the meatus nasopharyngeus into the nasopharynx and were extracted via the mouth. Minor bleeding was observed in 19 (54.4%) nasal cavities and was strong enough in one dog to impair visualisation so that the CAT could only be extracted one week later. Fourteen dogs (56%) had an endoscopic examination after 6 months in which complete healing and no signs of regrowth were observed in all dogs. Isolated CAT LATE is a viable method to remove CATs in dogs with non-obstructing intranasal turbinates and shows a low and only minor complication rate. It has the advantage of retaining intranasal turbinates in cases in which they are non-obstructing, therefore preserving their thermoregulatory capabilities. It is not suited for dogs with obviously obstructing intranasal turbinates.

PERI-OPERATIVE HORMONE PLASMA PROFILES PREDICT RECURRENCE AFTER TRANSSPHENOIDAL HYPOPHYSECTOMY IN DOGS WITH CORTICOTROPH PITUITARY ADENOMAS

Van Rijn SJ[1], Hanson JM[2], Tryfonidou MA[*1], Meij BP[*1]. [1]Faculty of Veterinary Medicine, Utrecht University, Utrecht, Netherlands, [2]Small Animal Hospital, Swedish University of Agricultural Sciences, Uppsala, Sweden.

Introduction – Pituitary-dependent hypercortisolism (PDH) is a common endocrinopathy in dogs, with an estimated prevalence of 1–2 per 1000 dogs/year. It is caused by an adrenocorticotropic hormone (ACTH) secreting adenoma in the pars distalis or pars intermedia of the pituitary gland. In dogs, transsphenoidal hypophysectomy has been performed for 15 years in the Netherlands and has been shown to be an effective treatment for dogs with PDH. Despite high initial remission rates, long-term recurrence does occur. The aim of the present study was to evaluate the predictive value of the early postoperative plasma ACTH, cortisol and α-MSH concentrations for recurrence of hypercortisolism after transsphenoidal hypophysectomy in dogs with PDH.

Materials and Methods – 55 dogs with PDH underwent transsphenoidal hypophysectomy as primary treatment. Diagnosis was based upon urinary corticoid:creatinine ratios (UCCRs) combined with a high dose dexamethasone suppression test. All surgeries were performed by the same neurosurgeon. After surgery, oral hormone substitution therapy was started. Plasma hormone levels of ACTH, cortisol and α-MSH were measured before surgery and 1,2,3,4,5, and 24 to 48 hours after surgery. Dogs with persistent disease were readily identified with the perioperative profile and were excluded from further analysis. Absolute values and the degree of decrease were analysed for their prognostic value of recurrence. Variables were analyzed with univariate and multivariate Cox's proportional-hazard analysis.

Results –Forty-eight dogs went into remission. Median disease free interval was 569 days (range 55–1927 days). Recurrence of hypercortisolism was seen in 12 dogs (25%) with a median disease-free interval of 255 days (range 54–1281 days). For all dogs in remission hormone profiles were analyzed. Univariate Cox's proportional-hazard analysis revealed that early postoperative plasma ACTH, cortisol and pre- and postoperative α-MSH concentration were prognostic for surgical outcome.

Discussion/conclusion – Despite high initial remission rates, long-term recurrence is a well-recognised complication of transsphenoidal hypophysectomy, which in the current study was 25% of dogs. From this study, it is concluded that postoperative plasma ACTH, cortisol and pre- and postoperative α-MSH concentration are prognostic for surgical outcome, but long-term clinical follow-up of the patients is also needed.

LAPAROSCOPIC OVARIECTOMY: A NOVICES LEARNING CURVE

Williams RA, Bell JC[*], Ness MG[*]. Croft Veterinary Hospital, Cramlington, United Kingdom.

Objective: To quantitatively assess the learning curve for laparoscopic ovariectomy using the cumulative summation (CUSUM) score technique and moving average operating time.

Study Design: Application of CUSUM technique and moving average operating time to consecutive laparoscopic ovariectomies.

Animals: Consecutive laparoscopic ovariectomy in 80 dogs.

Methods: Records of all dogs that had laparoscopic ovariectomy were reviewed. Data retrieved included operative time and intra-operative complications. Operative time was analyzed graphically and complications were analysed with the CUSUM technique.

Results: Eighty laparoscopic ovariectomies were carried out, 79/80 (98.75%) were completed successfully. 1/80 (1.25%) had to convert to an open procedure due to instrument failure. 9/80 (11.25%) of cases had a minor adverse intra-operative event recorded including dropped ovary and minor pedicle bleeding. Mean operative time was 24.85 minutes (+/−10.75). The learning curve was demonstrated to be 34 cases from the CUSUM chart. Mean operating time drops to 20.6 (+/−4.5) minutes once the learning curve has been achieved.

Conclusion: Laparoscopic ovariectomy is a safe technique for the novice laparoscopic surgeon with stabilisation of the learning curve by 34 cases.

Small Animal Surgery Posters

THE USE OF FLESH TUNNELS FOR THE MANAGEMENT OF LARYNGEAL COLLAPSE IN DOGS

Trinterud T, Nelissen P, White RAS. Dick White Referrals, Six Mile Bottom, Cambridge, United Kingdom.

Introduction: Various surgical approaches have been described for laryngeal collapse (LC) in dogs, but episodes of upper airway obstruction with the need for tracheostomy may still occur. Tracheostomy tubes are associated with a high complication rate and a successful outcome relies on intensive management with regular nebulisation, flushing, suctioning and cleaning.

Aim: To report the novel use of hollow silicone flesh tunnels, as used in human body jewellery, to maintain tracheostomy stomas in fifteen dogs with LC in which temporary or semi-permanent tracheostomy was used. We hypothesised that flesh tunnels are easier to manage than conventional tracheostomy tubes and are also suitable for home care.

Material and methods: Medical records for dogs undergoing tracheostomies with flesh tunnel placement associated with LC were reviewed retrospectively. Signalment, duration of flesh tunnel use and complications were recorded. The standard ventral surgical approach for tracheostomy was employed. Resection of a section of the third or fourth tracheal ring was necessary to enable flesh tunnel insertion using a mosquito forceps.

Results: Fifteen dogs with LC underwent flesh tunnel placement for maintenance of a tracheostomy stoma for periods ranging from 3 hours to 8 months. Most dogs had concurrent surgeries associated with LC and brachycephalic obstructive airway syndrome. There were no intra-operative or immediate post operative complications related to the flesh tunnels. Seven of the fifteen dogs were discharged with home care of the tracheostomy with the flesh tunnel in situ. Owners cleaned the flesh tunnel with a moist cotton bud according to individual requirements. Eight dogs were able to breathe without a tracheostomy and underwent removal of the flesh tunnel by simple traction. Three dogs with long-term tracheostomy needed replacement of the flesh tunnel with revision of the tracheal stoma because excessive granulation tissue formation caused flesh tunnel dislodgement. Five dogs needed conversion to a permanent tracheostomy.

Discussion and conclusion: Flesh tunnels provide a novel approach for the management of temporary and semi-permanent tracheostomy in dogs with LC and may provide a good alternative to conventional tracheostomy tubes. They are suitable for home care, easy to insert and less prone to dislodgement or mucus plugging than temporary tracheostomy tubes. Removal of the flesh tunnels is similar to tracheostomy tubes, done by simple traction, without the need for sedation or anesthesia, and the stoma is subsequently left to heal by secondary intention. Long-term flesh tunnel use is associated with the need for minor revisionary surgery to manage excessive granulation tissue formation.

THE IMPACT METHICILLIN-RESISTANT STAPHYLOCOCCUS PSEUDINTERMEDIUS COLONIZATION AS A RISK FACTOR FOR SURGICAL SITE INFECTION IN DOGS FOLLOWING TIBIAL PLATEAU LEVELING OSTEOTOMY

Singh A[*], Nazarali A, Moens NMM[*], Gibson TWG[*], Rousseau J, Weese JS. Ontario Veterinary College, University of Guelph, Guelph, Canada.

Tibial plateau leveling osteotomy (TPLO) is one of the most commonly performed surgical techniques to stabilize a cranial cruciate insufficient stifle in dogs. Numerous studies have reported high surgical site infection (SSI) rates for TPLO, and methicillin-resistant S. pseudintermedius has emerged as a leading cause of these infections. The objective of this study was to evaluate the impact of pre-operative MRSP colonization on TPLO SSIs.

A prospective, multi-institutional study of dogs undergoing TPLO was undertaken. Within 24 hours of admission, samples of the nares, pharynx, rectum and surgical site were obtained for MRSP screening. Active surveillance of all patients was performed 30 days post operatively and SSIs were documented according to standard definitions. The overall SSI rate was 24/401 (6.0%), with 14/24 (52.4%) caused by MRSP. Ten of 338 (3%) dogs were colonized with MRSP pre-operatively. Two of 10 (20%) MRSP colonized dogs developed MRSP SSI, compared to 12/377 (3.1%) dogs that were not colonized ($P = 0.06$).

The pre-operative MRSP colonization rate was consistent with studies of similar populations, as was the SSI rate and commonness of MRSP SSI. However, a significant association between SSI and MRSP colonization was not seen and most MRSP infections developed in dogs that were not identified as colonized pre-operatively. Further study of the epidemiology and pathophysiology of MRSP TPLO SSI is needed.

ATLANTOAXIAL INSTABILITY WITH INCONGRUENCE: IMAGING FINDINGS AND SURGICAL TREATMENT IN 5 DOGS

Malfassi L, Dolera M. La Cittadina Fondazione Studi e Ricerche Veterinarie, Romanengo - CR, Italy.

Introduction. Atlantoaxial instability is a surgical condition frequently described in toy breed dogs. Various correction techniques has been described in the veterinary literature. The aim of this study is to describe MR-CT imaging findings and a novel surgical technique for stabilisation of atlantoaxial instability associated with incongruence of the atlantoaxial joint in dogs.

Materials and methods. Five dogs with a body weight of 2 kg or less with atlantoaxial instability associated with articular incongruence were considered. At clinical examination all dogs showed tetraparesis and ataxia. At CT and MRI, the articular surface of the atlas was larger then the articular surface of the axis, a laxity of all atlantoaxial ligaments was evident, so during head and neck flexion the axis was dislocated dorsally and cranially into the spinal canal. Spinal cord showed chronic compression, with focal hyperintensity in seq TSE T2W and various degrees of syringomyelia. For surgery, the anaesthetised dogs were positioned in ventral recumbency, with the head extended on the neck with slight linear traction applied at maxillary canine teeth. The reduction of atlantoaxial subluxation was verified through fluoroscopy. A standard dorsal approach to the atlas and axis was made. Two 2.7 mm self tapping cortical screws were inserted into the wings of the atlas on each side in a dorsal-ventral direction. Three 2.0 mm self tapping cortical screws were inserted transversally in the dorsal process of the axis. All screws were fused with polymethylmethacrylate. Serial clinical and imaging controls were made.

Results. No intra-operative complications were observed. Functional improvement occurred in all dogs. Serial CT examinations showed a stable reduction of dorsal and cranial axis dislocation, with persistence of a residual mild spinal compression due to the different size of the articular surfaces of atlas and axis.

Discussion. Several means for stabilisation of atlantoaxial dislocation are described in the veterinary literature. Standard treatment utilises ventral arthrodesis with cross pinning, transarticular lag screw fixation or vertebral plating. This technique requires atlantoaxial joint congruence, otherwise the means of synthesis can injure the spinal cord. Dorsal techniques utilise various non-absorbable suture materials or devices, such as the Kishigami Tension Band. However, cranial dislocation or impingement of the axis on spinal cord are not adequately counteracted. The technique that we describe is simple and safe and can be useful in surgical treatment in dogs with atlantoaxial dislocation and articular incongruence, a condition resembling atlantoaxial invagination described in human medicine.

CANINE DIFFUSE IDIOPATHIC SKELETAL HYPEROSTOSIS (DISH) AND SPONDYLOSIS DEFORMANS: TWO DIFFERENT DISORDERS

Kranenburg HC, Voorhout G, Grinwis GCM, Hazewinkel HAW*, Meij BP*. University of Utrecht, Faculty of Veterinary Medicine, Dep.Clinical Sciences of Companion and Small Animals, Utrecht, Netherlands.

Introduction - Diffuse Idiopathic Skeletal Hyperostosis (DISH) is characterized by exuberant new bone formations throughout the body. It is mostly characterized by ossification of the spinal ventral longitudinal ligament, sparing the intervertebral disc (IVD). The disorder is well known in humans, although its etiology is still not completely understood, but little is known about DISH in dogs. On radiographic examination DISH can be diagnosed using criteria proposed by Resnick and Niwayama (1976).[1] Although radiographic differentiation between DISH and severe spondylosis deformans is challenging, the two disorders do differ in radiographic appearance.[2, 3] In spondylosis osteophytes originate from the region near the vertebral endplate and grow out to form spurs or sometimes bony bridges ventral to the intervertebral disc fusing two adjacent vertebral bodies. In contrast, in (spinal) DISH the ossification of the ventral longitudinal ligament affects the whole ventral plane of at least four continuous vertebrae. The prevalence of DISH in retrospective evaluation of 2041 mature pure bred dogs was reported to be 3.8% and specifically the Boxer breed is affected: 40.6%.[3]

Aim – To further the knowledge and comparative aspects on the imaging, macroscopic and microscopic appearances of canine DISH and spondylosis.

Materials and Methods – Computed tomography (CT) and magnetic resonance imaging (MRI) was performed on five case of canine DISH. DISH was confirmed in two of these cases using post mortal histopathology.

Results - We report the appearance of canine DISH on CT, MRI macroscopic appearance and/or histopathology.

Conclusions - Radiography, CT and MRI can be used to visualize new bone formation in the ventral plane of the vertebral column. The clinical diagnosis of canine DISH based on imaging findings can be confirmed on post mortem examination. The characteristic gross and histological features of DISH, i.e. continuous solid bone bridge formation ventral to the vertebral body and bridging at least three continuous healthy intervertebral discs, are distinct from the histopathological findings of spondylosis.

1. Resnick D, Niwayama G. Radiographic and pathologic features of spinal involvement in diffuse idiopathic skeletal hyperostosis (DISH). Radiology. 1976;119:559-568.

2. Morgan JP, Stavenborn M. Disseminated idiopathic skeletal hyperostosis (DISH) in a dog. Vet Radiol Ultrasound. 1991;32:65-70.

3. Kranenburg HC, Westerveld LA, Verlaan JJ, et al. The dog as an animal model for DISH? Eur Spine J. 2010;19:1325-1329.

CYSTIC ADRENOCORTICAL ADENOMA IN A CAT: CLINICAL AND PATHOLOGICAL FINDINGS

Spinella G, Dondi F, Brunetti B, Diana A, Morini M, Valentini S. Veterinary Clinical Sciences Dept. - University of Bologna, Ozzano dell'Emilia (BO), Italy.

Objective - The aim of this report is to describe the clinical and pathological findings of a case of cystic adrenocortical adenoma in a cat.

Case presentation - A 9 year old castrated male shorthair cat was referred for investigation of an abdominal mass palpated by the owner. On physical examination, the abdominal mass had a regular surface and fibroelastic consistency. Ultrasound and contrast-enhanced ultrasonography (CEUS) showed an inhomogeneous cystic cavitary mass (6×8 cm) close to the left kidney. Renal corticomedullary distinction was reduced. No evidence of metastasis was found on thoracic radiographs. Haematology and biochemistry profiles revealed mild hypokalemia and increased blood urea concentration.

Medical and surgical therapies were discussed with the owners, and a decision was made to pursue exploratory surgery and intraoperative fine needle aspiration. At surgery, the mass was partially adherent to the wall of vena cava, left renal hilus, small intestine and omentum. The cytological appearance was consistent with adrenal adenoma or low-grade carcinoma. On this basis, we chose to proceed with ablation of the mass. Immediately after mass removal, renal ischaemia occurred and intraoperative Doppler ultrasound revealed a lack of perfusion in the left renal parenchyma. Left nephrectomy was performed and the mass and kidney were submitted for histological examination. Four days after surgery the cat was severely azotaemic and presented with signs of multiple organ dysfunction. Seven days after surgery the cats was euthanised. Histological examination of the mass and kidney showed a cystic adrenocortical adenoma and chronic lymphoplasmacytic interstitial nephritis and severe periglomerular fibrosis.

Discussion and Conclusion - Cystic adrenocortical tumors have been described in man and ferrets, but to our knowledge this is the first report in a cat. Primary hyperaldosteronism and hypokalaemia are the most common effects of adrenal gland adenoma. However, chronic kidney disease (CKD) is frequently associated with spontaneous hypokalaemia in the cat and, in agreement with history and clinical signs, CKD could have contributed to hypokalaemia in this report. Moreover, the normal size of the contralateral adrenal gland supports our opinion. Histopathologically, the differential diagnosis between benign and malignant adrenocortical tumors is not always straightforward since adrenocortical carcinomas are often well differentiated. Nevertheless, the expansile growth, the presence of a capsule, the absence of necrosis and the very low mitotic rate supported the diagnosis of adenoma. Additionally, the absence of invasion of the vena cava, despite the large size, further support the benign nature of the lesion.

CONCENTRATIONS OF SERUM AMYLOID A, C-REACTIVE PROTEIN, IRON AND ALBUMIN AS POSSIBLE MARKERS FOR SEPSIS IN FEMALE DOGS WITH PYOMETRA

Jitpean S[1], Pettersson A[1], Höglund OV[1], Ström-Holst B[1], Olsson U[2], Hagman R[1]. [1]Department of Clinical Sciences, Faculty of Veterinary Medicine, Swedish University of Agricultural Sciences, Uppsala, Sweden, [2]Department of Economy, Swedish University of Agricultural Sciences, Uppsala, Sweden.

Background: Sepsis, defined as presence of systemic inflammatory response syndrome (SIRS) initiated by infection, is associated with a high rate of morbidity and mortality. Early diagnosis and treatment of sepsis is crucial, but currently there is no rapid or precise diagnostic method available. Sepsis is present in the majority of dogs

diagnosed with pyometra. The aim of the present study was to evaluate the concentrations of the inflammatory markers serum amyloid A (SAA), C-reactive protein (CRP), iron and albumin concentrations for the detection of sepsis in a group of female dogs with pyometra.

Materials and Methods: Blood samples were obtained before ovariohysterectomy (OHE) in 31 bitches with pyometra. Twenty-three bitches had sepsis (SIRS-positive) and eight were non-septic (SIRS-negative). After centrifugation, serum concentrations of SAA and CRP were measured by ELISA (Tridelta Development Limited, Kildare, Ireland), concentrations of iron by direct colorimetric determination (Abbott Laboratories Inc., Illinois, USA) and concentrations of albumin according to routine laboratory methods. The Student's t-test and ANOVA were used to test for differences between the groups.

Results: Concentrations of SAA (mean ± SE) were significantly higher in the bitches with sepsis (131 ± 8 mg/L) compared to those without sepsis (88 ± 21 mg/mL). Albumin was not significantly different in the septic compared to non-septic bitches (mean ± SE, 25 ± 1 g/L, and 26 ± 1 g/L, respectively). Mean ± SE concentrations of CRP and iron were not different in the septic (226 ± 18 mg/L and 16 ± 2 μmol/L, respectively) compared to the non-septic bitches (176 ± 41 mg/L and 18 ± 4 μmol/L, respectively).

Conclusions: Presence of sepsis was associated with increased serum concentrations of SAA. We conclude that SAA analysis may have clinical value as a marker for sepsis in dogs. Concentrations of CRP, iron and albumin were not useful in the detection of sepsis in this study.

MULTI-RESISTANT AND EXTENDED SPECTRUM BETA-LACTAMASE/AMPC-PRODUCING E. COLI AND KLEBSIELLA SPP IN DOGS TREATED WITH ANTIBIOTICS

Östberg S[1], Trowald-Wigh G[2], Fernström L[2], Börjesson S[3], Nicol C[4], Bergström A*[1]. [1]University Animal Hospital, Box 7040, Uppsala, Sweden, [2]Department of Biomedical Sciences and Veterinary Public Health, Division of Bacteriology and Food Safety, Swedish University of Agricultural Sciences, Box 7009, Uppsala, Sweden, [3]Department of Animal Health and Antimicrobial Strategies, National Veterinary Institiute (SVA), Uppsala, Sweden, [4]Bagarmossen Animal Hospital, Stockholm, Sweden.

Development of antimicrobial resistance is without a doubt one of the biggest threats against the public and animal health in the world today. The purpose of this study is to investigate presence of multi-resistant and ESBL-producing strains of E. coli and Klebsiella spp in dogs treated with antibiotics in Sweden. Hospitalized dogs were tested between January 2012 and October 2013. Inclusion criteria were formed using the identified risk factors for ESBL compiled by Swedish National Board of Health. The dogs had to be admitted to the animal hospital for at least 24 hours, to have received antimicrobial treatment for at least 24 hours within the last month and the dogs had to be diagnosed with one of the following diagnoses: illness to the urogenital tract, traumatic injury, traumatic wound or surgical site infection. Bacterial samples were taken from the diseased tissue and from faeces (carrier sample) with a Copan swab in Aimes medium. If bacteria were verified to be an ESBL-producing strain of E. coli or Kleibsiella spp, three new samples were collected from faeces with 3-6 months intervals. Sixty-seven dogs were included in the study; of these, five were positive for AmpC-producing E.Coli. Three of the positive cases remained so one year after initial testing. None of the dogs had signs of infection or symptoms of their carriership of ESBL. All of the positive dogs were treated with amoxicillin, case one was also treated with enrofloxacin and case four with cephalosporin. Length of treatment in the positive group was 8 ± 6.7 days. In the negative group length of treatment with antibiotics was 7.5 ± 8.7 days. The most common antibiotic in the negative group was amoxicillin. In the positive group average time of hospitalization was 3.8 ± 2.2 days and in the negative group it was 2.8 ± 1.5 days. There was no significant difference between the groups regarding length of treatment ($P = 0.88$) or hospitalization ($P = 0.36$). Of dogs tested, 7.5% had plasmid AmpC resistant bacteria, this plasmid enables fast dissemination since they can spread both vertically and horizontally. Horizontal dissemination enables resistance to spread between bacteria of different species. The finding that ESBL and AmpC-producing strains of bacteria was present in faeces in four animals one year after initial finding is clearly worrying. This could mean that the animals are potential reservoirs of these bacteria and could be a source for spread of resistant genes. It is not known how long it takes for the animal to eliminate these bacteria or if elimination happens at all. In Sweden, overall antimicrobial sales have decreased by almost 60% since the 1980's. Despite this, multi-resistant bacteria continue to increase in Sweden, indicating that horizontal dissemination could be an important factor, making this a potential global problem.

SURGICAL TREATMENT OF 14 VERTEBRAL FRACTURES AND LUXATIONS STABILIZED WITH SCREWS AND PMMA VIA A LATERAL APPROACH

Scotti S, Ragetly CA*. Clinique Vétérinaire EVOLIA, L'Isle Adam, France.

INTRODUCTION: The goals of surgical treatment of vertebral fractures/luxations consists in realignment of the vertebrae, spinal cord decompression and vertebral stabilization. The objectives of this study were (1) to evaluate the outcome with screws and PMMA stabilization via a lateral approach to treat vertebral fractures/luxations in dogs and cats in a clinical setting and (2) to assess the ease of use of this method.

MATERIALS AND METHODS: The species of patients with vertebral trauma treated surgically, breed, weight, age, origin of the trauma, neurological dysfunction, localization of the injury, delay between accident and treatment, and complications were recorded. All patients were positioned in right lateral recumbency and placed under traction during surgery. Thoracic fractures were treated via a left lateral intercostal thoracotomy; lumbar fractures needed a transverse process ostectomy. All screws were aimed to be bicortical with their heads embedded in PMMA. The number of bicortical screws visible on the postoperative radiographs and CT images and the degree of neurological recovery were evaluated.

RESULTS: Fourteen patients were included (11 dogs, 3 cats, 1.2 to 35 Kg), most commonly injured by road accident (11/14). Four patients had a pre-operative degree of neurological dysfunction of grade V, 5 of IV, 3 of III, and 2 of II. The total number of affected vertebrae was of 7 in the thoracic region, 5 lumbar and 5 at the thoracolumbar junction. In one patient, injured by a dog bite, 4 vertebrae were affected. Eleven animals (78.6%) were treated within 24 hours and 3 were treated between 24 and 72 hours post injury. All screws were bicortical and no canal effraction was recorded. Complications included implant failure (1 cat). One dog died post operatively. Six dogs and 1 cat showed rapid improvement with only mild ataxia present 2 weeks after stabilization. Two cats were ambulatory 2 and 3 months after surgery. Two dogs with grade V neurological dysfunction were ambulatory 4 months after stabilization. They had surgery within 24 hours of injury. Two of the 3 dogs treated surgically between 24 and 72 hours after injury (both degree V) did not improve (follow up of 6 months).

DISCUSSION/CONCLUSION: The outcome achieved with this lateral approach to treat vertebral fractures/luxations was comparable to previously published results with 84.6% of animals regaining ambulatory function. Time spent between injury and surgery may have affected outcome more than the degree of neurological dysfunction at presentation. The advantages of this technique were (1) the relative easiness of bicortical screw placement, (2) the access to a large bone surface, and (3) the low risk of canal effraction.

THE EFFECT OF A BODY-WEIGHT-SUPPORTED STANDING AND WALKING TRAINING SYSTEM ON WEIGHT BEARING AND FUNCTION IN THE LEGS OF HEALTHY DOGS

Edamura K[1], Oyama T[1], Akune T[2], Yasukawa S[1], Nakano R[1], Tanegashima K[1], Teshima K[1], Asano K[1]. [1]Nihon University, Fujisawa, Japan, [2]Sakai Medical CO. Ltd., Tokyo, Japan.

Introduction: Partial weight bearing therapy (PWBT) using an underwater treadmill is currently widely used to facilitate functional recovery in dogs. In human medicine, body-weight-supported treadmill training (BWSTT) is the primary method for PWBT. However, there have been no basic studies on BWSTT in dogs. In this study, we investigated the effect of a body-weight-supported standing and walking training system designed for animal use on weight bearing and function in the legs of healthy dogs.

Materials and Methods: Six healthy beagles were used for this study. A body-weight-supported system (ACTOR VET-100: Sakai Medical) designed for animal use was used to apply upward traction in increments of 10% of body weight, during which the weight borne by each leg and distribution of weight were measured. In addition, the gait was observed when the dogs were walked on the ground at normal walking speed and when they were walked on a treadmill at speeds of 0.5 km/h and 1.0 km/h under the same amounts of traction. The active-ROM of each joint was also measured. Gait pattern and the active-ROM when the harness was worn were compared at levels of traction of 10%, 20%, 30%, 40%, and 50% of body weight. In some dogs, surface electromyography of the quadriceps femoris muscles and hamstring muscles was also performed, and muscle activity was analysed.

Results: The value of the load on each leg divided by body weight decreased by 10% for all legs for each 10% of body weight increment of traction imposed. We found no significant change in the distribution of body weight while traction was imposed. These values exhibited wide variation at traction with 50% of body weight. Wearing the harness slightly restricted the active-ROM of each joint under all walking conditions, but the active-ROM was not affected by traction. Muscle activity during walking decreased under all conditions purely because of wearing the harness. When walking on the ground or on the treadmill, increased weight bearing tended to increase muscle activity in quadriceps femoris muscles. Muscle activity in the hamstring muscles was lower than that in the quadriceps femoris muscles while walking on the treadmill and did not change when weight bearing was increased.

Discussion: These results show that this system can carry out walking training in dogs without disturbing the gait pattern while partial load bearing of body weight is imposed. In this study, a wide variation in body weight distribution and active-ROM was evident at traction of 50% of body weight, suggesting that load bearing should be

kept below 40% of body weight. Our results show that this system is more effective than an underwater treadmill in conditioning the extensor muscles and is thus more suitable for standing and walking training.

RIDGESTOP® NOVEL IMPLANT FOR PATELLAR GROOVE AUGMENTATION FOR PATELLAR LUXATION

HarGittai T[1], Shani J[*2], Ness M[*3]. [1]AndersonVeterinary Group, Orpington, United Kingdom, [2]ChavatDaat, Beit Berl, Israel, [3]Croft Vets Northumberland, Cramlington, United Kingdom.

Introduction. Patellar luxation (PL) is patella displacement from the trochlear groove. In dogs, medial luxations account for 75% of all PL cases, this is frequently associated with patella alta. The common surgical practice is trochleoplasty and tibial tuberosity transposition (TTT). In patella alta cases distal TTT is also described. The incidence of post operative complications in dogs is estimated at 18–29%, with up to 48% of complications involving re-luxation, ridge fracture and trochlear wedge migration has also been reported. Use of an implant to augment the trochlear ridge has not been described yet. Our hypothesis was that augmenting the ridge at the direction of the luxation of the patella will eliminate the need for trochleoplasty, and in some cases of grade 2 patellar luxation, for TTT. RidgeStop® is a novel high molecular weight polyethylene implant that has been used in 17 cases of MPL.This report describes 17 cases treated with this new surgical technique with a 1–18 month follow up period.

Methods Seventeen dogs were included in this study, the dogs were operated between March 2012-November 2013. Signalment, surgical technique, complications and follow up period results are presented.

Results Of the 17 dogs, 3 had to have RidgeStop® removed, 14 had full resolution of clinical signs,1 incomplete resolution. Excepting the cases of implant removal, none had significant complications (mild seroma in one, some joint swelling in another which resolved after a week of NSAID), 1 (borderline grade II-III) made a full recovery only after TTT was additionally performed. All 3 of the failed cases underwent implant removal, subsequently undergoing traditional procedures, all making a full recovery. Average post-operative time to resolution of lameness, excluding the three failed cases, was: RidgeStop® only - 9 days (range 2–12 days), RidgeStoP+TTT - 15 days (range 10–21 days). Where RidgeStop® was an adjunct to cruciate ligament surgery (Liga-Fiba lateral suture); in all cases the patella remained reduced. None of the cases (excluding the 3 failed cases) had subsequent complications following resolution of clinical signs, the longest follow up being 18 months.

Discussion. An implant designed to augment the trochlear ridges, has not previously been described in small animals. The only report of such an implant was in a heifer, reported in the 1970s. Complete replacement of the trochlear groove was made available recently by Kyon. However the major differences between techniques are RidgeStop®'s simplicity, minimally traumatic nature, very short surgical time, and reversibility i.e. the surgeon can still resort to the classical techniques of trochleoplasty and tibial crest transposition. This was demonstrated by the 3 failed cases where all dogs made a full recovery following implant removal and revisionary surgery. Long term patellar stability needs to be monitored, 1.5 year follow ups do not indicate a problem.

MORPHOLOGICAL EVALUATION OF EXPERIMENTAL AUTOLOGOUS RECTUS FASCIA SHEATH VASCULAR GRAFTS USED FOR ARTERIAL REPLACEMENT IN A DOG MODEL

Csébi P[1], Jakab CS[2], Németh T[*1]. [1]Department and Clinic of Surgery and Ophthalmology, Faculty of Veterinary Science, Szent Istvan University, Budapest, Hungary, [2]Department of Pathology, Faculty of Veterinary Science, Szent Istvan University, Budapest, Hungary.

Introduction: Autologous vascular replacement has been used in human surgery and may be indicated in the veterinary field too. Although experimental patch or tubular vascular conduit grafts made from the internal rectus fascia sheath to replace arterial or venous defects have been reported in the human and veterinary literature, thorough and detailed morphological evaluation and verification of the histological arterialisation of the rectus sheath graft are lacking.

Material and methods: Four purpose-bred Beagle dogs were utilised to create 8 arterial rectus fascia sheath (ARFS) grafts implanted between bisected ends of the external iliac arteries. The 20-mm-long tubular graft was tailored with its peritoneal layer inside, using a single layer simple continuous 6-0 USP polypropylene (Prolene) suture and anastomosed with the arterial ends with a single layer simple interrupted end-to-end technique. Heparin sodium injection (200 IU/kg) was applied intra- and post-operatively as anticoagulant. At the end of the 3-month follow-up period, ARFS grafts along with the anastomosed section of the iliac artery and a piece of the intact internal rectus sheath were surgically removed and submitted for thorough morphological examination including haematoxylin-eosin and Azan staining as well as immunohistochemistry (claudin-5, smooth muscle actin (SMA), desmin and pancytokeratin) and electron microscopy.

Results: Four out of 8 ARFS grafts were patent and viable after three months, while the remaining grafts suffered from stenosis. Haematoxylin-eosin and Azan staining showed a vessel-like layered structure of the grafts with large amounts of collagen fibres. The luminal surface of the grafts covered by endothelial-like cell lining showed claudin-5 positivity and pancytokeratin negativity like the endothelial lining of the intact arteries. The mesothelial lining of the intact internal rectus sheath samples was positive for pancytokeratin and negative for claudin-5. The cells of the wall of the grafts showed moderate α-SMA and desmin positivity like the smooth muscle cells of the tunica media of intact arteries, while the wall of the intact internal rectus fascia sheath was α-SMA negative and desmin positive. Electron microscopic examination of the grafts revealed abundance in thick collagen fibres including large amounts of active fibroblasts. The membrana elastica interna and the lamina elastica externa were absent in the graft. Smooth muscle cells were not visible either.

Conclusion: The study has proved that ARFS autographs may be used as an alternative in arterial replacement, since the graft becomes morphologically and functionally similar to the host vessel via arterialisation.

MODIFIED MAQUET TECHNIQUE FOR TREATMENT OF CANINE CRANIAL CRUCIATE LIGAMENT INJURY: EARLY RESULTS, COMPLICATIONS AND RISK FACTORS IN 109 DOGS

BARTHELEMY N[1], RAMIREZ JM[2], NOEL S[1], CLAEYS S[*1], FARNIR F[3], BALLIGAND M[*1]. [1]Faculty of Veterinary Medicine, Department of Clinical Sciences, University of Liège, Liège, Belgium, [2]Centro Veterinario de Referencia Bahia de Malaga, Malaga, Spain, [3]Faculty of Veterinary Medicine, Biostatistics and Bioinformatic Department, University of Liège, Liège, Belgium.

Introduction:

The purpose of this retrospective study was to describe the complications, risk factors and owner satisfaction associated with the modified Maquet technique (MMT).

Materials and Methods:

Medical records and radiographs of 109 dogs (117 stifles) were reviewed. A major complication was defined as complication requiring a second surgery. Risk factors analyzed for intra-operative and post operative complication were age, drill hole at the distal part of the osteotomy, angle of opening, thickness of bony attachment, and post-operative tibio-patellar angle. Long-term follow-up was obtained by telephone interview.

Results:

Complications occurred in 27% of the dogs (9% major and 18% minor). Subsequent meniscal tear was the most common major complication and was not associated with a high tibio-patellar tendon angle. Fracture of the bony attachment of the tibial crest was the most common intra-operative and minor post-operative complication. Risk factors for intra-operative crest fracture were a high angle of opening, and a drill hole distal to the osteotomy. Risk factor for post operative crest fracture was a thin craniocaudal thickness of bony attachment. Overall outcome was rated as excellent or good by 82% and 13.1% of owners respectively.

Discussion/Conclusion:

Outcome of MMT was comparable with other techniques used for treatment of cranial cruciate ligament injury. The osteotomy should be extended distally, no drill hole should be performed, and the recommendation that the thickness of bony attachment of the tibial crest should be calculated with a maximum load equivalent to 6 times dog's bodyweight appears appropriate to reduce risk of distal fracture of the tibial osteotomy.

CLINICAL AND MRI CHARACTERISTICS OF LUMBAR DISSEMINATED IDIOPATHIC SPINAL HYPEROSTOSIS (DISH) IN 18 DOGS

Togni A[1], Kranenburg Hendrik-Jan C. HCK[2], Steffen Frank FS[1]. [1]Vetsuisse faculty University of Zurich, clinic for small animal surgery, section of neurology, Zurich, Switzerland, [2]Faculty of Veterinary Medicine, Utrecht University, department of Clinical Sciences of Companion Animals, Utrecht, Netherlands.

Introduction: Diffuse idiopathic skeletal hyperostosis (DISH) and spondylosis deformans (SD) are thought to represent two different, non-inflammatory, types of spinal new bone formation that occur in dogs. Our purpose is to evaluate clinical signs, to describe lesions and differences in the MRI appearance of spinal new bone formation classified as disseminated idiopathic spinal hyperostosis (DISH) and/or spondylosis deformans (SD) on radiographs and to compare degeneration status of the intervertebral discs using the Pfirrmann scale. Our goals were, firstly, to describe radiographic and MRI-findings including degeneration status of the IVD using the Pfirrmann scale in vertebral segments with new bone formation in order to allow a more precise differentiation between DISH and SD. Secondly, the clinical significance of both DISH and SD was compared in this population of dogs.

Material and Methods: Retrospective analysis of 18 dogs presented with spinal disorders using information from clinical, radiographic and MRI examinations.

Pfirrmann score, signal intensity and signal intensity index were used to differentiate new bone formation due to DISH or SD.

Results: All dogs were found to be affected with both DISH and SD. Neurological signs due to foraminal stenosis associated with DISH were found in 2 dogs. SD was associated with foraminal stenosis and/or disc protrusion in 15 cases. Vertebral segments with DISH had a lower degree of intervertebral disc degeneration, as depicted in the Pfirrmann score (mean 1.5), compared to segments with SD (mean 2.87), the difference was statistically significant ($P < 0.0001$).

Comparison of the signal intensity index of the new bone of DISH (mean 0.6) with the new bone of SD (mean 0.81) revealed a statistically significant difference ($P = 0.004$).

Discussion and conclusion: Differences between DISH and SD found on MRI contribute to an increased differentiation between the two diseases. The SIx was a useful tool to differentiate the two entities. Clinically relevant lesions in association with DISH were rare compared to those seen with SD.

COMBINATION OF TRIPLE TIBIAL OSTEOTOMY AND A COPLANAR MEDIAL CLOSING WEDGE OSTEOTOMY OF THE PROXIMAL TIBIA FOR THE TREATMENT OF CRANIAL CRUCIATE LIGAMENT RUPTURE ASSOCIATED WITH PROXIMAL TIBIAL DEFORMITIES

Ferrand FX, Bismuth C, Cabon C, Viguier E*, Carozzo C*, Fau D, Cachon T*. Surgery Department, VetAgro Sup, Campus vétérinaire de Lyon, Marcy L'Etoile, France.

Objective: To describe a surgical technique and outcome in 4 cases for the concomitant treatment of cranial cruciate ligament (CrCL) rupture and proximal tibial deformity.

Study Design: Cases series

Animals: Dogs (n = 4, 4 stifles)

Methods: Medical records of dogs that had TTO combined with a coplanar medial closing wedge osteotomy (CMCWO) were reviewed. Tibial deformities included in this study were tibial valgus and tibial torsion. Dogs with medial patellar luxation (MPL) were also included. Pre- and post operative patellar tendon angle (PTA), tibial plateau angle (TPA), mechanical medial proximal (mMPTA) and distal (mMDTA) tibial angles in the frontal plane, tibial torsion, methods of fixation and complications were recorded. Tibial valgus was calculated with the formula (mMPTA − 90°) + (mMDTA − 90°). The angle of the medial closing wedge osteotomy corresponded to the angle of the tibial valgus. Short-term functional limb recovery and radiographic healing were assessed up to 3 months.

Results: Cranial cruciate ligament injury and proximal tibial valgus were present in the 4 dogs. Mean pre- and post operative PTA was 105.1° (range, 99.1°–110°) and 89.3° (range, 85.4°–92.2°), respectively. Mean pre- and postoperative tibial valgus was 19.7° (range, 17.1°–25.9°) and 2.4° (range, 1.1°–4.7°), respectively. Two dogs had a concomitant MPL, which was treated with a tibial tuberosity displacement. The same two dogs had also an important tibial torsion, which was grossly resolved with a manual rotation of the distal aspect of the tibia before stabilization. Stabilization was performed using a 2.7 or 3.5 mm TPLO plate. In one case stabilization was performed with a 2.0 mm LC-DCP T-plate and a centromedullary pin. The main complication was intra-operative distal tibial crest fracture (3 cases). This was treated in 2 cases with one or two pins and a figure-of-8 tension-band wire. The third case was treated with only two cranio-caudal pins. The other complications included postoperative cranio-proximal displacement of the tibial crest in one case, seroma formation in one case, and swelling at the cranial aspect of the pins in another case. Three dogs had no lameness and one dog had mild lameness at 8 or 12 weeks. Radiographic evaluations at 4 or 8 weeks showed good to excellent bone healing, even in the case with cranio-proximal displacement of the crest.

Conclusion: Combination of TTO and a CMCWO is a simple and effective method to concomitantly treat CrCL rupture and proximal tibial valgus. Tibial torsion and MPL can be managed at the same time. Intra-operative fracture of the tibial crest occurred in 3 cases.

APPENDICULAR FRACTURES REPAIR IN CATS AND SMALL DOGS USING 2.0 AND 2.4 LOCKING COMPRESSION PLATES

Vallefuoco R[1], Savin A[2], Le Pommellet H[3], Decambron A[2], Manassero M[2], Gauthier O[3], Viateau V[2], Fayolle P[2]. [1]Faculty of Veterinary Medicine, University Utrecht, Department of Clinical Sciences of Companion, Utrecht, Netherlands, [2]Ecole Nationale Veterinaire d'Alfort, Small Animal Surgical Department, Maisons-Alfort, France, [3]ONIRIS - Ecole Nationale Veterinaire de Nantes, Small Animal Surgical Department, Nantes, France.

Objective: to review the postoperative results and complications associated with stabilization of appendicular fractures in dogs and cats using 2.0 and 2.4 locking compression plate (LCP).

Study design: Retrospective clinical study.

Materials and Methods: Medical records and radiographs of dogs and cats with long-bone fractures treated with 2.0 and 2.4 LCP were reviewed. Only cases with both clinical and radiological follow-up to document clinical union were included. Radiographic union was defined as the presence of at least one bridging cortex on both lateral and cranio-caudal radiographic views. Recorded data include: signalment, body weight, cause of the fracture, fracture description, concurrent orthopedic injuries, implant size, presence of concurrent ancillary implants, technique used (ORIF -Open reduction and internal fixation- or MIPO -Minimally invasive plate ostheosynthesis-), and complications. Additionally, plate-bridging ratio, plate span ratio, working length, number of screws and cortices engaged per plate and per main fragment, plate screws density, number of empty screws holes across the fracture zone, ratio between screw and bone diameter at the most narrow aspect of the bone, were also reported. Complications were classified as "fixation failure" or "other complications". Cases with fixation failure were compared to cases with no fixation failure for all variables. Data were analyzed by use of statistical software. Significance was set at $P < 0.05$.

Results: Seventy-five fractures from 63 cats (64 fractures) and 10 dogs (11 fractures) met the inclusion criteria. Eight humeral fractures, 13 radial/ulnar fractures, 26 femoral fractures, 28 crural fractures were treated. Primary fracture repair was performed using 2.0 LCP in 22 cases, and using 2.4 LCP in 53 cases. Median plate span ratio was 4 (1.42–42), and median number of screws per main fragment was 3 (2–4). Median plate screw density was 0.5 (0.29–1) and the mean number of empty holes across the fracture zone was 4 (0–10). ORIF and MIPO techniques were used in 51 and 14 cases, respectively. Postoperative radiographic follow-up was carried out between 4 and 270 days (median 76 days). Fixation failure was recorded in 7 cases (9%) including plate breakage (1 case), plate bending (3 cases), pull-out of screws (1 case), and migration of intramedullary pins (2 cases). Fixation failure complications were not significantly associated with any factors considered in this study.

Clinical significance: 2.0 and 2.4 LCPs with a minimum of 2 screws that engage at least 4 cortices per main fragment is a stable fixation technique for fracture healing in cats and small dogs.

CEMENTLESS ACETABULAR CUP ROTATION: ARTIFICIAL BONE IMPLANTATION, THEORETICAL AND FINITE ELEMENT ANALYSES WITH CORRELATION TO SURGERY

McCartney WT*[1], Lostado-Lorza R[2], Mac Donald BJ[3]. [1]NOAH/Dublin City University, Dublin, Ireland, [2]University of La Rioja, Logroño, Spain, [3]Dublin City University, Dublin, Ireland.

The objective of this study was to analyse the rotational forces acting on an implanted cementless acetabular (AC) cup and the intra-operative evaluation of cup position. Aseptic loosening of the AC cup is a recognised complication of hip replacement. AC cups (Kyon) were implanted into artificial bone. Rotation was considered in 2 axes, the mediolateral (ML) and craniocaudal axes. Four different depths of cup implantation were chosen with position 0 being no holes visible lateral to dorsal AC rim, position 1 being one row of holes, positions 2 and 3 being two and three rows respectively.

Results.

The minimum force required to elicit movement of the cup within the bone socket was recorded. A 3D theoretical analysis based on Hertz laws was performed to calculate the distribution of contact pressure between the cup and the bone for forces acting on a cup. Using mathematical methods (inc FE models) the net resultant forces from loads of 300, 850 and 1600 N were calculated. In conjunction with these analyses attention was paid to the cup position and the location of the dorsal AC rim during total hip replacement intraoperatively. The average torque (Nm) required to move the cup ML for position 0, 1, 2, 3 were 4.2, 1.7 .0.9 and 0.6 respectively. Theoretical analysis indicated that at 350N, 850, 1600 the cup load-torque force was 250N–0.975 Nm, 710–2.76 and 1337–5.2 respectively. The angle of the net resultant force on the cup in relation to the ground was 113°.

Discussion.

Observations during AC cup implantation indicated that unless the dorsal joint capsule was dissected away completely to allow clear unobstructed view of the dorsal AC rim then it was difficult to ensure the depth. The theoretical torque was higher than the torque limit measured in the samples when any holes were visible indicating a weakness. Artificial bone is manufactured with the same material properties as real bone to allow for consistent sample properties during testing, but it is not known if this extends exactly to press fit cups and torque. Therefore these results would need to be verified in bone samples as a further study. From this analysis it is possible to notify caution to surgeons that an AC cup not implanted completely under the dorsal AC rim will be at risk of ML rotation at normal loading forces. Complete dissection of the dorsal AC joint capsule off the AC rim is recommended to clearly determine that the cup has been implanted sufficiently below the dorsal AC rim. In conclusion it can be recommended that implantation of the Kyon cementless cup should aim to have no holes visible lateral to the dorsal AC rim to be certain that the initial fixation can resist ML rotational forces sufficiently.

CHONDRODYSPLASTIC MASS OF THE LARYNX IN A DOG

Bismuth C, Pillard P, Fau D, Cachon T*, Carozzo C*, Viguier E*. VetAgro Sup, Small animal Campus vétérinaire de Lyon, Marcy L'Etoile, France.

Introduction: To report the diagnosis, treatment and long-term follow-up of a benign laryngeal mass in a dog.

Study Design: Clinical report.

Case description: A 12-year-old spayed female Dogue de Bordeaux was admitted for evaluation of a progressive inspiratory stridor, dyspnoea and weakness. Oral examination via laryngoscopy and computed tomographic scan revealed a right-sided arytenoid mass without local invasion or generalized spread. The mass was removed by subtotal resection of the right arytenoid cartilage through a transoral video-assisted approach. A dramatic improvement occurred 36 hours after the surgery and the patient was discharged from the hospital 4 days after the surgical procedure. Pathological examination of the mass revealed a well-defined lesion composed of multiple nodules of 2–4 mm in the cartilaginous tissue of the arytenoid. On microscopic examination, the nodules were composed of hyaline cartilage completely surrounded by a thin rim of fibrous tissue without infiltrative edges. At low magnification, the nodules appeared hypercellular with a centripetal growth pattern. At higher magnification, cells within the chondroid matrix showed no cytonuclear atypia and no mitotic activity. Connective tissue around the nodules was composed of dying striated muscle cells and elastic cartilage tissue, dissected and fragmented by beams of collagen, compatible with fibrosis. Histological examination was consistent with a benign chondroid proliferation characterized by multiple chondrodysplastic nodules of hyaline cartilage tissue. On re-examination 6 months after surgery, laryngoscopy showed good healing of the laryngeal mucosa and no recurrence of the lesion. Follow-up at 12 months revealed no recurrence of clinical signs.

Conclusion: This case is the first description of a benign chondroid laryngeal mass in a dog. Surgical excision via transoral video-assisted subtotal arytenoidectomy permitted a complete resolution of the clinical signs and an absence of recurrence 12 months postoperatively.

PRE- AND POST SURGICAL COMPUTER TOMOGRAPHIC EVALUATION IN PATIENTS WITH CORONOID DISEASE TREATED ARTHROSCOPICALLY

Peppler C*, Nikolai L, Amort KH, Kramer MH. Clinic for small animals, Surgery, Giessen, Germany.

Introduction: Aim of the present prospective study was to evaluate the area of the medial coronoid process pre- and post arthoscopic treated elbows with coronoid disease.

Material and Methods: In 25 dogs with clinically and radiographically suspected coronoid disease CT-Scans were performed in a standardized position pre- and post arthoscopic treatment. The area of the coronoid process was measured at standardized landmarks using a (dedicated software) special program (Philips view forum V3.0.1). Fragment number was recorded pre- and postoperatively. The treatment modality was removal of fragments and a varying degree of coronoidectomy, based on subjective evaluation of visibly diseased portions of the medial aspect of the coronoid process.

Results: Of the 50 examined elbow joints 19 showed presurgically a single isolated fragment and 5 patients showed two isolated fragments at the medial coronoid process. In 23 cases no isolated fragment could be seen, but signs of coronoid pathology. The remaining 3 elbow joints showed no signs of coronoid disease.

For the right elbow the mean difference of the medial coronoid area comparing pre to post operative CT scan was 15.47 mm^2 with a range from 1 mm^2 to 50.2 mm^2 and a median of 14.2 mm^2. In three cases in which a single isolated fragment was detected pre-operativly, a single fragment was also shown to remain in the elbow joint post arthroscopy.

For the left elbow the mean difference of the medial coronoid area comparing pre and postoperative CT scans was 25.62 mm^2 with a range from 0.4 mm^2 up to 34.5 mm^2 and a median of 11 mm^2. Post arthroscopy CT scans showed one single remaining fragment in 4 cases. One of the elbows showed no fragment pre-arthoscopy but an isolated fragment after surgery. Two elbows showed two isolated fragments pre arthroscopy and one fragment afterwards.

Conclusion: Based on results of CT scan and arthroscopically visible alterations, subtotal coronoidectomy does not seem to be necessary in all cases of coronoid disease. The amount of diseased bone that needs to be removed seems to be highly variable, possibly due to diverse disease pattern.

CLINICAL APPLICATION OF THE SYNTHES LCP PLATE IN TRAUMATIC INJURIES IN CATS

Boero Baroncelli A, Giammarresi I, Olimpo M, Piras LA, Peirone B. Department of Veterinary Sciences, Grugliasco, Italy.

Introduction: Long bone fractures are common and account for 60 per cent of all feline fractures (1). Voss et al (2009) published a series of 32 cats treated with the Unilock 2.0–2.4 mm system (2). The Synthes Locking Compression Plates (LCP) feature innovative traits (i.e. combi-hole, low contact design) that enable use both as a dynamic compression plate and as an internal fixator through minimal invasive techniques.

To our knowledge there are no reports about the use of the LCP plate in cats. The aim of our study is evaluate the clinical application of the LCP plate for the treatment of traumatic injuries in cats.

Materials and methods: Cats with traumatic injuries to appendicular skeleton treated with an LCP 1.5, 2.0, 2.4 mm plates were retrospectively evaluated. Twenty cats were included and information regarding each signalment, body weight, cause of the fracture, concurrent musculoskeletal injuries were recorded. Cats were clinically and radiographically evaluated at the time of surgery and every month until healing occurred.

Results: Three humeral fractures, 7 radial/ulnar fractures, 4 femoral fractures, 2 tibial fractures, 3 iliac fractures, one pancarpal arthrodesis and one pantarsal arthrodesis were treated. Eleven out of 19 fractures were simple while 8 were comminuted. In 14 cases a ORIF surgery was performed while 5 cases had a MIPO surgery. The following implants were used: eleven 2.4 mm LCP, nine 2.0 mm LCP and one 1.5 mm LCP. In 5 cases a LCP "T" shaped plate has been used, while in 16 cases standard straight plates were applied. In 10 cases the plate was applied in neutral fashion, in 6 cases in compression and in 5 cases with bridging function. Bone healing was observed in all patients. Functional recovery was excellent in 20 cases and fair in 1. We experienced minor complications in 2 cases and one major complication.

Discussion: The Mini Synthes LCP system as proved to be an affective method for the treatment of skeletal appendicular fractures in cats. Radiographic healing was observed in all cases and final clinical outcome was good in all cats. The 2.4 mm LCPs are suitable to be applied on femur, tibia, humerus and ilium, while the 2.0 mm LCP is recommended for the cat radius. The 2.4 mm and 2.0 mm "T" shaped LCP is suitable for the treatment of distal radial, distal humeral, distal tibial, distal femoral and ilial fractures. Minor complications occurred in 2 cases with a superficial surgical site infection due to licking of the limb few day after surgery. In one case with a very distal comminuted femoral fracture, medial patella luxation occurred 1 week postoperatively.

References:

Scott H. In Practice (2005) 27: 390-397

Voss K et al. VCOT 2009; 22: 398–405

LONG-TERM CLINICAL AND RADIOGRAPHIC OUTCOME AFTER THE ARTHROSCOPIC TREATMENT OF ELBOW OSTEOCHONDRITIS DISSECANS IN DOGS

Spillebeen AL[2], Samoy Y[1], Verhoeven G*[1], Van Ryssen B[1]. [1]Department of Veterinary Medical Imaging and Small Animal Orthopaedics, Faculty of Veterinary Medicine, Ghent University, Ghent, Belgium, [2]Department of Clinical Sciences of Companion Animals, Faculty of Veterinary Medicine, Utrecht University, Utrecht, Netherlands.

Introduction

Elbow osteochondritis dissecans (OCD) is a less frequently diagnosed elbow disorder compared to medial coronoid disease. Arthroscopic treatment of elbow disorders is described as a standard procedure in veterinary orthopaedic surgery, however there are no reports related to elbow OCD. Therefore, the main objective of this study was to evaluate the long-term clinical and radiographic outcome of the arthroscopic treatment of elbow OCD.

Materials and methods

For this retrospective study, complete files of client owned dogs diagnosed with elbow OCD were collected over a period of 4 years. Clinical data and radiographs before and after arthroscopic treatment were evaluated in retrospect.

Results

52 dogs were accrued over this period of which 24 dogs had an owner questionnaire filled out and of these 24 dogs, 17 dogs (28 elbows) returned to the clinic for re-assessment. Of the 17 dogs that were re-evaluated at our clinic, a mean follow-up period of 4.4-year period was achieved (range 2.3–5.8 years). Over time, clinical parameters (lameness, joint swelling, and pain) subjectively improved, range of motion decreased, and radiographic evidence of elbow osteoarthritis increased significantly.

Good clinical outcome was seen in 96.4% of the arthroscopically treated joints, despite the radiographic development of severe osteoarthritis (OA). A combination of osteochondritis dissecans (OCD) and fragmented coronoid process (FCP) was seen in 61.8 % of dogs and, wehn present, this was associated with a more severe development of osteoarthritis.

Discussion/Conclusion

The results of this study prove that arthroscopic treatment of elbow OCD has a good long-term clinical outcome when treated at a young age, despite the severe worsening in osteoarthritis. Newfoundlanders, Golden and Labrador Retrievers developed more severe osteoarthritis versus Bordeaux Dogs, who had a slightly better prognosis with a rapid post-operative clinical improvement. Although the combination of OCD and FCP gave rise to a more severe development of osteoarthritis after treatment, no clinical consequences were seen. Study limitations comprise of a lack of a control group and objective evaluation of clinical outcome as orthopaedic and owner-questionnaires only give a subjective impression. In conclusion, arthroscopic treatment should be advised as a minimally invasive surgical treatment for elbow OCD, rendering excellent long-term results. Though the development of osteoarthritis cannot be avoided even by minimally invasive

procedure as elbow arthroscopy, the severity of OA changes, as assessed radiographically, seems unrelated to clinical outcome during the period studied here.

THE SUBCUTANEOUS PARAPREPUTIAL POCKET: A WAY TO PREVENT URETHRAL FOLEY CATHETER DISPLACEMENT FOR THE MANAGEMENT OF URETHRAL TRAUMA IN MALE DOGS. DESCRIPTION OF THE TECHNIQUE AND PRELIMINARY RESULT

Deneuche A*, Chotar-Vasseur Y, Khuc T. VET24, Marcq en Baroeul, France.

Urethral trauma generally occurs as a result of blunt or penetrating injuries or iatrogenic damage. Conservative or surgical management of urethral injuries may necessitate the placement of a urethral catheter for long periods. It is sometimes difficult to maintain the catheter in place and some dogs are able to dislodge the catheter with potentially serious consequences, e.g. urine leakage, stricture.

The aim of this preliminary study is to describe the placement of the proximal part of a urinary catheter in a subcutaneous parapreputial pocket to prevent catheter dislodgement in male dogs.

After routine anesthetic management, a cystostomy tube is placed routinely and connected to a closed collection system. After urethral catheterization and bypass of the urethral lesion by a Foley catheter, the bulb of the urethral Foley catheter is inflated with saline and placed in the bladder neck. The external port of the Foley tube is occluded with a sterile catheter plug. A parapreputial subcutaneous pocket is prepared: the proximal part of the Foley catheter is introduced in the pocket and secured to the abdominal wall. The parapreputial pocket is closed routinely.

This technique was used successfully in a male Bernese moutain dog which presented with pelvic fractures and a urethral laceration. Removal of the urinary catheter resulted in generated major complications of stricture, cellullitis, and leakage. The subcutaneous parapreputial pocket permitted the dog to tolerate the urethral catheter for 30 days, the time necessary for a correct urethral healing.

To allow chronic catheterisation and to avoid catheter displacement, the subcutaneous parapreputial pocket technique is a valuable solution in combination with a cystostomy tube. Even if the subcutaneous parapreputial pocket technique necessitates a local surgical procedure, it is easily combined with a urethral anastomosis or a bladder approach, sometimes necessary to manage to catheterize the urethra. Local complications may be infection, seroma and urine leakage, but they are minor complications compared to the dramatic complications observed with catheter displacement.

The subcutaneous parapreputial pocket technique necessitates the placement of a cystostomy tube. Cystostomy tubes may be associated with many complications, but this has to be balanced with the risk of serious complications in the event of displacement of the urethral catheter.

The subcutaneous parapreputial pocket technique is a simple and well tolerated technique and is indicated in patients where dislodegemtn of the urethral catheter would cause potentially serious complications.

PREDICTION OF BENDING STIFFNESS OF CANINE HUMERUS BY FINITE ELEMENT ANALYSIS AND VALIDATION BY EX VIVO MECHANICAL TESTS

Bohme B*[1], Laurent C[1], D'Otreppe V[2], Ponthot JP[2], Balligand M*[1]. [1]Department of Clinical Sciences, University of Liege, Liege, Belgium, [2]Aerospace and Mechanics Department, University of Liège, Liege, Belgium.

Internal osteosynthesis is a widely used stabilization technique for long bone fractures in dogs. Technical failures have been reported to contribute to up to 80% of fracture complications[1]. Therefore adequate fracture stabilization is a crucial part in fracture healing. Providing surgeons with guidelines may help to reduce technical errors like insufficient stability or excessively stiff constructions. The objective of the present study was to create a bone model by finite element analysis (FE) including the heterogeneity of bone properties and to validate this model by experimental studies. This will enable us to evaluate the mechanical aspects of different types of osteosynthesis in the future.

Based on computer tomographic scans of adult canine humeri (n = 8, 17–39 kg, embedded in resin molds, 1mm sections), a finite element three-dimensional model of the canine humerus was created[2,3,4]. Trabecular and cortical bone were considered transversely isotropic elastoplastic[5] (axial direction $Ea = 2065\rho^{3.06}$, transverse direction $Et = 2314\rho^{1.57}$) and heterogeneous.

Embedded humeri were tested in 3-point bending and experimental data were compared to the FE simulations. Experimentally, fracture onset appeared on the tensile surface of the humeral shaft, where tensile forces are maximal and parallel to the axis of the bone diaphysis. The experimental modelling of bone failure was set at a maximum principal strain[6] with an arbitrary value of 3.5% [6].

Bending stiffness and yield load of the bone were satisfactorily predicted by the model (less than 20% error). This result is the first step to realize our long-term objective which is to introduce different osteosynthesis patterns in FE simulations to optimize plate length and size, screw placement and in the following the type and amount of implants to achieve an optimal balance between rigid and elastic fixation for optimal fracture healing.

TWO CASES OF FRACTURE-ASSOCIATED FIBROSARCOMA IN CATS

Degasperi B*[1], Rick T[1], Reifinger M[2].[1]Department for Companion Animals and Horses, Clinic for Small Animals, Division of Small Animal Surgery, University of Veterinary Medicine, Vienna, Austria,[2]Department of Pathobiology, Institute of Pathology and Forensic Veterinary Medicine, University of Veterinary Medicine, Vienna, Austria.

Fracture-associated sarcoma has been mainly reported in dogs, with very few cases in cats. In this context, osteosarcoma is the most frequent tumour in both species and few other types of tumour are reported. One of the eight feline cases reported in the literature was classified as fibrosarcoma, and all other reported cases were osteosarcomas. Our report presents two rare cases of fibrosarcomas in cats, associated with implants following fracture repair after 7 and 10 years. Two male castrated domestic shorthair cats, 10 and 11 years old, were diagnosed with fibrosarcoma, involving the left femur in cat 1 and the right tibia in cat 2. Both cats had bone plates in situ at the affected site. Amputation was carried out, survival for cat 1 was 1 year, and 3 years for cat 2. As far as the authors are aware, these are the first reported fracture-associated sarcomas in cats in conjunction with bone plates. The pathogenesis of fracture-associated neoplasia is obscure. Initial trauma, fracture healing processes, inflammation, metallic implants, surgical trauma, irradiation, infection and many other possibilities have been listed as possible aetiological causes. The potential clinical relevance of fracture- or implant-associated sarcomas in small animals cannot be established without more epidemiological data.

RADIATION THERAPY IN PAINFUL OSTEOARTHRITIS IN DOGS. ANALGESIC EFFICACY AND DURATION OF THE ANALGESIC EFFECT

Schmierer PA. University of Zurich, small animal surgery, Zurich, Switzerland.

Introduction and hypothesis

Degenerative joint disease is one of the most common reasons for severe lameness in dogs. Adequate pain control is a challenging task in these patients. Besides other therapies radiation therapy is an established option in humans. The purpose of this study is to evaluate the degree and the constancy of the analgesic effect of radiation therapy on an subjective and objective base in dogs with painful osteoarthritis.

It was hypothesized that low-dose radiation therapy in dogs with painful osteoarthritis leads to excellent and long lasting pain control.

Materials and methods

Patients included in this study were dogs suffering from severe osteoarthritis. Results of the Veterinary-assessed mobility index were collected in week 1, 2, 4, 6, 14, 22, 30. Furthermore the dogs were evaluated utilizing a Visual analogue scale and the GAIT4DOGs Electronic Walking System before treatment and at each follow up. Owners were asked to complete the Helsinki chronic pain index questionnaire. Radiation therapy consisted of 3 fractions of 2 Gy within one week.

Results

Eighteen dogs were included in this study. Median age was 9.1 years (3.4–13.5) and median weight was 34 kg. Results of the Veterinary-assessed mobility index showed improvement in 85%. A reduction in the Visual analogue scale was seen in 87.5 % of the examined dogs and according to the Helsinki chronic pain index questionnaire 56.3 % of the owners recognized obvious improvement.

The objective analysis of the Gait4Dog Electronic Walkway System showed a decrease in lameness in 24% (n = 18) of all dogs.

Discussion and conclusion

The data of this study showed promising results comparable to those in human medicine. Veterinary-assessed mobility index showed obvious improvement in 85% of the dogs over a mean time of 100.5 days. No side effects were observed in the follow up period.

Low dose radiation therapy is an excellent treatment option for dogs with severe painful osteoarthritis without side effects

NECROTIZING FASCIITIS IN TEN DOGS: RETROSPECTIVE EVALUATION OF SURGICAL TREATMENT AND LONG-TERM OUTCOME

Del Magno S, Cinti F, Foglia A, Beha G, Zanoni RG, Pisoni L. Department of Veterinary Medical Sciences, University of Bologna, Bologna, Italy.

INTRODUCTION

Necrotizing fasciitis (NF) is a rare life-threating, rapidly progressive infection of soft tissue. β-haemolityc Streptococcus spp., especially Streptococcus canis, is the most frequent agent of the disease. An early and aggressive surgical treatment, together with antibiotics and supporting care, is essential for a positive short-term outcome.

MATHERIALS AND METHODS

The medical records of dogs affected by NF, confirmed by histopathology, diagnosed at the veterinary teaching hospital, University of Bologna, between 2001 and 2012, were revised.

RESULTS

Ten large-breed dogs were included. The median age of the dog was 7 years, ranging from 1 year to 24 years and 60% were males. They showed painfull swelling located mainly on the limbs, but other sites were affected. Systemic involvement was frequently present and after initial stabilisation, surgery was performed in all cases.

After pre-operative ultrasound studies debridement of necrotic tissue, fasciotomy, lavage and positioning of multiple passive drains were performed. Bacterial culture was performed in 7/10 dogs and yielded different isolates: Streptococcus canis (3/10), Escherrichia coli (2/10), Streptococcus dysagalactiae spp equisimilis (1/10) and Staphylococcus β-haemolitycus (1/10). Two of the isolates (E. coli and S. β-haemolyticus) showed antibiotic multi-resistance. All the dogs were treated with specific or broad spectrum antibiotic, with supportive care and analgesia.

Histological examiantion reported mainly severe necrotizing panniculitis, myositis, fasciitis and cellulitis, with a neutrophilic and lymphoplasmacytic infiltrate. Nine dogs survived and seven were still alive at the moment of writing this work. The only complication encountered was tarsal joint instability consequent to septic arthritis. One dog died in the post-operative period, probably due to DIC, and two dogs died of unrelated causes.

DISCUSSION/CONCLUSION

The age of presentation of NF was variable .The slight prevalence of males reflects the same trend in human medicine. Different parts of the body were affected by NF without an apparent initiating cause. Prompt surgical therapy was necessary to evacuate exudate, debride necrotic tissue and relieve pressure on the affected parts (e.g. muscles, nerves and vessels). Surgery is a fundamental step in the diagnostic and therapeutic protocol; tissue from different sites and depth can be collected to submit for histopathology and microbiology. As few complications were encountered, if the patient survives to the acute phase, a positive long-term outcome is expected.

SURGICAL APPROACH TO ESOPHAGEAL DUPLICATION CYST IN A DOG: A CASE REPORT

Foglia A, Del Magno S, Cinti F, Pietra M, Morini M, Joechler M, Pisoni L. Department of veterinary medical science, University of Bologna, Ozzano dell'emilia, Bologna, Italy.

Introduction. Oesophageal duplication cysts are unusual congenital disorders of the foregut. They are infrequent in humans and even less common in domestic animals. We report a case of thoracic oesophageal duplication cyst, treated successfully by surgical resection.

Case report. A 7 year old, entire male Rottweiler was presented to the Veterinary Teaching Hospital of Bologna University, with a history of chronic dysphagia and regurgitation. Endoscopy showed a submucosal bulging mass in the right side of the lower oesophagus and computed tomography revealed a cystic lesion in the caudal mediastinum, probably arising from the oesophagus. With a presumptive diagnosis of oesophageal cancer, abscess or congenital duplication cyst the patient underwent surgery by right lateral thoracotomy at the level of ninth rib. Histologic evaluation confirmed the clinical suspicion of a cystic structure. Histological examination showed a 5 cm diameter cystic lesion containing mucoproteinaceous fluid with a dual muscular layer. The inner layer was composed of cuboidal epithelium.

Discussion. In humans oesophageal duplication cysts result from a foregut budding error from the third to the sixth week of embryonic development and they account for 10% to 15% of duplications of all foregut cysts. To the best of our knowledge this is the first reported case of duplication cyst in the thoracic esophageal tract in dogs.

Conclusions. Although the diagnosis and treatment of this pathology may be improved, oesophageal duplication cysts respond well to complete surgical excision, therefore surgical treatment is always recommended, like in humans, immediately after diagnosis to avoid complications such as bleeding or aspiration.

EN BLOC RESECTION OF A LARGE HEPATIC MASS BY CENTRAL AND LEFT DIVISIONAL HEPATIC LOBECTOMY IN DOGS

Asano K, Seki M, Ishigaki K, Iida G, Kutara K, Teshima K, Yoshida O, Edamura K, Sakai M. Department of Veterinary Medicine, Nihon University, Fujisawa, Japan.

Introduction– We have developed a new efficient surgical procedure for the complete resection of a large hepatic mass infiltrating into the left and central hepatic divisions in dogs. The purposes of this pilot clinical study were to present the surgical procedure of central and left divisional hepatic lobectomy, and to report its outcome in dogs with a large hepatic mass.

Materials and Methods– Three dogs (#1, #2 and #3) with a large hepatic mass underwent en bloc resection of the mass by central and left divisional hepatic lobectomy. Mercedes or cruciate incisions (cranial abdominal midline incision, right and left paracostal incisions, caudal median sternotomy, and diaphragmatic midline incision) were performed for approaching to the large hepatic mass. The right medial lobar portal vein and hepatic artery and duct, and cystic artery and duct were en bloc ligated and cut during the temporary occlusion of hepatic blood inflow by using the Pringle manoeuvre, followed by the en bloc ligation and dissection of the left branch of portal vein and hepatic arteries and ducts toward the quadrate and left medial and lateral lobes. After that, an accessory central hepatic vein from the right medial lobe, and central and left hepatic veins were en bloc ligated and cut. The large mass was resected, and histopathologically diagnosed in each dog.

Results– En bloc resection of the large mass by the central and left divisional hepatic lobectomy was feasible in all dogs. Histopathological diagnosis of the mass was HCC in Dogs #1 and #3, and hepatocholangiocarcinoma in Dog #2. The intraoperative findings and histopathological examination showed that the large tumour could be completely resected by this procedure in each dog. Dog #1 had shown no clinical signs associated with HCC after the operation, and died of the causes unrelated to HCC on 738th day after the operation. Dog #2 had recovered steadily for 1 week after the operation, but died of the respiratory failure due to the pneumonia on 11th day after the operation. Dog #3 is alive at the time of writing this abstract.

Discussion– After the central and left divisional hepatic lobectomy, normal preservation of postoperative liver function by the residual right hepatic division was observed in all dogs. Based on the CT findings of all dogs, we could preoperatively design the surgical procedure including Mercedes incision, Pringle manoeuvre, and central and left divisional hepatic lobectomy with the surgical devices such as an ultrasonic aspirator and vessel sealing system. In conclusion, the central and left divisional hepatic lobectomy is suggested to enable the complete resection of large hepatic tumours infiltrating the multiple central and left divisional lobes without major complications in dogs.

OUTCOME OF A COMBINATION SURGERY WITH THORACIC DUCT LIGATION, PARTIAL PERICARDIECTOMY AND CISTERNA CHYLI ABLATION FOR TREATMENT OF IDIOPATHIC CHYLOTHORAX IN 11 DOGS

Ishigaki K, Asano K, Teshima K, Seki M, Serizawa Y, Yoshida O, Kutara K, Edamura K. Department of Veterinary Medicine, College of Bioresource Sciences, Nihon University, Fujisawa, Japan.

Introduction–The combined surgical techniques of thoracic duct ligation (TDL) and partial pericardiectomy (PP) or cisterna chyli ablation (CCA) have been reported to have a high success rate for the complete resolution of chylothorax. We hypothesised that the combination of these 3 techniques (TDL, PP and CCA) would improve the success rate for the treatment of canine idiopathic chylothorax. The purpose of this study was to evaluate the outcome and complication of a combination surgery of TDL, PP and CCA in dogs with idiopathic chylothorax.

Materials and Methods–Eleven dogs with idiopathic chylothorax underwent the combination surgery of TDL, PP and CCA due to little response to the medical management. A right 8–10th intercostal thoracotomy was performed in each dog. After a paracostal abdominal incision, lymphangiography and/or indocyanine green dyeing were performed. Three or 4 ligations of the thoracic duct with 4-0 polypropylene suture material were performed in all dogs. After the TDL, PP was performed via the same intercostal incision or an additional 4 or 5th intercostal thoracotomy. The incisions were routinely closed following the chest tube placement. Each dog was repositioned at the dorsal recumbency and a median celiotomy and cisterna chyli ablation was performed. Each dog had postoperative medical management including rutin and octreotide as needed.

Results–Of 11 dogs with idiopathic chylothorax, 7 dogs were Shiba, 2 were Afghan hounds, and each one was Borzoi and mongrel. Five dogs underwent 2 intercostal thoracotomies for TDL and PP, whereas 6 dogs had single intercostal incision site. No major intraoperative complications were shown in all dogs. Of 11 dogs, 9 had no pleural effusion without medical and dietary management after the operation. In 1 mix breed dog, the chyle changed to the modified transudate postoperatively with the reduction of pleural effusion. In 1 Shiba, the pleural accumulation of chyle was not improved postoperatively, and died 4 months after the combination surgery. Mortality rate was therefore 9.1% in this clinical study.

Discussion–There are no reports on the 3 techniques (TDL, PP and CCA) for the treatment of canine idiopathic chylothorax. This clinical study demonstrated that TDL, PP and CCA resulted in the excellent prognosis of the patients. Therefore, TDL, PP and CCA are suggested to be effective for the treatment of idiopathic chylothorax in dogs. Further large-scale studies are warranted to verify whether this combination surgery would improve the success rate for complete resolution of pleural chyle compared with the other surgical techniques and combinations.

SPINAL NEURENTERIC CYST IN A DOG

FERRAND FX[1], PILLARD P[1], ESCRIOU C[2], MARCHAL T[3], SEURIN MJ[4], CAROZZO C*[1,1].[1]Surgery Department, VetAgro Sup, Campus vétérinaire de Lyon, Marcy l'Etoile, France,[2]Small Animal Internal Medicine Department, VetAgro Sup, Campus Vétérinaire de Lyon, Marcy l'Etoile, France,[3]Histopathology Department, VetAgro Sup, Campus Vétérinaire de Lyon, Marcy l'Etoile, France,[4]CIRMA, Marcy l'Etoile, France.

Introduction: To report the diagnostic, treatment and long-term follow-up of an original intra-dural extramedullar thoracic cyst lesion in a dog.

Study Design: Clinical report

Animal: Crossbreed Dog (2-year-old female).

Methods: The dog was admitted for evaluation of a progressive ataxia and paraparesis. Neuroanatomical location was the T3-L3 spinal cord segment. Magnetic resonance imaging revealed an ovoid-shaped, well-circumscribed lesion affecting the spinal cord at the level of T9 vertebra. The lesion was iso-intense on T1-weighted

views and hyper-intense on T2-weighted views with no enhancement after gadolinium contrast compared with the normal spinal cord. No location with respect to the meninges was possible. The dog underwent a left hemilaminectomy and a durotomy at the level of T9.

Results: An ovoid deformation of the meninges with a cystic appearance could be seen at the level of T9. Upon opening the dura mater, an intradural extramedullary soft mass was observed more accurately. The lesion did not adhere to the surrounding nervous tissue. En bloc removal was performed and appeared to be complete. Pathological analysis showed a voluminous cystic lesion lined by a heterogeneous epithelium. Three types of epithelium were present: a pseudostratified columnar epithelium, a stratified squamous epithelium and a transitional epithelium. None of these epitheliums were clearly differentiated. Periodic acid-Schiff stain highlighted mucus in some cells. The age of the dog, anamnesis, MRI study and histological findings supported the hypothesis of an intradural neurenteric cyst as described in human beings. After an early post-operative clinical worsening, a progressive resolution of the neurological signs occurred. Follow-up MRI study performed 111 days after the surgery revealed no recurrence of the lesion and no spinal cord compression. The owners reported no recurrence of clinical signs after 10 months.

Conclusion: We report the description of an unusual intradural extramedullar cyst in a 2-year-old female crossbreed dog. MRI study and histological findings supported the hypothesis of an intradural neurenteric cyst as describe in human beings. Total surgical removal led to a progressive clinical improvement with no recurrence at 10 months. Neurenteric cyst should be included in the differential diagnosis of "tumor like" or cystic intradural lesions in the young dog.

FUNCTIONAL ANATOMY OF ANTEROMEDIAL AND POSTEROLATERAL BANDS OF THE CRANIAL CRUCIATE LIGAMENT IN DOGS

Tanegashima K, Akita Y, Yasukawa S, Nakano R, Teshima K, Asano K, Edamura K. Nihon University, Fujisawa, Japan.

Introduction: The Cranial Cruciate Ligament (CrCL) in dogs mainly consists of two bands: the craniomedial band (CrMB) and caudolateral band (CaLB). To the best of our knowledge, studies on the morphology and functions of these bands in dogs are limited. Therefore, we investigated the functional anatomy of CrMB and CaLB in dogs.

Materials and Methods: Hind-limbs (n = 12) were obtained from cadaver Beagle dogs. After the removal of soft tissue, the morphology of the CrCL attachment site, the presence or absence of adjacent CrCL-folding with stifle joint movement, and the presence of the resident's ridge were evaluated from the femoral aspect. In addition, the areas of CrMB and CaLB attachment to the femur and tibia were quantified using the quadrant method. Each attachment area was measured using an image-processing program (ImageJ: NIH). CrMB and CaLB were divided into 4 small fibre bundles to evaluate their orientations. Additional bands, when detected, were also recorded. Finally, the tension strength of CrCL, CrMB, and CaLB during stifle joint movement was measured by selecting 4 small fibre bundles from each entity and by using a digital force gauge (ZTS-20N:Imada CO.,Ltd.,Japan).

Results: CrCL attachment to the femur of the dogs showed a V-shaped morphology. Unlike humans, dogs do not show apparent CrCL-folding adjacent to the attachment site during stifle joint movement. No resident's ridges were observed in any of canine femurs. The attachment sites of CrMB and CaLB in dogs were more caudal than those in humans on both the femoral and tibial sides. The area of CrMB and CaLB attachment on the femur, was 18.5% and 16.9%, respectively, and on the tibia, was 8.5% and 7.5%, respectively. Small fibre bundles belonging to CrMB or CaLB overlapped with each other during stifle joint movement. Bands other than CrMB and CaLB were identified caudal to CaLB in 8 of the 12 limbs. The tension strength of CrCL and CrMB remained tense with stifle flexion. The small fibre bundles at the centre of CrMB contributed to the preservation of this tension. Conversely, CaLB tension progressively decreased with stifle flexion. The lateral and caudal small fibre bundles provided tension in CaLB, although all small bundles lost their tension with increasing flexion.

Discussion: The anatomy of the CrCL attachment region in dogs clearly differed from that in humans. In this study, we also objectively confirmed that the CrCL in dogs was exclusively associated with tension in CrMB during flexion, in contrast to the involvement of both bands during extension. Furthermore, this investigation has provided new information on the differences between CrMB and CaLB tension strength and changes in the tension strength of the divided small fibre bundles during joint movement.

COMPLEX SURGICAL REPAIR OF A TRAUMATIC PREMAXILLARY DEGLOVING INJURY IN A DOG

Aertsens AG, Poncet CM*. CHV Fregis, Arcueil, France.

Objective: There are few reports in the veterinary literature of severe facial trauma. The purpose of this clinical report is to describe complex reconstruction of the rostral aspect of the muzzle of a dog after an extensive traumatic amputation.

Clinical report: A 12 year-old intact male Yorkshire terrier was admitted for surgical management of traumatic amputation of the rostral aspect of the muzzle. The nasal planum and the upper lips and skin were missing to the level of the frontal and zygomatic bones.

After the first step of wound management, staged surgeries were performed. Initially surgical debridement, dental care, and placement of an esophagostomy feeding tube was performed. Two weeks after the trauma, the area was healed as much as it could be, and the reconstructive surgery was performed. The whole planum was reconstructed using a hard palate mucoperiosteal flap with rubber tubes for the nasal passages. Three flaps were used to reconstruct the skin in the area: a superficial temporal artery axial pattern flap was performed on the dorsal aspect and on each side, a labial advancement flap and an angularis oris axial pattern flap were used. Crusts and minimal necrosis of the rostral part of the superficial temporal artery flap appeared quickly post-surgery, followed by wound dehiscence. This resulted in sub-cutaneous emphysema, which persisted for a week. Necrosis and dehiscence were surgically managed and healed by secondary intention. The nasal aperture fused into one single nasal opening. Six months after the surgery, the dog has recovered his normal life.

Discussion/Conclusion: The mucoperiosteum of the hard palate combined with the use of nasal tubes and several cutaneous flaps can be use to reconstruct the entire nasal planum, resulting in an acceptable cosmetic and excellent functional outcome.

THORACODORSAL AXIAL PATTERN FLAP: RE-EVALUATION OF THORACODORSAL ARTERY ORIGIN AND ARBORISATION IN THE DOG

Liehmann LM*, Schierach C, Dupré G*. Clinic for Small Animals: Small Animal Surgery, Vetmeduni Vienna, Vienna, Austria.

To elevate the thoracodorsal axial pattern flap in the dog, the surgeon has to locate the vessel origin in the caudal shoulder depression. Depending on individual body conformation, identification of this landmark can be difficult. While the flap healed successfully in experimental studies when it was not rotated from its bed, a clinical study showed flap survival of only 2–53% in 70% of the patients. We therefore wanted to specify precise landmarks to help identification of the vessel origin as well as to re-evaluate artery arborisation. Fifteen canine cadavers with intact forelimbs were included in the study. Selective angiography of the thoracodorsal artery was performed with green Chinese ink after dissection of the brachial plexus. Classical flap borders and the caudal shoulder depression were marked on the dogs' skin. The dogs were dissected in layers and geometrical landmarks were defined. Line G1 was defined as a vertical line from the caudal scapular angle to the olecranon within the 2nd intercostal space. Line G2 was a horizontal line at the dorsal border of the olecranon intersecting G1 at a 90° angle. The crossing point was M1, the point of the thoracodorsal artery origin. The branching of a consistent dorsal arterial branch was marked as M2, located 0.5–1 cm craniodorsal to M1. To confirm the pertinence of the locations, M1 and M2 were injected percutaneously with 0.5 ml of black and red Chinese ink, respectively. Again, dogs were dissected in layers. Ramification patterns were similar in all dogs and clearly recognisable except in dogs 4 and 9, where, in one leg, no colouration was visible. In all other cases, the thoracodorsal artery surfaced at the cranial border of the latissimus dorsi muscle, caudal to the anconeal line and continued superficially on the cutaneous trunci muscle. We consistently found the dorsal branch of the artery located at the cranial border of the cutaneous trunci muscle arborizing further dorsal into the muscle and overlying skin. After drawing of the two lines G1 and G2, we were able to define a precise point M1 (at the point of line intersection) that represents the thoracodorsal artery origin, and a point M2 identifying the dorsal branch of the artery. These landmarks help the surgeon plan the approach for the thoracodorsal axial pattern flap. Both points lie within the caudal shoulder depression, so modification of the flap borders described in the current literature does not seem necessary. However, flap viability probably depends on the function of both thoracodorsal branches. It is therefore possible that published rotational angles need to be reduced in order not to compromise the blood flow of either of the vessels. Further clinical studies are warranted to identify the clinical impact of this finding.

SURGICAL STABILIZATION OF BILATERAL SLIPPED CAPITAL FEMORAL EPIPHYSIS IN A MAIN COON

Rochereau PH, Haudiquet PH*. VETREF Surgical Department, Angers, France.

Introduction

Femoral capital physeal fractures in cats (type I Salter Harris) are commonly a result of trauma. Cats between 4 and 11 months old are most frequently affected.

Spontaneous feline femoral capital physeal fractures, without any history of trauma, have been described in male, adult, overweight cats. In previous studies, all cats but one, had femoral head and neck resection.

This case report described successful surgical treatment, using K-wires, of bilateral spontaneous femoral capital physeal fractures in an adult Main Coon.

Case report

A 22-month-old, neutered male Main Coon was presented with acute onset weight-bearing lameness of the left hind limb of 4 days duration. No history of

trauma was reported. Ventrodorsal pelvic radiograph showed a left femoral capital physeal fracture. The contralateral femoral capital physis was still open. The femoral capital fracture was successfully stabilized using two K-wires. The cat was released from the clinic with strictly restricted activity during the following 8 weeks. The owners reported uneventful recovery and good limb function at 10 weeks postsurgery.

The cat was presented 10 weeks after the initial fracture, with acute onset weight-bearing lameness of the right hind limb of 2 days duration. No history of trauma was reported and the cat was still under strict restricted activity. On a ventrodorsal pelvic radiograph, a right femoral capital physeal fracture was diagnosed. On a computed tomographic pelvic scan, the left capital femoral physeal fracture appeared fully healed (figure 1); the right femoral capital physeal fracture was confirmed (figure 2). The right femoral capital fracture was successfully stabilized using two K-wires.

Physical and radiographic exam was performed six months after the first surgical stabilization. The cat had good hind limb functional recovery despite intermittent stiffness of the pelvic limbs. On a ventrodorsal pelvic radiograph, radiographic healing was evident for both fractures; moderate bilateral degenerative joint disease was present (figure 3).

Discussion

Despite lack of a histopathological diagnosis, a bilateral slipped capital femoral epiphysis was suspected. Spontaneous femoral capital physeal fractures have been previously reported in heavy, adult, neutered male cats, including 3 Maine Coon cats.

Femoral head and neck ostectomy is the recommended treatment for slipped capital femoral epiphysis in cats. Reduction and stabilization with divergent K-wires of spontaneous femoral capital physeal fractures was previously reported in only one cat. This case report described successful surgical stabilization of bilateral spontaneous femoral capital physeal fractures. Surgical stabilization of slipped capital femoral epiphysis should be considered as a treatment option.

BILATERAL PERINEAL HERNIA REPAIR WITH POLYPROPYLENE MESH (2006-2011) A RETROSPECTIVE STUDY ON THIRTY DOG CASES

Garcia-Fernandez P[1], Mayenco A[1], Quero P[1], Buracco P*[2], Sanchez-Muela M[1]. [1]Dept Med Surgery - HCVC- Vet School - UCM, Madrid, Spain, [2]Dpto Patologia Animale, School Vet Medicine, Torino, Italy.

The aim of this study was to evaluate in dogs with bilateral perineal hernia (PH) a new technique to restore the lateral support of the rectum in the pelvic region. We developed a surgical technique using two polypropylene meshes in dogs with severe bilateral PH, with or without additional diseases of the lower urinary system and/or prostate or rectum. Between 2006 and 2011, 30 dogs with bilateral PH repared with this technique have been included in the study.

Dogs were routinely prepared for a simultaneous abdominal and perineal approach. Two surgeons worked in combination, one in the perineal region and the other through a laparotomy approach. Once the animal was under inhaled anaesthesia, PH was manually reduced by pulling the bladder from the abdominal approach and pushing gently from perineal approach, all organs were positioned in their anatomic place. The surgeon acting in the perineal region, introduced the mesh and anchored it over stable structures, such as ischiatic periosteum, bulbospongious muscle, external sphincter muscle, and tail base muscles. The cranial edge of the mesh was sutured to the abdominal muscles with full-thickness sutures. Preoperative and postoperative prostatic or digestive alterations, surgery time, pain, inflammation and other postsurgical complications, including short and long term faecal incontinence, were recorded. Hernia did not recur (mean follow-up 19.23± months). Complications were seroma (two cases) and transient rectal prolapse (three dogs). Surgical time was 79.7 ± 6.8 minutes. In conclusion, complicated bilateral PH can be repaired in one surgical act with polypropylene mesh.

Findings in this study allow to conclude that this surgical technique may represent an useful surgical solution for bilateral complicated PH. In most of the dogs of this study, the atrophy of the pelvic muscles made technically difficult to restore an efficient lateral support to the rectum. Therefore the use of polypropylene mesh resulted in a consistent restoration of the pelvic diaphragm.

CLINICAL OUTCOME OF DOGS UNDERGOING PARTIAL PANCREATECTOMY. A MULTICENTRE RETROSPECTIVE STUDY OF 36 CASES

Bowlt KL*[1], Barnes DC[2], Carwardine D[3], Friend E*[3], Demetriou JL*[2]. [1]Animal Health Trust, Newmarket, United Kingdom, [2]Dick White Referrals, Newmarket, United Kingdom, [3]University of Bristol, Bristol, United Kingdom.

Introduction: Partial pancreatectomy in dogs is performed for the treatment of pancreatic cysts, neoplasia, trauma, and abscessation. There have been a limited number of cases of partial pancreatectomy published in the veterinary literature.

Material and Methods: Our objective was to describe a case series of 36 dogs undergoing partial pancreatectomy from multiple referral practices in the UK. Case records (1993–2013) from 3 referral hospitals were searched for the terms pancreatectomy or insulinoma. Data recorded included: signalement, clinical signs, blood glucose and insulin, anaesthetic protocol, perioperative medications, results of diagnostic imaging, surgical findings, histopathology and survival time (ST). Kaplan-Meier survival plots were modelled for categorical variables and to determine the median survival time.

Results: Insulinoma was diagnosed in 30 of 35 (86%) cases undergoing partial pancreatectomy. The mortality rate at 7 days was 6/36 (17%). Five out of the 6 (83%) perioperative deaths were attributed to an uncontrollable marked inflammatory response. Median survival time was 292 days with a range from 3–1465 days.

Discussion and Conclusion: Partial pancreatectomy in the dog has a moderate perioperative mortality rate. Most cases undergo surgery for treatment of insulinoma. Long term survival is possible in cases that survive the immediate postoperative period.

PAROTID ABSCESSES IN DOGS: 2 CASES

Jacques D*, Meige F*. Clinique vétérinaire Occitanie, Toulouse, France.

Abscesses of the retropharyngeal region can occurred secondary to migration of a foreign body, bite wound, severe otitis, salivary gland, lymph node or tumor necrosis. The purposes of this study were to describe two cases of retropharyngeal abscesses secondary to abscesses of the parotid gland and sialolithiasis.

MATERIALS AND METHODS

Cases of retropharyngeal abscesses secondary to abscesses of the parotid gland and sialolithiasis treated in 2013 at the Veterinary Occitanie Clinic were reviewed. For each case, the breed, the age, the clinical signs and previous treatment given before admission, others complementary exams, definite treatment and outcome were reported.

RESULTS

The first case was a 7 year old male Cavalier King Charles Spaniel who presented with an history of spontaneous pain and recurrent swelling near the dorsal left retromandibular region. A CT-scan showed a sialolith in the parotid duct with a probably infected parotid mucocele. The second dog was an 11 year old female spaniel who presented with history of recurrent abscess near the dorsal left retromandibular region and pain when eating. A CT-scan showed a sialolith in the parotid salivary gland and numerous hypodense cavities in the parotid salivary gland compatible with abscesses. Parotidectomy was performed for the 2 dogs No complications were noted during the follow-up. The 2 dogs are doing well 5 months and 2 months postoperatively respectively.

DISCUSSION

Abscesses of salivary gland and sialolithiasis in dogs are very unfrequent. Salivary calculi are uncommonly reported, with most cases occurring in the parotid duct. Cavalier King Charles spaniels, spaniels and English bulldogs seem to be at risk for this condition.

Clinical signs usually include swelling of the affected gland with or without pain during eating. Parotid salivary gland affections are part of the differential diagnosis of retropharyngeal abscess or swelling. CT scans provide more information than plain radiographs or ultrasonography regarding the cause of the lesion, the status of the parotid duct and gland, and the exact location of the sialoliths.

Surgical treatment is more effective than medical treatment. Parotidectomy is recommended with chronic clinical signs and severe inflammatory changes of the parotid gland.

CONCLUSION

Parotid abscesses and sialolithiasis are infrequent in dogs but remain a differential diagnosis for recurrent abscesses or swelling of the retropharyngeal region. For diagnosis, CT or MRI are the most reliable tools. Cavalier King Charles Spaniel, spaniels and bulldogs seem to be at risk for this disease. Based on the results of this study, parotidectomy appears to be an effective treatment for dogs with parotid abscess and sialolithiasis.

BONE MINERAL DENSITY (BMD) LOSS AFTER INTRACAPSULAR CRANIAL CRUCIATE LIGAMENT REPLACEMENT: A 12 MONTH STUDY IN SHEEP

Viateau VJ[1], Guérard S[2], Mitton D[3], Bonneau M[4], Migonney V[5], Manassero M[1]. [1]Université Paris Est, Ecole Vétérinaire d'Alfort, Maisons- Alfort, France,[2]Ecole Nationale Supérieure d'Arts et Métiers Esplanade des Arts et Métiers, TALENCE Cedex, France, [3]Université Claude Bernard Lyon, BRON, France,[4]INRA, Jouy-en-Josas, France, [5]Université Paris, Villetaneuse, France.

Introduction. Bone mineral density (BMD) loss occurring in the knee joint after rupture of the ACL is well described in humans. Because intra-articular techniques of ACL replacement rely on graft or artificial ligament fixation through interference screws in bone tunnels drilled in the femoral and the tibial metaphysis, adequate tibial bone mineral density (BMD) is reported to be essential to graft fixation. The aim of this study was to investigate BMD changes in a sheep model of reconstructed CrCL-deficient stifles with analysis of dual energy X-ray absorptiometry (DEXA) and to evaluate the mechanical performance of reconstructed stifles.

Design: Experimental study.

Materials and methods. Nine sheep underwent CrCL excison; subsequent replacement with a 44 strands polyNaSS grafted LARS AC™ artificial ligament was

performed in 7 sheep, while no stabilisation was performed in two sheep. BMD was assessed bilaterally, using DEXA, at the level of the femur, the patella and the tibia in both operated and unoperated limbs at the time of sacrifice, and 12 months post operatively. BMD measured in the hind limbs of 9 healthy unoperated sheep were used as control values. Stifles of operated sheep were explanted and processed for mechanical tests including a kinematic analysis and tension loading tests in which contralateral stifles were used as controls.

Results and discussion. BMD was inferior in the ROIs examined in operated, stabilized stifles compared to the unoperated contralateral stifles, with values of 1.22 ± 0.1 g/cm2 versus 1.08 ± 0.11 g/cm2 ($P = 0.024$); 0.79 ± 0.08 g/cm2 versus 0.89 ± 0.08 g/cm2 ($P = 0.03$) and 1.43 ± 0.02 g/cm2 versus 1.51 ± 0.04 g/cm2 ($P = 0{,}026$), in the femur, patella, and tibia, respectively. BMD ratios between stabilized and unoperated contralateral stifles were lower in operated animals compared to those in normal, unoperated animals with calculated ratios of 87,25 ± 3,6 % versus 96,77 ± 2,48 %. ($P < 0.0001$) in the femur and 94,6 ± 3,49 % versus 98 ± 1 % ($P = 0{,}016$) in the tibia,. Higher BMD loss did not correlate with lower tensile strength but correlated with higher anterior laxity.

Conclusions. Loss of BMD may be an important issue to adress in techniques using artificial ligament fixation in bone tunnels. BMD loss was not correlated with lower tensile strength 12 months post operatively but was associated with increased anterior laxity. Further studies, at earlier time points, are needed to determine the impact of BMD loss on stifle laxity and functional recovery

PYOTHORAX RESULTING FROM A CAUDAL MEDIASTINAL PARAESOPHAGEAL ABSCESS IN A DOG TREATED BY THORACOSCOPY

Haudiquet PH*, Hamelin A, Jossier R, Charbonneau M. VETREF, Clinique Vétérinaire de Référés, Angers, France.

Caudal mediastinal paraesophageal abscess (CMPA) is a rare pathologic entity in dogs and cats whose diagnosis is difficult. Seven patients with CMPA have been reported in one study in the veterinary literature. Two were treated by lateral thoracotomy and five by sternotomy. A one year old entire male Beauce shepherd dog was presented for weight loss, depression, dysorexia, heavy breathing, coughing and sneezing for 3 or 4 days. Chest radiographs showed pleural effusion and thoracocentesis was performed. On analysis many neutrophils without associated bacteria were observed, suggesting pyothorax. Oxygen therapy, antibiotics, and analgesia were started. Two chest drains were placed under thoracoscopy which revealed a an abnormal pleura. Drainage and lavage of the thoracic cavity twice a day, with fluid analysis every 2 days was performed. In the absence of reduced drain production after 5 days of antibiotics, a CT scan was performed. A fluid opacity area was noted along the esophagus to the right, measuring 12.7 cm long and 2.8 cm wide and with associated signs of mediastinitis. Thoracoscopy was performed to explore the thoracic cavity, which showed a more normal pleura and the presence of an abscess. The abcess was punctured and drained and the free wall of the abscess was withdrawn and sent for culture, which yielded two isolates: Pseudomonas aeruginosa and Burkholderia cepacia, sensitive to gentamicin and trimethoprim. Lavage was continued until fluid production decreased and then the drains were removed. The dog was discharged after 26 days of hospitalization, 15 days after the last surgery. On re-examination a month later, the dog was in good health and no signs of effusion or mediastinitis were visible radiographically. A year later, the dog was still healthy. CMPA should be suspected in cases of regurgitation or coughing associated with fever and a mass in the caudal mediastinum or a caudal mediastinal widening. Mediastinal drainage and abscess resection using video-assisted thoracoscopic surgery can be a feasible and effective surgical option. The originality of this case lies in the diagnostic difficulties resulting from the major pleural effusion and in the non-invasive surgical treatment that have not been described previously.

LARGE ANIMAL

Short Communications

Large Animal General Surgery

ULTRASOUND GUIDED TRANS-ARTERIAL COIL EMBOLIZATION OF THE INTERNAL AND EXTERNAL CAROTID ARTERY IN HORSES

Muñoz JM*[1], Bussy CB[2]. [1]Alfonso X Veterinary School, Madrid, Spain, [2]Clinique Vétérinaire du Grand Renaud, Saint Saturnin, France.

Objectives:

To asses ultrasound guided transarterial coil embolization (UGTACE) for occlusion of the internal carotid artery (ICA) and external carotid artery (ECA) in horses.

Study design and animals:

Ex vivo study on ten cadaveric horses, and one horse diagnosed with guttural pouch mycosis (GPM).

Material and methods:

Ex vivo study: UGTACE was performed on the cardiac side of the ICA and ECA. Coil placement on the non-cardiac side of the ICA was performed blindly and controlled by radiography. No coils were placed in the maxillary artery.

Clinical case: One adult horse diagnosed with GPM had UGTACE of the ICA under general anesthesia. Correct placement of coils and vascular occlusion was assessed by ultrasound and radiography.

Results:

Ex vivo study: Accurate ultrasound-guided catheterisation of the ICA and ECA was performed in all specimens. Ultrasound-guided coil placement at the level of the cardiac side of the ICA and ECA was successfully performed in all except one case.

Clinical case: UGTACE of the left ICA was successfully performed without complications.

Conclusions:

Based on our study, UGTACE of the ICA and cardiac side of the ECA is a feasible alternative to fluoroscopy. Our technique should be considered to limit the operators risk related to radiation and because of the accuracy to detect unusual branching at the origin of the ICA and OA.

MODIFIED LARYNGEAL TIE-FORWARD PROCEDURE FOR TREATMENT OF ASYMMETRIC "SMALL" CLEFT PALATES IN THE HORSE

Roecken M, Barske K, Mosel G. Veterinary Clinic Starnberg, Starnberg, Germany.

Introduction: Patients with "small" cleft palates are often presented with clinical symptoms more comparable to those of DDSP than to those of a cleft palate defect.

The purpose of this clinical study was to evaluate a modified laryngeal tie-forward procedure for treatment of "small" asymmetric cleft palates in foals as well as in adults.

Material and Methods:Two foals, two and four months of age and six horses, aged between two and eight years were presented with endoscopically confirmed asymmetric "small" cleft palate defects.

Horses were placed in dorsal recumbency. A 15 cm midline incision was made, extending from the rostral aspect of the basihyoid to the cranial border of the cricoid. After exposure of the ventro-lateral aspect of the larynx, the distance between the caudal border of the basihyoid and the rostral aspect of the cricoid was measured, before and after suture fixation. Fixation of the thyroid cartilage to the basihyoid bone was accomplished with the head held in a flexed position of approx. 90°, using 2 nylon sutures and crimp tube originally designed for cranial cruciate ligament repair in the dog. Radiographic and endoscopic re-evaluation were performed 24 hours and four weeks postoperatively. Long-term follow-up was obtained by telephone.

Results: Length of cleft palate defects varied between 1.5 and 3.5 cm. Intraoperative measurements of the distance between basihyoid and cricoid were 102 to 104 mm before and 58 to 64 mm after suture placement. So rostral advancement of about 4 cm was achieved.

Postoperative lateral radiographs and endoscopic re-evaluation revealed correct positioning and functioning of the epiglottis. Long-term follow-up (8-36 months) showed no recurrence of clinical symptoms in any case.

Conclusion: According to the present results, the modified laryngeal tie-forward procedure might be suitable to compensate functional problems related to "small" cleft palate defects.

INDICATIONS, COMPLICATIONS AND OUTCOME OF 54 HORSES UNDERGOING REPEAT CELIOTOMY WITHIN 14 DAYS AFTER COLIC SURGERY

Dunkel BM[1], Bolt DM*[1], Carnwath J[1], Marr CM[2]. [1]Royal Veterinary College, Hatfield, United Kingdom, [2]Rossdales Equine Hospital, Newmarket, United Kingdom.

Introduction: Exploratory celiotomy for colic has been extensively investigated. However, little information is available about horses requiring a second abdominal exploration shortly after the first procedure. This study aimed to describe indications, findings, complications and prognosis for horses undergoing a second abdominal surgery within 14 days.

Material and methods: Records (Jan 2005–Nov 2013) of two large equine referral hospitals were reviewed to identify horses that had undergone two exploratory celiotomies within 14 days, either due to complications arising from the first surgery or due to newly developed problems. Signalment, history, clinical, laboratory and surgical parameters were compared between surviving and non-surviving horses by chi square or Mann–Whitney U test.

Results: Fifty-four horses met the inclusion criteria for the study; detailed records were available for 44 animals. Strangulating small intestinal lesions were the most common finding during the first surgery (32/54; 59.3%) and small intestinal ileus was the most common reason for a second surgery (29/54; 53.7%), followed by recurrent or persisting colic with/without ileus (25/54; 46.3%) and incisional complications (6/54; 11.1%). The median time between surgeries was 3 days (range 0.5–13 days). Forty four horses (81.5%) were recovered from the second surgery, but 20 animals were

euthanased in the immediate postoperative period due to ileus and/or colic (n = 13), subacute grass sickness (n = 2), peritonitis (n = 2), incision dehiscence (n = 1) and toxaemia and neurological signs (n = 1). Twenty four (45%) survived to discharge; the outcome of one horse was unknown. Follow up was available for 11 horses, 5 survived for <100 days after discharge, one had a third laparotomy due to colic 5 months after the first, 2 survived 5.4 and 5.3 years and one horse was alive at the time of writing. Most admission parameters (heart and respiratory rates, rectal temperature, packed cell volume, lactate concentrations, nasogastric reflux) were not different between survivors to discharge and non-survivors, with exception of total plasma protein concentration which was significantly higher ($P = 0.009$) in survivors to discharge (median 71.5 g/l, range 59–82 g/L versus median 62 g/L, range 17–78 g/L). Survival to discharge was not influenced by the type of the primary lesion (small versus large intestine, strangulating versus non-strangulating) or the reason for repeat celiotomy. Incisional infection developed in 12 (50%) of horses surviving to discharge progressing in 4 to hernia formation requiring additional surgery.

Conclusion: The prognosis for horses requiring repeat celiotomy within 14 days of the first is guarded with a high likelihood of incisional complications necessitating further surgical treatment in almost one fifth of survivors.

CANALICULOSINOSTOMY AS SURGICAL TREATMENT OF OBSTRUCTED NASOLACRIMAL DUCT IN 8 HORSES

Brink P*[1], Schumacher J*[2]. [1]Jagersro Equine Clinic, Malmo, Sweden, [2]University of Tennessee, Knoxville, USA.

Objective: To describe a technique (canaliculosinostomy) used to correct permanent obstruction of the nasolacrimal duct and to report the outcome of horses undergoing this procedure.

Study Design: Case series.

Animals: Eight horses of mixed sex, age, weight and athletic use with unilateral or bilaterally obstructed nasolacrimal ducts.

Methods: Seven horses were treated under sedation and local anaesthesia and one horse was anaesthetised. The ventral lacrimal punctum was progressively expanded with catheters of increasing diameter until a 14-ga, Jamshedi needle could be passed into and through the lacrimal sac into the paranasal sinus. A plastic tube was inserted into the shaft of the needle and advanced into the paranasal sinus and the needle was withdrawn over the tubing. Using a hubless needle, the tubing was passed through the mucocutaneous junction of the eyelid leaving a short segment of tubing exposed ventral to the eyelid. A small osteotomy was created over the frontal bone medial to the affected eye, and the tubing was grasped, exteriorized and tunneled beneath the skin adjacent to the osteotomy, using a hubless needle, leaving a short segment of tubing exposed. The ends of the exposed tubing were anchored to the skin with sutures. The tubing was removed at 5-6 weeks.

Results: For each horse, lacrimal secretions were successfully routed into the ipsilateral paranasal sinuses resolving epiphora. The procedure was easily performed with the horse sedated, and the procedure was tolerated well by all horses. Follow-up information obtained for 7 out of 8 horses at 3–11 years after surgery showed that 5 horses had complete resolution of epiphora, and two horses had marked improvement in clinical signs but still had a small amount of epiphora on the affected side.

Conclusions: Obstruction of the nasolacrimal duct can be corrected by canaliculosinostomy to re-route lacrimal secretions into the ipsilateral paranasal sinuses. Canaliculosinostomy can be performed with the horse standing or anesthetized.

Clinical Relevance: Canaliculosinostomy to bypass an obstructed nasolacrimal duct provides a good functional and cosmetic outcome and can be performed with the horse sedated.

THE "GR" TROCAR : AN ALTERNATIVE TO LAPAROSCOPY FOR THE CLOSURE OF THE NEPHROSPLENIC SPACE IN THE STANDING HORSE

Bussy CP, Benredouane K. Equine Veterinary Clinic "Grand Renaud", St Saturnin, France.

Introduction: In horses which suffer from recurrent nephrosplenic entrapment, recurrence can be avoided by laparoscopic closure of the nephrosplenic space. The reported techniques require expensive equipment, laparoscopic experience and trained personnel, and they may be time-consuming. We present the results of three years of investigation of a special trocar instrument which greatly simplifies this procedure.

Material and methods: The instrument used is an ovoid (4 cm by 6 cm) plastic, two-element (cannula and trocar) piece which is 20 cm long. Illumination is provided by a ring of LEDs incorporated into the end of the cannula. Control and batteries are located in the handle. Light or camera extension cables are not required. The system can be sterilized. Food is withheld for 48 hr prior to surgery. Horses are restrained in stocks and are sedated with Detomidine (0.02 mg/kg) and Butorphanol (0.01 mg/kg). Sedation is maintained by an IV infusion of Detomidine. The left flank is clipped, followed by surgical preparation and sterile draping. A block with 20 ml of lidocaine is performed in the left paralumbar fossa, at the site of the trocar insertion. A vertical 6 to 8 cm skin incision is performed, followed by blunt dissection through the muscle layers. Puncture of the peritoneum and peritoneal incision is then completed with scissors, allowing the introduction of the trocar and cannula into the abdomen cavity. The trocar is then removed from the cannula. An anatomical assessment of the area is initially performed, by direct visualization through the cannula, with the LEDs providing a sufficiently bright but cool illumination of the interior of the abdominal cavity. The cannula is then directed between the spleen and left kidney into the nephrosplenic space. Under direct visualization, a simple continuous suture pattern of absorbable poly-filament polyglactine 910 (Polysorb ND, loop No. 2), on a 65 mm half-curve atraumatic needle is placed between the dorsal edge of the spleen and left kidney capsule. Purpose-made long instruments are manipulated and directed though the cannula. The suture pattern is started cranially, ending at the caudal pole of the kidney. The cannula is then removed and the muscle and subcutaneous layers are closed with a simple continuous pattern. The skin incision is closed with staples. Antimicrobials and anti-inflammatory drugs are administered immediately prior to surgery and continued for 5 days.

Results and conclusion: The procedure has been performed on 30 horses, with no major complications. Advantages of this technique and instrumentation include no requirement for intra-abdominal insufflation of the abdomen, the single required portal site, and absence of cable connections cluttering the surgical field. This technique is easily learned, relatively inexpensive, and less risky than the alternative techniques of nephrosplenic space closure.

RISK FACTORS ASSOCIATED WITH SURGICAL SITE INFECTION FOLLOWING EXPLORATORY LAPAROTOMY IN HORSES

Darnaud SJM[1], Southwood LL*[2], Tomassone L[1], Aceto HW[2], Lindborg S[2], Zarucco L[1]. [1]Department of Veterinary Sciences, Scuola di Agraria e Medicina Veterinaria, Uni. degli Studi di Torino, Grugliasco (TO), Italy, [2]Department of Clinical Studies - NBC, Uni. of Pennsylvania School of Veterinary Medicine, Kennett Square, PA, USA.

Introduction: Surgical site infection (SSI) is one of the most common complications after exploratory laparotomy in horses with a reported incidence varying from 2.7% to 37%. Several risk factors have already been identified, but results from different studies are conflicting at times. The goal of this study is to determine the rate of SSI in horses admitted to a veterinary teaching hospital for colic and subsequent ventral midline exploratory celiotomy, and to examine peri-operative (pre-, intra-, and post-operative) risk factors possibly contributing to the development of incisional site infection.

Material and methods: Data collection was performed prospectively (with a check-list) for parameters related to history, clinical conditions at time of hospital admission, preparation for surgery, and surgical procedure. Data concerning the post-operative period were obtained by reviewing the medical records. Information following hospital discharge (long-term outcome) was obtained by telephone questionnaire. Horses were included in the study if they survived at least 12 days after surgery without undergoing a second laparotomy. A univariate analysis was performed to identify which of the 78 parameters collected were associated with significant variations in incisional site infection rate. Parameters that were significantly associated with the incidence of incisional infection ($P < 0.05$ with a 95% confidence level) or were close to significance ($P < 0.25$) were selected for a multiple logistic regression.

Results: One-hundred-and-eighty-five horses met the inclusion criteria and 36 (19.5%) of them developed a SSI. Univariate analysis revealed eight variables that were significantly associated with variations in the rate of SSI: age of the animal, prophylactic antibiotic choice, skin incision length, plasma fibrinogen level, number of repeated white blood cell counts, time between surgery and first febrile episode, length of hospitalization, and incisional hernia formation. In the final multivariate model six parameters were included, and multiple logistic regression indicated that the probability of contracting an incisional infection was 17 times (p 0.0172) greater for animals with an incision length in excess of 24 cm and 7 times (p 0.0135) higher in horses affected by hyperfibrinogenemia.

Conclusion: Surgical site infection rate could be reduced by limiting the skin incision to ≤24 cm while the presence of hyperfibrinogenemia may increase the risk for the development of incisional infection.

Large Animal Orthopedic Surgery

KERF CUT CYLINDERS IMPLANTATION FOR DISTAL TARSAL FUSION IN HORSES

Biedrzycki A[1], Morello S*[1], Grant B*[2], Markel M*[1] [1]University of Wisconsin-Madison, Madison, USA, [2]Equine Wobbler Consultant, Bonsall, Ca, USA.

Introduction: Osteoarthritis (OA) of the distal tarsal joints is a crippling condition that affects a significant proportion of the equine population. Kerf-cut cylinders (KCC's) have been utilized in equine cervical stabilization surgery and in other orthopedic sites requiring joint fusion.

Objectives: The objectives of this study were to evaluate the biomechanical stability of equine tarsal joints and the impact of surgical drilling, KCC implantation

in mediolateral and dorsoplantar directions and locking compression T-plate (LCP) application on this stability. Furthermore, we aimed to develop and evaluate the surgical technique when these implants are placed in 4 experimental horses.

Material and methods: Pairs of tarsi harvested from euthanatized horses were assigned to 4 treatment groups, with the contralateral tarsus as a control. The stability of each construct was evaluated in dorsoplantar, mediolateral, lateromedial, rotational directions and non-destructive axial compression. A repeated measures analysis of variance was used to determine whether there were significant differences between treatment groups, with significance set at $P < 0.05$. For the experimental evaluation, 4 horses were recruited. A single kerf cut cylinder was inserted into a randomly allocated hind leg. An autogenous bone graft from the tuber coxae was obtainied and placed in the implant. Horses were monitored radiographically for a period up to 4 months post surgery and subsequently euthanatized for histological evaluation.

Results: For craniocaudal compression, the dorsal KCC application and the LCP significantly increased the stiffness of tarsi compared with controls (between 110–125% stiffness of control.) Surgical drilling significantly weakened the tarsi (92% stiffness of controls). In terms of rotational stiffness, LCP's and dorsal KCC's significantly improved the rotational stiffness (109% and 119% greater than controls respectively; dorsal KCC's were superior to LCP's in this regard.) Surgical drilling significantly weakened the construct compared with the control (91%). Surgical procedures were completed, 3 out of 4 without incident. One horse was noted to have minor implant instability at the time of surgery and subsequently euthanatized for evaluation. Of the three successful surgeries, no horse exhibited any significant degree of lameness. Histologically all horses demonstrated successful bridging of the tarsometatarsal and centrodistal joints.

Discussion: The implantation of KCC's increases the biomechanical stability and can be placed via a minimally invasive approach. Surgically, the devices are straightforward to implant and result in minimal post operative complications. Horses were able to return to paddock turnout within one month.

OSTEOCLAST COUNTS IN SUBCHONDRAL BONE CORRELATE WITH OVERLYING CARTILAGE DEGRADATION IN EQUINE CARPAL JOINT OSTEOARTHRITIS

Bertuglia A[1], Girard C[2], Lacourt M[3], Richard H[3], Beauchamp G[2], Laverty S*[3]. [1]Department Veterinary Science/University of Turin, Turin, Italy, [2]Département de Pathologie et Microbiologie Vétérinaires/Université de Montréal, Saint-Hyacinthe, Canada, [3]Comparative Orthopaedic Research Laboratory/Département de Sciences Cliniques/Université de Montréal, Saint-Hyacinthe, Canada.

Introduction: Equine osteoarthritis (OA) is a degenerative joint disease characterized by loss of articular cartilage and subchondral bone (ScB) remodelling. Cartilage and ScB cells respond to local biological signals in the matrix and cross-talk may occur between these adjacent tissues. Osteoclasts (OCs) contribute to ScB loss and may also have a role in overlying cartilage degradation. We hypothesize that there is a biological inter-play between the ScB and cartilage in naturally occurring equine OA mediated by OCs. Our objectives were to quantify OCs in the ScB and relate these counts to overlying cartilage histological changes.

Material and methods: Third carpal bone (C3) osteochondral cores were harvested from racehorses (n = 15) with varying degrees of OA. Cores were decalcified, embedded in paraffin and sectioned. Sections were stained with HPS and SOFG and immunostained with a cathepsin K antibody (cat-K). Complete 2D-images of the osteochondral sections were captured with a digital slide scanner. Bone histomorphometric analysis was performed in a minimum of 100 mm^2 of representative ScB for each animal. Total bone area in section (TA: L x W), Bone area (BA: mineralized area) and Bone Perimeter (BPm: length of trabecular bone surface) were measured. OC counts were performed by 2 independent readers on the HPS and Cat-K stained sections and normalized to TA, BA and BPm. Each osteochondral section was then divided digitally into regions of interest (ROI: 1 × 3 mm). An ROI OC count was performed and the ratio between BA/TA (%) was determined. A modified Mankin scoring system was employed to assess cartilage degenerative changes in each section (n = 15) and also for each ROI (n = 120) co-localized to underlying ScB ROIs. Microcrack number (per mm) and tidemark destruction were also evaluated.

Results: Bland-Altman plots revealed strong inter-observer agreement for OC count and cartilage scores. OC counts on both HPS and Cat-K stained sections were also highly correlated, indicating reliability of assessment. OC counts ranged from 0 to 8.75 cells/mm^2 and cartilage scores from 0 to 23 in the ROIs (n = 120). The OC counts in ROIs were positively correlated to the cartilage degeneration scores ($P < 0.001$), microcrack number/mm ($P < 0.001$) and tidemark destruction ($P < 0.001$). An increased OC density was negatively correlated with the BA/TA ($P = 0.002$).

Discussion: Taken together these results suggest that OCs are recruited in the ScB during progression of naturally occurring OA and may participate in degradation of deep regions of articular cartilage. OCs are major players in bone destruction in OA and may also contribute to cartilage degeneration in OA.

REPRODUCIBILITY AND FEASIBILITY OF ACOUSTOELASTOGRAPHY IN THE NORMAL EQUINE SUPERFICIAL DIGITAL FLEXOR TENDON

Brounts SH*[1], Ellison ME[2], Duenwald-Kuehl S[3], Forrest L[1], Vanderby Jr R[3]. [1]Department of Surgical Sciences, University of Wisconsin, Madison, USA, [2]Department of Clinical Sciences, Louisiana State University, Baton Rouge, USA, [3]Department of Orthopedics and Rehabilitation, University of Wisconsin, Madison, USA.

Introduction: Superficial digital flexor tendon (SDFT) injury is common in athletic horses. Recovery requires balancing rest and controlled exercise, resulting in high risk of re-injury. It is difficult to determine the level of work the damaged tissue can sustain based on serial ultrasound examination alone. Acoustoelastography (AEG), is a new ultrasound-based model to evaluate tendon function. AEG deduces stiffness gradient, the rate of change of normalized stiffness as a function of strain, by analyzing the changes in echo intensity observed in cine loops captured from gradually deforming tendon. The goal of this project was to establish a reproducible method for applying AEG in the normal equine SDFT.

Material and methods: Fifteen horses with no history of lameness and normal lameness exams were recruited for this study with owner consent. Stiffness gradient index (SGI) and dispersion values (DV) for the palmar SDFT of clinically normal horses were evaluated with ultrasound examination at three sites (5, 10, and 15 cm DACB) by two observers. B-mode ultrasound cine loops in longitudinal orientation were also obtained at each of these tendon sections. Lifting of the contralateral forelimb during image acquisition resulted in the required SDFT deformation for AEG. Randomized files of each cine loop were loaded into post-processing software that automatically tracks a specified region of interest (ROI) and AEG application was performed. Interobserver repeatability, intraobserver repeatability, and right-to-left limb symmetry were evaluated.

Results: SGIs and DVs for the SDFT at different locations, as well as effects of age or gender, showed no statistical difference ($P > 0.05$). Interclass correlations evaluating repeatability within the same observer, between observers, and symmetry between right and left limbs demonstrated excellent agreement.

Conclusion: This study shows that AEG is a feasible and repeatable technique for measuring stiffness gradients in normal equine SDFTs. The SGIs and DVs measured with the AEG in clinically normal equine SDFTs in-vivo are consistent with expected mechanical properties for normal tendon, which is a firm (low SGI), homogenous (low DV) tissue. This study will provide the basis for developing a simple, non-invasive evaluation of tendon function that could vastly improve the ability to detect, monitor, and treat tendon injuries. Additional research is needed to determine the ability of the AEG to detect tendon injury and monitor tendon healing.

A CONTROLLED CLINICAL TRIAL ON THE EFFICACY OF AN INTRA-ARTICULAR POLYACRYLAMIDE HYDROGEL IN HORSES WITH OSTEOARTHRITIS

Tnibar A*[1], Schougaard H[2], Koene M[3], Christensen LH[4], Markussen B[5]. [1]Department of Large Animal Sciences, Faculty of Health and Medical Sciences, University of Copenhagen, Taastrup, Denmark, [2]Nørlund Hestehospital, Them, Denmark, [3]Tierärztlische Klinik für Pferde, Lüsche, Germany, [4]Department of Pathology, Rigshospitalet, University of Copenhagen, Copenhagen, Denmark, [5]Department of Mathematical Sciences, Laboratory of applied Statistics, University of Copenhagen, Copenhagen, Denmark.

Introduction: Polyacrylamide hydrogel (PAAG) was trialed recently to treat osteoarthritis (OA) in horses with encouraging results; however no comparative field-study was done to explore its clinical efficacy. We hypothesized that lameness related to fetlock (metacarpo/metatarso-phalangeal) joint OA would improve significantly after treatment with PAAG, when compared with a standard Triamcinolone acetonide-Hyaluronic acid (TA-HA) treatment.

Materials & Methods: A controlled clinical trial was conducted involving horses with symptomatic OA in one of the fetlock joints. The diagnosis of OA was based on clinical evaluation, intra-articular anesthesia and imaging (radiography, MRI). Horses were assigned to a treatment group (PAAG) or control group (TA-HA), including follow-up clinical evaluations at 1, 3, and 6 months. Variables associated with the outcome measured "lameness scoring" were analyzed using a generalized linear mixed model for ordinal regression.

Results: Of the 40 horses meeting the inclusion criteria, 20 were assigned to the treatment group, and 20 to the control group. At 1, 3 and 6 months, estimated proportions of sound horses were 55%, 65% and 75%, respectively in the treatment group, and 15%, 40% and 35%, respectively in the control group. No adverse-effects of PAAG were detected. Estimated odds ratio for a lower lameness score between groups was 92 ($P = 0.001$) and strongly indicates that the treatment of OA using PAAG is significantly better than the control treatment (TA-HA).

Discussion/Conclusions: Horses with fetlock joint OA treated with intraarticular PAAG demonstrated a significant reduction in lameness when compared with horses treated with TA-HA ($P = 0.001$). No adverse reactions following joint injection was observed in the treatment group, which is consistent with previous studies using PAAG intraarticularly to treat OA. PAAG is a promising new treatment for OA in horses.

LOW-FIELD MAGNETIC RESONANCE IMAGING OF EQUINE STIFLE DISORDERS - 70 CASES (2011–2013)

Waselau M*, Bracher B, Kasparek A, Lutz H. Equine Hospital Aschheim, Aschheim, Germany.

Introduction: Magnetic resonance imaging (MRI) of equine stifle disorders is challenging due to patient size. We describe a routine technique for low-field stifle MRI under general anaesthesia, report main findings and compare results to traditional imaging modalities. We hypothesized that MRI-scans of the stifle can be safely and routinely performed, can portray bone and soft tissue diseases thoroughly and facilitate pre-op planning for arthroscopy.

Material and methods: Medical records of 70 stifles positive after intraarticular anesthesia and without abnormalities on conventional diagnostics were reviewed for breed, age, gender, MRI-anesthesia time and -findings. In dorsal recumbency, limbs were extented in a rotating MRI-Scanner. Different sequences in several planes were obtained in an average anaesthesia time of 65min. Retrospectively, radiographic/ultrasonographic and/or arthroscopic findings were compared to MRI-results. Arthroscopy was performed if lesions were surgically accessible based on MRI-results.

Results: In all horses, MRI-scans were successfully accomplished and stifles were completely imaged. Typical MRI-lesions included synovitis, fibrinous adhesions, bone edema/cysts, cartilage defects, cruciate/collateral/meniscotibial desmitis and meniscal tearing. Retrospective analyses confirmed, that initial radiographic, ultrasonographic or arthroscopic images failed to identify lesions with very few exceptions. After MRI-scanning, 23 stifles underwent arthroscopy and accessible lesions were treated, if possible. The extent of low-grade cartilage fibrillations and synovial adhesions was more clearly deliniated in surgery. MRI-findings were particularly useful to estimate expansion of cruciate desmopathies, meniscal damage and/or subchondral bone cysts.

Conclusion: Our protocol allows for routine equine stifle MRI-scans, independent on breed, age and gender. Based on our preliminary results, low-field MRI of stifles is save, can delineate abnormal structures thoroughly and appears superior to identify lesions compared to traditional imaging techniques. A combination of low-field MRI-scanning with subsequent arthroscopy may be a promising approach for a better understanding of equine stifle pathology, treatment and prognosis.

THE RACING PERFORMANCE OF SWEDISH STANDARDBRED TROTTING HORSES WITH PROXIMAL PALMAR/PLANTAR FIRST PHALANGEAL (BIRKELAND) FRAGMENTS COMPARED TO DISEASE FREE CONTROLS

Carmalt JL[1], Borg H[1], Näslund H[1], Waldner C[2]. [1]Hallands Djursjukhus, Slöinge, Sweden, [2]Western College of Veterinary Medicine, University of Saskatchewan, Saskatoon, Canada.

Goal:A study was undertaken to determine whether horses having a proximal palmar/plantar first phalangeal osteochondral fragment (POF) had comparable racing careers as disease-free horses.

Material and methods: 174 Swedish Standardbred trotters with osteochondral fragmentation in the palmar/planter fetlock joint and 617 radiographically negative control horses racing a total of 16,448 races were used. Medical records and radiographs pertaining to each horse were examined. Racing data were retrieved from online Swedish Standardbred harness racing records. Multivariant analysis was performed using generalized estimating equations controlling for horse to determine the effect of having a POF on race speed, money earned, career longevity and personal best-speed compared to radiographically negative control horses.

Results: Horses gained speed as a function of race number. Horses racing prior to surgery with POFs fractures were not slower than control horses. The time (days) from the last pre-visit race to the first post-visit race was not significantly different between POF and control horses. Horses did not slow prior to, nor speed up after hospital visit. Career earnings, race starts and record speed were not significantly different between groups.

Conclusion: Overall results suggest that the purported benefit of surgical intervention should be questioned.

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COMPARISON OF THE REPAIR OF FORE- AND HINDLIMB SURGICALLY INDUCED CORE LESIONS OF THE EQUINE SUPERFICIAL DIGITAL FLEXOR TENDON

Estrada RJ[1], Van Weeren PR*[2], Van Delest CHA[2], Boere J[2], Reyes M[3], Ionita JC[4], Estrada M[5], Lischer CJ*[1]. [1]Equine Clinic, Free University of Berlin, Berlin, Germany, [2]Department of Equine Science, Utrecht University, Utrecht, Netherlands, [3]Department of Orthopaedics, Erasmus MC, University Medical Center, Rotterdam, Netherlands, [4]Large Animal Clinic for Surgery, University of Leipzig, Leipzig, Germany, [5]Large Animal Hospital, National University, Heredia, Costa Rica.

Introduction: Several experimental models of equine SDFT tendinopathy have been developed, aiming at gaining a better understanding of the tendon healing process. These models have traditionally been used in forelimb SDFTs since natural lesions more often affect them and because both forelimbs are submitted to similar biomechanical loads. Recently, a quadrilateral equine SDFT lesion model was reported in which lesions were induced in the SDFTs of both fore- and hindlimbs and then randomly treated using different therapeutic modalities. This important difference in study design compared to the earlier mentioned tendon lesion models calls for further investigation to determine if healing of SDFT lesions in fore- and hindlimb is comparable. Therefore, the aim of this study was to compare objectively the healing process of standardised, surgically induced superficial digital flexor tendon (SDFT) core lesions of fore- and hindlimbs in horses.

Materials and Methods: This study was part of a larger research project in which the effect of an autologous platelet concentrate was assessed. For the comparison of the tendon healing between fore- and hindlimb, this study used data from the placebo-treated tendons only. Tendon core lesions were surgically induced in the SDFT of both fore- and hindlimbs in eight healthy horses. At days 7 and 15 after induction of the lesions one randomly assigned fore- and hindlimb was treated with placebo or platelet concentrates. The healing process of the tendon lesions was monitored clinically and ultrasonographically using plain and color doppler ultrasound (CDU). After a period of 24 weeks, the tendons were harvested and biochemical, biomechanical and histological parameters were evaluated.

Results: Two weeks after lesion induction the forelimb SDFTs presented a significantly increased total lesion percentage (TL-%) ($P = 0.05$) when compared to the hindlimbs. Twenty-four weeks post-surgery, forelimb SDFT lesions presented a trend towards decreased echogenicity ($P = 0.06$) and had a significantly higher CDU vascularization score ($P = 0.02$) and Glycosaminoglycan (GAGs) concentration ($P = 0.04$) and a significantly lower Hydroxylysylpyridinoline (HP) content ($P = 0.03$) when compared to the hindlimbs.

Discussion/Conclusions: Our results indicate that fore- and hindlimb SDFTs present significant differences regarding to lesion propagation, vascularization and healing, therefore their combined use in multi-limb tendon lesion models should be avoided. Understanding that fore- and hindlimb SDFTs respond differently to injury will help to optimize the study design of equine tendinopathy models in the future.

EVALUATION OF TWO PRE-SURGICAL IODINE-BASED DISINFECTION PROTOCOLS OF THE EQUINE PERIPODAL REGION

Johnson J[1], Messier S[2], Meulyzer M*[3], Vinardell T[4], Marcoux M[2], David F*[1]. [1]Large Animal Surgery, Veterinary Clinical Studies, School of Veterinary Medicine, University College Dublin, Dublin, Ireland, [2]Faculté de Médecine Vétérinaire, Université de Montréal, Montreal, Canada, [3]Paardenkliniek de Morette, Asse, Belgium, [4]Animal and Crop Science, School of Agriculture and Food Science, University College Dublin, Dublin, Ireland.

Objective: To evaluate short and long disinfection protocols based on iodine tincture (IT) or povidone iodine (PI) solutions on the equine peripodal region.

Study design: *In vivo* experimental study.

Animals or sample population: 10 horses.

Methods: Five unshod horses had their front feet cleaned and trimmed to remove superficial horn. IT was applied to the left foot, PI to the right. A fixed surface of the sole, frog, hoof wall and peripodal skin was swabbed (T0). Following a common pre-disinfection step (T1), a short disinfection consisting of application of 0.5% IT or PI solution (T2) and a long disinfection consisting of 12 h-soaking in 0.25% IT or PI solution (T3), the sites were swabbed again. Quantitative bacteriology was performed on each swab. Results were analyzed with regression linear models with significance set at $P < 0.05$. The feet, including the hoof and peripodal skin, were then evaluated daily for three days. Subsequently they were examined once weekly for four weeks.

Results: The frog and sole were initially the most contaminated sites compared to hoof wall ($P \leq 0.003$) and skin ($P \leq 0.01$). At the end of T2, IT and PI reduced bacterial counts significantly ($P \leq 0.03$), but similarly ($P > 0.59$). At the end of T3, bacterial counts were stable with IT whereas they increased with PI ($P = 0.001$) compared to T2. *Staphylococcus* spp. and *Corynebacterium* spp. were the two most frequently isolated organisms. With regard to the effect of the treatment type, the chances that *Staphylococcus* spp. would be present were higher for PI than IT, for all stages and locations combined ($P = 0.04$). For *Corynebacterium* spp. the same observation could be made but the result was not statistically significant ($P = 0.08$). Skin abrasions were detected on almost all feet but were subjectively more severe on IT-treated feet. The experiment was repeated with a further 5 horses. However this time, for ethical reasons, T3 was omitted from the protocol. Similar results were observed, as have been described above.

Discussion: 0.5% IT and PI short disinfection protocols are appropriate pre-surgical techniques that significantly decrease the surface bacterial counts to acceptable pre-surgical levels. 0.5% IT disinfection protocol may be preferred due to its increased elimination of *Staphylococcus* spp. compared to that of the 0.5% PI protocol. In addition, IT may have a superior penetration power compared to PI, resulting in deeper sterilization of horny tissues.

Conclusion: Based on this study, the use of 0.25% IT or PI long disinfection protocols is not recommended as they both appeared to be detrimental for skin health (IT>PI) and, in addition, bacterial re-colonization was noted with PI.

TENDONITIS OF THE DISTAL BRANCHES OF SUPERFICIAL DIGITAL FLEXOR TENDON IN STANDARDBRED RACEHORSES: 15 CASES (2004–2011)

Tricaud C[1], Alexandre A[2], Tessier C[*2], David F[*3], Cousty M[*1]. [1]Clinique Equine de Livet, Cour Samson, St Michel de Livet, France, [2]Oniris, La Chantrerie - Atlanp"le, Nantes, France, [3]Large Animal Surgery, Veterinary Clinical Studies, School of Veterinary Medicine, Uni. College Dublin, Belfiled, Dublin 4, Ireland.

Introduction: Tendonitis of superficial digital flexor tendon (SDFT) usually occurs in the metacarpal/tarsal region. Tendonitis of the distal branches of the SDFT is less commonly observed. The objective of this study was to describe the clinical and ultrasonographic findings and racing outcome of distal tendonitis of the SDFT in Standardbred racehorses. We hypothetised that Standardbred racehorses would carry a similar prognosis to Thoroughbred racehorses.

Material and methods: Cases of distal tendonitis of the SDFT in isolation were reviewed from January 2004 to December 2011. Age, gender, affected limb, lesion location (medial or lateral), abnormality at physical examination at the time of injury, grade of lameness, ultrasonographic findings, rehabilitation schedule, rehabilitation time (time between injury and first start), clinical follow-up, racing outcome (number of starts, number of shows (horses finishing in the price money), number of wins and total earnings) were recorded.

Results: 15 cases were recorded during the period of the study (7 years). There were 6 males, 6 geldings, 3 females. Mean age +/− sd at the time of the injury was 5.9 +/− 1.3 years. The injury was located on the left forelimb in 10 horses (67 %) and on the right forelimb in 5 horses (33 %). The lateral branch was involved in 12 horses (80 %) and the medial branch was involved in 3 horses (20 %). Mean time between injury and first start was 302 +/− 142 days. Thirteen out of 15 horses returned to racing (87 %). A clinical follow-up was available for 9 horses at 24-months post-injury, two of which had developed a re-injury (22%). For all horses, the number of starts, number of shows, number of wins and total earnings were not significantly different before and after injury ($P > 0.05$). Number of starts, number of shows, number of wins and total earnings were not significantly different after the injury for horses with a lateral lesion compared with a medial lesion ($P > 0.05$).

Discussion and conclusion: In our study, 87 % of horses returned to racing, which is within the same range (although better) than what has been reported for Thoroughbred racehorses (71 %). The re-injury rate was 22 % in Standardbred racehorses, which is slightly lower but within the same range than what has been reported in Thoroughbred racehorses (30 %). Our results suggest a better prognosis and a lower recurrence rate compared to what has been typically reported for SDFT injuries within the metacarpal region in racehorses.

In conclusion, tendonitis of distal branches of SDFT in isolation carries a good prognosis in Standardbred racehorses, slightly more favorable than for racing Thoroughbreds. Following a period of rest and restricted exercise, all performance parameters did not significantly differ before and after injury.

AN ANATOMICAL AND HISTOLOGICAL STUDY OF THE PROXIMAL MANICA FLEXORIA IN THE HORSE

Findley JA, Ricci E, Singer ER*. Philip Leverhulme Equine Hospital, University of Liverpool, Neston, United Kingdom.

Introduction: The proximal manica flexoria (MF) is a collar of tendinous tissue originating from the superficial digital flexor tendon (SDFT) and attaching to the proximal digital flexor tendon sheath (DFTS). This study aims to characterize the gross and histological anatomy of the MF. We hypothesize that gross differences exist in MF anatomy between the forelimb (FL) and hindlimb (HL).

Material and methods: Anatomical measurements were made on 20 paired cadaver FL and HLs. Histological sections obtained from the medial and lateral junctions of the MF and SDFT (n = 18) were stained with H&E and Alcian blue-PAS. The MF samples were divided into three anatomical zones (E1-3) from dorsal to palmar/plantar. The number and distribution of tenocyte phenotypes, blood vessels (BV) and nerves were analyzed quantitatively and were compared between regions.

Results: Attachments between the SDFT and MF extend the entire proximal-distal length of the tendinous MF. Proximally, the MF attaches to the DFTS and the dorsal surface of the DDFT via a reflection of loose areolar tissue. The proximal and distal borders of the tendinous portion of the MF are cupola shaped with the arc proximal. The MF is thickest at the proximal margin (~1.5 mm) and tapers gradually to 1mm at the distal border. The length of the centre of the MF in the FL was 35 ± 2.5 mm and in the HL was 28 ± 4.1 mm ($P = 0.001$). The areolar reflection of the MF is shorter in the FL 14 ± 1.8 mm, than the HL 22 ± 2.4 mm ($P = <0.01$). The distal margin of the MF is located at approximately 29 ± 3.9 mm proximal to the base of the proximal sesamoid bones and approximately 10mm proximal to the proximal border of the palmar annular ligament (PAL) in the non-weight-bearing limb. Histologically, the attachments of the MF to the SDFT are composed of dense collagenous tissue orientated longitudinally, with no clear distinction between the borders of the MF and the SDFT. On transverse sections, nerves are located laterally at the SDFT junction. BVs are located proximally on longitudinal section and in zone E2 (middle) at the SDFT junctions on transverse section. Degenerate BVs were prevalent in zone E3 (palmar). A positive relationship was noted between degenerate BV and "chondrocyte-like" tenocytes.

Conclusions: Detailed description of the MF anatomy will inform diagnostic imaging and surgical assessment and provide guidance for resection of the MF during tenoscopy. The relationship between degenerate BV and tenocyte chondroplasia on the palmar surface indicate the biomechanical need for a stiffer tissue at this location. Therefore, the microscopic anatomy provides clues to the biomechanical forces placed on the MF and therefore, the aetiology of MF tears.

COMPUTER TOMOGRAPHIC CONFIGURATION OF INCOMPLETE PROXIMAL FRACTURES OF THE PROXIMAL PHALANX IN HORSES NOT USED FOR RACING

Brünisholz H[1], Hagen R[2], Fuerst AE[*1], Kuemmerle JM[*1]. [1]Equine Hospital, Vetsuisse Faculty, University of Zurich, Zurich, Switzerland, [2]Department of Diagnostic Imaging, Vetsuisse Faculty, University of Zurich, Zurich, Switzerland.

Objective: The aim of this study was to provide specific information on the configuration of incomplete proximal fractures of the proximal phalanx (P1) in horses not used for racing. For this purpose, CT studies of non-racehorses suffering from such fractures were analyzed using a predefined quantitative system.

Material and methods: Medical records of horses diagnosed with an incomplete proximal fracture of P1 based on clinical and radiographic examination and confirmed by computed tomography (CT) at our institution between 2008–2013 were retrieved. Radiographs and CT studies of these patients were re-evaluated using a predefined system.

Results: 24 horses were included in the study. Twenty of these were Warmbloods, mean age was 9.5 years, mean body weight was 574 kg and sex distribution was mixed. Fourteen frontlimbs and 10 hindlimbs were affected. Mean duration of lameness before diagnosis was 8.7 weeks.

On radiographs, a distinct fracture line was visible in only 26% of cases. In an additional 65% of cases, a fracture was suspected based on ill-defined subchondral defects in proximal P1 in the dorsopalmar/-plantar view. In comparison with CT as the gold standard, radiography was inaccurate in determination of fracture length and dorsopalmar/-plantar localization of the fracture.

On CT, 92% of fractures were located in the mid-sagittal plane. Mean proximodistal length of the fracture was 13 mm. Fractures penetrated the dorsal cortex only in 33%, the palmar/plantar cortex only in 8% and both cortices in 17% of cases. At the level that is used for routine insertion of a lag screw for osteosynthesis of proximal incomplete sagittal fractures, i.e. 5mm distal to the sagittal groove of P1, fractures were centered at a mean of 37% of the dorsopalmar/-plantar depth of P1. The maximal dorsopalmar/-plantar extent of fractures spanned a mean of 53% of the dorsopalmar/-plantar depth of P1. Fractures in frontlimbs were located significantly more dorsally than fractures in hindlimbs.

Conclusion: Incomplete proximal fractures of P1 have significant variation in their configurations and CT is required for an exact diagnosis. When performing osteosynthesis of these fractures using lag screws, adaptation of screw localisation to the individual configuration should be beneficial.

FREQUENCY OF DIGITAL FLEXOR TENDON SHEATH AND DISTAL INTERPHALANGEAL JOINT PENETRATION WHEN USING A DIRECT ENDOSCOPIC APPROACH TO THE NAVICULAR BURSA IN HORSES

Kane-Smyth J, Reardon RJM*, Taylor SE*, Cillan Garcia E. Royal (Dick) School of Veterianry Studies, The University of Edinburgh, Edinburgh, United Kingdom.

Objectives: To evaluate the frequency of inadvertent penetration of the digital flexor tendon sheath (DFTS) and/or distal interphalangeal joint (DIPJ) when using a direct endoscopic approach to the navicular bursa of the horse.

Study design: Descriptive study.

Sample population: Forty cadaver limbs, 10 forelimb pairs and 10 hindlimb pairs.

Material and methods: A positive contrast radiographic navicular bursogram was performed to ensure there were no pre-existing communications with the DFTS and/or DIPJ. The limbs were divided amongst the authors such that each author carried out the procedure on 5 forelimbs and 5 hindlimbs, with different authors performing the procedure on contralateral limbs and with an even distribution of left and right limbs. A standardised conventional direct endoscopic approach was made to the lateral aspect of the navicular bursa in each limb. Successful entry into the bursa was confirmed endoscopically. Centesis and distension of the DFTS and DIPJ were performed to determine whether communication with the endoscopic portal (identified as egress from the skin incision) had occurred. Positive contrast radiographic navicular bursograms were repeated to evaluate iatrogenic communications between synovial structures.

Results: There were no pre-existing communications between the navicular bursa and DFTS or DIPJ in any limb. Inadvertent penetration of an adjacent synovial

structure occurred in 50% of the limbs. The DFTS was involved in 42.5%, the DIPJ in 25% and both structures were inadvertently penetrated in 17.5% of the limbs. Wide variation in frequency of penetration was observed between the authors (range 10–90%).

Conclusions: There is significant risk of inadvertent penetration of the DFTS and /or the DIPJ when making a direct endoscopic approach to the navicular bursa. Individual surgeon technique influences the frequency of penetration of adjacent synovial structures. When treating navicular bursa contamination endoscopically via a direct approach, it is advisable to consider the potential for penetration of the DFTS and the DIPJ.

THE EFFECT OF SEDATION ON EVALUATION OF SUBTLE LAMENESS IN HORSES USING BODY-MOUNTED INERTIAL SENSORS

Rettig MJ, Leelamankong P, Rungsri P, Lischer CJ*. Equine Clinic at the Faculty of Veterinary Medicine, Free University of Berlin, Berlin, Germany.

Introduction: Performing diagnostic analgesia can be quite challenging and dangerous in uncooperative horses during a lameness exam. If not responding to physical restraint, short-acting sedation can be used. This may however interfere with the subsequent interpretation of the block. The aim of this study was to objectively evaluate the change in head and pelvic movement before and after injection of Xylazine using body-mounted inertial sensors.

Material and methods: Horses were randomly split into a Xylazine (n = 22) and placebo group (n = 22). They were instrumented with inertial sensors on right front pastern (gyroscope), head and pelvis (accelerometer) to measure vertical movement asymmetry of head and pelvis respectively. Horses were trotted on hard ground in a straight line (base line) before injected with either Xylazine or sterile saline intravenously and reevaluated after 20 (20) and 60 min (60). The degree of sedation was evaluated by measuring head height above ground (HHAG). The maximum (HDmax), minimum (HDmin) head and maximum (Pmax), minimum (Pmin) pelvis height difference in millimeters was measured. The change for each horse between time points was calculated and the value compared between placebo and Xylazine group. For the forelimb the vector sum was calculated, since HD(max) and HD(min) are dependent variables. The data were analyzed and found not to be normally distributed, so for statistical analysis a Friedman's Test was used.

Results: Comparing 0 to 20 in the forelimb between both groups showed no significant difference ($P = 0{,}1237$), but horses got lamer at 0 to 60, when injected with Saline. In the forelimb the variability in the control group was higher. In the hind limb there was no significant difference in Pmax/Pmin between groups at any timepoints ($P = 0{,}2581$). At Pmin the Saline group was significantly more variable than the Xylazine group ($P = 0{,}03$). The head height above ground decreased significantly between 0 and 5 ($P < 0{,}001$) only in the treatment group.

Conclusion: The Vector sum (amplitude of forelimb lameness) became larger for the control group 60 minutes post injection with Saline, meaning the head movement increased slightly. This could be explained by the fact that some horses get lamer if trotted more often. Without sedation the variance in head and pelvic movement was higher. Horses sedated with Xylazine showed less variance in lameness. It might make them calmer so that they are less likely to be distracted at the second and third trial and gives some evidence that sedating horses leads to more consistency in the degree of lameness. The results suggest that sedating horses with Xylazine (0,3mg/kg) does not have an effect on the horses head and pelvic movement and therefore doesn't interfere with the degree of lameness.

THE EFFECT OF ADIPOSE TISSUE-DERIVED MESENCHYMAL STEM CELLS (AT-MSCS) ON NEOVASCULARISATION OF SURGICALLY INDUCED SUPERFICIAL DIGITAL FLEXOR TENDON (SDFT) LESIONS IN HORSES

Conze P[1], Van Schie HTM[2], Van Weeren R*[3], Staszyk C[4], Skutella T[5], Stadler P[1], Geburek F*[1]. [1]Equine Clinic, University of Veterinary Medicine Hannover, Foundation, Hannover, Germany, [2]Monash University, Frankston, Australia, [3]Faculty of Veterinary Medicine, Utrecht University, Utrecht, Netherlands, [4]Faculty of Veterinary Medicine, Institute for Anatomy, Histology and Embryology, Justus-Liebig-University Giessen, Giessen, Germany, [5]Institute for Anatomy and Cell Biology, University of Heidelberg, Heidelberg, Germany.

Introduction: Injury of the SDFT is a common condition in race and performance horses. The hypothesis of this study was that intralesional adipose tissue-derived mesenchymal stem cell (AT-MSC) treatment of surgically induced SDFT lesions increases neovascularisation during tendon healing in contrast to controls and that neovascularisation is detectable with colour Doppler ultrasonography (CDU) and histology.

Material and methods: Nine non-lame adult horses without clinical and ultrasonographic signs of tendinopathy were included. A standardised surgical model was used to create central forelimb SDFT lesions. Either a suspension of 10x10E6 AT-MSCs or control substance was injected intralesionally 14 days after surgery. Colour Doppler ultrasonography of SDFTs was performed at regular intervals. At 24 weeks post-operatively horses were euthanized and SDFTs were harvested for immunohistochemical detection of Factor VIII (von-Willebrand-Factor).

Results: Four week after creation of lesions the CDU signal was significantly more extensive in AT-MSC treated SDFTs compared to controls. At 24 weeks post-surgery a significantly higher number of vessels stained positive for Factor VIII in AT-MSC treated versus control SDFTs.

Discussion: AT-MSCs are known to enhance expression of various angiogenic factors which may have contributed to neo-angiogenesis in the present study. Different studies state the importance of neovascularisation during the acute phase of tendon healing, whereas the area of neovascularisation in chronic tendon lesions is considered to be a potential source of pain. Since SDFT lesions in this study were of acute nature, and neovascularisation during acute tendon healing assures extrinsic healing mechanisms and transportation of nutrients towards and away from the lesion site, we regarded neovascularisation as an indicator of improved tendon healing. Recruiting freeze-frames from loops and using picture processing software helped to objectify the extent of CDU signal in this study. Immunohistochemical staining for Factor VIII was effective to detect vascularisation which has successfully been proven before in various tissues. Our findings indicate that a single intralesional AT-MSC treatment may have a beneficial effect on tendon healing. Theoretically higher AT-MSC numbers or multiple injections during tendon healing might further enhance neovascularisation. Further investigations into the effects of AT-MSCs on neovascularisation of equine SDFT lesions are warranted before AT-MSCs can be advocated as evidence-based treatment for tendon lesions in the horse.

EFFICACY OF ULTRASOUND-GUIDED LOCAL ANALGESIA OF THE MAXILLARY NERVE WITHIN THE PTERYGOPALATINE FOSSA IN THE HORSE

Nottrott K, Schramme MC*, Lepage O*. Université de Lyon, VetAgro Sup, Campus Vétérinaire de Lyon, GREMERES, Marcy L'Etoile, France.

Introduction: Desensitisation of the maxillary nerve in the depth of the pterygopalatine fossa for surgeries of the equine head is an indispensable procedure in equine practice. Nevertheless a variety of complications can be encountered. The purpose of this study was to compare the accuracy of a maxillary nerve block and the incidence of adverse effects between a blind perpendicular insertion technique relying on anatomical landmarks (PI) and an ultrasound-guided perpendicular insertion technique (UGPI).

Material and methods: For the PI, the needle was inserted perpendicular to the skin just ventral to the zygomatic arch at the level of the lateral canthus of the eye and advanced to the sphenopalatine bone. For UGPI, a microconvex 5–8 Mhz probe was placed ventral to the insertion site, perpendicular to the skin with the ultrasound beam aligned orthogonal to the dorsal contour of the forehead. Ten live horses were randomly assigned to injection of 0.15 ml methylene blue dye (MB) by either technique. Peri- and post-interventional complications were observed and recorded. One hour after needle insertion the horses were submitted to euthanasia and subsequent dissection. In a second study on 3 live horses the efficacy of UGPI was evaluated using volumes of 6 ml and 12 ml of mepivacaine hydrochlorid (20 mg/ml).

Results: Mean times to injection were 70 sec (±12,8 sec) for PI and 302,7 sec (±100,3 sec) for UGPI. Dissection revealed that all (n=10; 100%) UGPI injections resulted in successful deposition of MB dye in contact with the nerve, while only 5 out of 10 PI injections (50%) were successful. Complications were 4,75 times less common in the UGPI group than the PI-group. Pathological changes were twice as common in the PI group, than in the UGPI group. In the anesthetic volume study time to onset of desensitization was 9 min 15 sec ± 9 min 11 sec for the 6 ml trial and 7 min 36 sec ± 5 min 25 sec for the 12 ml trial. Mean duration of action was 4 hours 11 min ± 2 hours 26 min for the 6 ml trial and 4 hours and 12 min ± 1 hour 27 min for the 12 ml trial. Complete and partial desensitization were achieved for 2/6 and 2/6 injections with 6 ml and 4/6 and 1/6 injections with 12 ml mépivacaïne hydrochloride respectively. There was no significant difference for time of onset, presence and duration of analgesia between both volumes.

Conclusion: This study confirms that a maxillary nerve block with the needle inserted perpendicular to the skin can be achieved more accurately and with less complications using ultrasound-guidance than using a blind technique.

COMPARATIVE STUDY OF THE APPROACH TO AND EXAMINATION OF THE NAVICULAR BURSA BY NEEDLE-VIEW ENDOSCOPY VIA THE CONVENTIONAL AND THE TRANSTHECAL APPROACH

Mählmann K[1], Bodo G*[2]. [1]Vetsuisse Faculty University of Berne, Institut suisse de médecine équine (ISME), Berne, Switzerland, [2]Faculty of Veterinary Science, Szent István University, Budapest, Hungary.

Introduction: The aim of the present study was to establish a conventional and a transthecal approach for diagnostic 'needle-view' endoscopy of the navicular bursa in equine cadaver limbs and to compare the visualization of structures and the safety of the two approaches.

Material and methods: Forelimbs of 10 horses, euthanased for reasons unrelated to navicular disease, were used. One of each of the forelimbs was randomly chosen for

needle-view bursoscopy (using a semi rigid, 1.2 mm outer diameter, 100 mm working length, 10° optic needle-view endoscope) through a conventional approach. The other limb underwent bursoscopy using a transthecal approach. For the conventional approach, the arthroscopic sleeve with a sharp trocar was advanced blindly whereas for the transthecal approach, the sleeve was inserted under the visual control of a preplaced needle-view endoscope positioned in the digital flexor tendon sheath. Structures within the navicular bursa, and the estimated percentage of the navicular bone (NB) and deep digital flexor tendon (DDFT) that could be visualized through one portal, were recorded. The number of attempts to gain access to the navicular bursa and the total time needed for the insertion and examination were documented. Lesions to the NB and the DDFT detected by gross examination were documented and scored.

Results: There was no statistical difference between the conventional and transthecal approach for the number of attempts needed to access the navicular bursa, for the time needed for insertion and examination and for the estimated percentage of the NB and the DDFT visualised. Using the conventional approach there was a significantly higher visibility of the abaxial ipsilateral margin ($P = 0.0095$) and the proximal ipsilateral margin ($P = 0.0001$) of the NB. The severity scores for iatrogenic damage were overall mild and were lower in the DDFT when using the conventional ($P = 0.0159$) and lower for the NB when using the transthecal approach ($P = 0.0429$).

Discussion: Needle-view bursoscopy via a conventional approach yielded significantly better visualization of the ipsilateral aspect. This may be explained by a more abaxial insertion of the endoscope with this approach. This approach did not impair the evaluation of the remaining aspects of the navicular bursa when compared to the transthecal approach.

Conclusion: Needle view bursoscopy offers a safe technique that has the potential to complement other diagnostic modalities in horses with navicular disease. As this was a preliminary study in cadaver limbs of horses with no history of navicular disease, the method needs evaluation in limbs of diseased animals and in clinical cases.

Large Animal Surgery Posters

PELVIC FLEXURE ENTEROTOMY CLOSURE WITH A TA-90 STAPLING DEVICE: A RETROSPECTIVE CLINICAL STUDY

Rosser JM*[1], Brounts SB*[2], Slone DE*[3], Lynch TM*[3], Clark CK[3], Livesey MA*[2]. [1]Vetmeduni, Vienna, Austria, [2]University of Wisconsin School of Veterinary Medicine, Madison, WI, USA, [3]Peterson and Smith Equine Hospital, Ocala, FL, USA.

Objective: Our objective was to compare survival and complication rates of clinical horses undergoing pelvic flexure enterotomy closure using a TA-90 stapling device with hand-sewn enterotomies.

Material and methods: Medical records of horses undergoing pelvic flexure enterotomy between 2001–2008 were reviewed. History, clinical and surgical findings, surgical techniques, and post-operative complications were included variables. Long term outcome was established by telephone questionnaire.

Results: Of the 84 pelvic flexure enterotomies performed, 70 were stapled and 14 were hand-sewn. Seventy seven horses survived to discharge (91.7%). Six horses with stapled closures (8.6%), and one horse with a hand-sewn closure did not survive to discharge (7.14%). No significant associations were established between survival and closure technique ($P = 0.69$). Follow up was available for 54 horses; 50 survived long term (93.0%). Forty of these horses went on to perform their intended function (80.0%).

Conclusion: TA-90 stapled closure of pelvic flexure enterotomies is a viable technique option with survival and complication rates similar to hand-sewn closure.

COMPARISON OF SURGICAL CLOSURE OF EQUINE PELVIC FLEXURE ENTEROTOMIES WITH A TA-90 STAPLING DEVICE AND HAND-SEWN CLOSURE

Rosser JM*[1], Brounts SB*[2], Livesey MA*[2]. [1]Vetmeduni, Vienna, Austria, [2]University of Wisconsin School of Veterinary Medicine, Madison, WI, USA.

Introduction: Pelvic flexure enterotomies of the large colon are frequently performed in the horse during surgery of gastrointestinal conditions. Closure of pelvic flexure enterotomies using the Thoracoabdominal stapler (TA-90) has been described as technically simple and time saving, with a low incidence of complications. Our objective was to compare the TA-90 stapled enterotomy closure to traditional double layer hand-sewn closure, using time to perform the technique, luminal diameter and bursting pressure in ex vivo specimens.

Material and methods: The pelvic flexure of thirteen horses euthanased for reasons unrelated to gastrointestinal disease were harvested. All pelvic flexures had one 6 cm antimesenteric enterotomy performed. Six enterotomies were closed using the TA-90 stapling device and seven were closed with a conventional double layer hand-sewn technique. The luminal diameter of the bowel at the enterotomy site was assessed via double contrast radiography. Bursting pressure was assessed by continuous manometry during infusion with colored solution while the colon was submerged in warm water.

Results: Time to perform stapled closure was significantly less than for hand-sewn closure ($P < 0.0001$). Post-enterotomy luminal diameters were significantly increased in stapled specimens as compared to hand-sewn ($P = 0.028$). Percent change in luminal diameter between pre and post-enterotomy was significantly less in stapled specimens ($P = 0.034$). There was no significant difference in bursting strength between the two closure techniques ($P = 0.196$).

Discussion: The morbidity associated with equine gastrointestinal surgery is closely associated with length of the procedure. Stapled closure of enterotomy incisions offers significant time savings while improving post-enterotomy luminal diameter without compromising biomechanical strength.

PREVALENCE OF OSTEOCHONDROSIS IN SPANISH PUREBRED HORSES

Boado A, López-Sanromán FJ. Facultad de Veterinaria. Universidad Complutense de Madrid, Madrid, Spain.

Introduction: Developmental orthopaedic diseases are commonly reported in horses, with special attention to osteochondrosis (OC) or dyschondroplasia. There are no previous reports regarding the prevalence of OC, distribution of lesions, and interrelations between lesions in different joints in the Spanish Purebred horses. It is necessary to retrieve these data because breeding programmes are already established trying to reduce the OC incidence in this breed. The aim of the present retrospective study was to assess the prevalence of OC lesions in the Spanish Purebred, as well as the distribution of different types of lesions in the tarsocrural, metacarpophalangeal, metatarsophalangeal and femoropatellar joints.

Material and methods: Data were obtained from the radiographs of 309 Spanish Purebreds included in the National Stud book. The prevalence and interrelation of lesions was calculated.

Results: There were 195 (63.1%) males and 114 (36.9%) mares ranging from one year to 12 years of age. In 158 (51.1%) horses no significant lesions were detected. In 151 (48.8%) horses, osteochondral lesions at predilected sites were diagnosed. It was more common to find the presence of fragments (28.8%) than flattening of the subchondral bone contour (20.1%). The percentage with normal articular margins was 98.7% for the femoropatellar joint, 66.7% for the tarsocrural joint and 75% for the fetlock region. In the fetlock region flattening was more common than the presence of fragments, whereas in the tarsus fragments were more common than flattening of the joint surface. The severity of the disease was higher in the fetlock region in hindlimbs than in forelimbs. Femoropatellar lesions were rare.

Discussion: Dyschondroplasia is a common disease in the Spanish Purebred and this study provides information about the prevalence of osteochondrosis lesions in this breed and confirms some empirically based assumptions such as the high prevalence of flattening or fragmentation of joint surfaces in this breed, the correlation between homologue joints, the higher severity of metatarsophalangeal than metacarpophalangeal joints and the low prevalence of femoropatellar lesions.

ARTERIAL CALCIFICATION OF PERIPHERAL VESSELS IN YEARLING THOROUGHBREDS PRESENTED AT NATIONAL THOROUGHBRED SALES IN NEW ZEALAND

Quinn GC*, Jorgensen AJ. Hamilton Veterinary Service, Hamilton, New Zealand.

Introduction: Calcification of the major arteries has been reported in horses, primarily associated with the aortic or pulmonary trunk or immediate tributaries. Arterial calcification in horses is primarily confined to the tunica media and has similarities to arterial lesions observed in humans. To the authors knowledge there have been no reports of medial arterial calcification of vessels outside of the major cardiopulmonary trunk and its immediate tributaries in horses.

Case series: Twelve young thoroughbreds (6–18 months of age) examined during 2011–2013 were identified as having unusual discrete areas of soft tissue calcification on screening radiographs. The areas were invariably positioned at the level of the carpus (10 horses) or in the pastern (2 horses). The radiographic changes consisted of discrete areas of mineralisation (3–8 mm diameter), often forming a helical type appearance.The extent of the clinical history available on the horses varied from full history from birth to clinical inspection on day of identification; this was dependent on whether lesions were noted during review of repository radiographic studies on behalf of prospective purchasers, or during "screening" of weanling animals on farms routinely attended by the authors. In no instance has there been any clinical abnormality noted or preceding traumatic incident recorded. In 8 horses ultrasound images were obtained and in every case these lesions were determined to be associated with the regional major arterial vasculature. Three horses underwent qualitative assessment of the arterial function by measuring flow velocity and assessment of level of occlusion and development of collateral circulation using colour flow doppler. This showed that the larger the region of radiographic abnormality, the greater the reduction and impairment of arterial flow. Although in a small number of cases, some lesions appeared to be progressive when following selected horses over a 12 month period. At the time of writing no horses have become available for tissue collection and histopathological assessment of the arterial

disorder. Three horses are due to enter training for the 2013/2014 season however no race records have been generated at this time.

Discussion: Further work is required to determine which lesions are likely to progress to cause arterial occlusion and what if any impact this will have on athletic performance. We propose to attempt screening identified individuals for cardiopulmonary vessel calcification, and analyse parentage for potential familial links. Once this information is established, a level of risk could be assigned to lesions regarding the potential impact on performance when these lesions are assessed during repository screening for sale.

IS ACEPROMAZINE A GOOD CHOICE FOR LAMENESS INVESTIGATION IN FRACTIOUS HORSES? AN ACCELEROMETRIC EVALUATION

Lopez-Sanroman FJ[1], Gomez Cisneros D[1], Varela del Arco M[1], Santiago Llorente I[1], Santos González M[2]. [1]Facultad de Veterinaria, Universidad Complutense de Madrid, Madrid, Spain, [2]Unidad de Medicina y Cirugía Experimental, Medical and Surgical Research Unit, Hospital Universitario Puerta de Hierro, Majadahonda, Spain.

Introduction: In equine practice, lameness examination and regional analgesia of the distal limb can be accomplished in most horses using minimal restraint, but in some cases tranquilisation is necessary. Phenothiazines are drugs that produce sedation, indifference to the enviroment and reduce the locomotor activity. The aim of this study was to quantify by accelerometry the effects of sedation, with two different low doses of acepromazine, on movement pattern of adult horses and to assess the use of this drug in equine lameness evaluation.

Material and methods: Seven adult horses were used, and saline solution 0.9% (control) and acepromazine maleate in two different low doses (0.02 mg/kg and 0.01 mg/kg) were administered intravenously (IV). For the accelerometric analysis, a triaxial accelerometer (Equimetrix®) was used. Data were recorded at the walk and trot 10 and 5 minutes before drug administration (−10, −5), every 5 minutes during the first 20 minutes (5, 10, 15, 20) and then every 10 minutes until the end of the experiment (30, 40, 50, 60, 70, 80, 90, 100, 110, 120). In each trial, the studied variables included speed (SP), stride frequency (SF), stride length (SL) regularity (REG), symmetry (SIM), dorsoventral power (DVP), propulsive power (PP), mediolateral power (MLP), total power (TP) and force of acceleration (FA). Finally, the mediolateral, dorsoventral, and propulsive power as a percentage of total power were also calculated (ie, %MLP/TP, %DVP/TP and %PP/TP, respectively). Three sedation parameters were also determined: Ground-lip distance (GLD), forelimbs distance (FLD) and ears distance (ED).

Results: At walk, there was a significant decrease in speed, stride frequency, stride length, dorsoventral power, propulsion power, total power and force of acceleration compared to the control group. At trot, a significant decrease in speed, stride frequency, stride length, force of acceleration and the redistribution of DVP and MLP was observed. For the sedation parameters, only the ground-lip distance was significantly lower in the sedated compared to the control group. For almost all parameters, the effect started 5 minutes after the drug administration, a maximal effect was observed after 30 minutes and it remained until about 90 minutes. When comparing both ACP groups (0.02 mg/kg and 0.01 mg/kg) no significant differences between values were observed.

Discussion: The accelerometry is a useful tool to detect abnormalities in the locomotor pattern in horses sedated with acepromazine. Acepromazine produces less alterations compared with other sedative drugs, not affecting coördination variables (regularity and symmetry) and could be the tranquilizer of choice for evaluating lameness in horses.

ACTIVATION OR NOT OF PLATELET-RICH PLASMA FOR TREATMENT OF EQUINE TENDONITIS?

Rajão MD[1], Oliveira FTO[1], Fonseca FA[1], Dumont CBS[1], Santos-Leonardo A[1], Lima EMM[1], Godoy RF[2]. [1]University of Brasilia, Brasilia, Brazil, [2]University College of London, London, United Kingdom.

Introduction: Growth factors are signaling proteins that regulate cellular metabolism favoring tissue recovery. Platelet-rich plasma (PRP) is a simple, efficient and minimally invasive method of obtaining large quantities of autologous growth factors, and their final product may or not be activated in vitro by chemicals. The aim of this study was to evaluate the difference between activated and inactivated PRP for the treatment of equine superficial digital flexor tendon (SDFT) injury induced by collagenase.

Material and methods: In five healthy horses tendinitis lesions were created in three limbs by injecting 2.5 mg of collagenase (2.5 mg.mL-1) into the SDFT. Fourteen days after induction of tendinitis, the animals were treated: one limb received 2.5 mL of saline 0.9% locally, being considered the control group (CG), the second limb received an injection of 2.5 mL PRP without activation (GTI) and the third member received an injection of 2.5 mL of PRP activated with calcium chloride (GTA). The distribution of the limb used (left forelimb, right forelimb and left hindlimb) and the treatment prescribed (GC, GTI or GTA) was random and blinded for the operator of the injections and the evaluator of the results (US, lameness, and clinical examination). After treatment, animals were submitted to controlled and progressive physical activity for 35 days. Clinical and ultrasound examinations were conducted on day 0 (D0), day 2 (D2), day 7 (D7) and weekly until the end of the experiment (D48). The following parameters were evaluated by ultrasonographic examination: cross-sectional area of the tendon (ATT), cross-sectional area of the lesion (ATL), echogenicity of the lesions and parallelism of collagen fibers.

Results: Clinical examination performed after treatment showed decreased sensitivity and digital pulse that were seen at first in the GTA and in a second stage in the GTI. There was also an increase in local heat in the treated groups compared to controls. A decrease in the ATT and ATL (D28) was observed in both treated groups ($P < 0.05$), compared with controls. Regarding the echogenicity and parallelism of fibers, both treated groups shown better alignment of fibers than the control, and the GTA had slightly better results over the GTI, mainly in the early stages of tendon healing.

Discussion: The use of PRP, activated and not, promotes a better and earlier healing of tendon lesions in horses by improving echogenicity and reorganization of collagen fibers and reducing lesion area. Furthermore, it reduces local sensitivity, providing greater comfort for the animal during the period of recovery from tendonitis.

ARYEPIGLOTTIC FOLD AUGMENTATION: A TREATMENT OPTION FOR A NEWLY DESCRIBED CONDITION OF LATE-ONSET DYSPHAGIA FOLLOWING PROSTHETIC LARYNGOPLASTY AND VENTRICULECTOMY

Vidovic A. Equine Clinic St. Georg at Trier, Trier, Germany.

Introduction: Coughing and dysphagia are known post surgical complications following prosthetic laryngoplasty for laryngeal hemiplegia, in most cases subsiding with time. The author observed cases with a delayed onset of dysphagia which was always associated with abnormalities of the ipsilateral aryepiglottic fold. The aim of the present report is to describe a new condition of late-onset dysphagia in 6 cases following prosthetic laryngoplasty and ventriculectomy and to offer a successful treatment option for those patients.

Case series: All 6 horses had undergone routine prosthetic laryngoplasty and ventriculectomy for left sided laryngeal hemiplegia 9 months to 6 years previously. An intermittent cough was the first symptom, which worsened over time. Food material was endoscopically visible in the pharynx, larynx and trachea and the left aryepiglottic fold appeared atrophied, therefore exposing the palatopharyngeal arch and piriform recess. Horses were treated under standing sedation. The head was extended forward and the endoscope was placed transnasaly to visualize the larynx. An 18 G spinal needle was introduced ventrally through the cricothyroid ligament. After local analgesia using lidocain, the needle was placed submucosally just ventral to the arytenoid cartilage and augmenting material was injected as a single depot. Various products were used for injection over time. Sodium hyaluronic acid (HA) was used at first, but symptoms of dysphagia reoccurred in all patients 4 to 6 weeks later. For the second injection either cross-linked HA, platelet rich plasma (PRP), or polyacrylamid-hydrogel was used.

The injection resulted in swelling at the puncture site which normalized after 3 days. Clinically, signs of dysphagia improved immediately after treatment. Symptoms reoccurred 4–6 weeks later and after a second injection 3 horses remained without problems. In the other 3 horses, a 3rd injection was performed 3 months later with good success.

Discussion: This newly described condition of late-onset dysphagia resemble axial deviation of the aryepiglottic fold, a condition causing dynamic obstruction of the upper respiratory tract during maximal exertion. Patients presented in this study were assessed during rest. A successful treatment for this new condition is offered. Failure of the first treatment course was attributed to resorption of the sodium HA. Subsequently, a cross-linked HA, PRP and acrylamid have been utilized instead. Cross-linked HA and polyacrylamid are used in human plastic surgery as a soft tissue filler.

Conclusion: In this report, a new condition following prosthetic laryngoplasty and ventriculectomy, namely a late-onset dysphagia as well as a successful, minimally invasive and cost efficient treatment option are presented.

ADVANCES IN EQUINE DIAGNOSTIC ARTHROSCOPY: INTRA-ARTICULAR ULTRASOUND AND INTRA-ARTICULAR OPTICAL COHERENCE TOMOGRAPHY

Brommer H*[1], Liukkonen J[2], Viren T[3], Te Moller NCR[1], Timonen M[2], Jurvelin JS[2], Toyras J[4]. [1]Utrecht University, Faculty of Veterinary Medicine, department of Equine Sciences, Utrecht, Netherlands, [2]University of Eastern Finland, Faculty of Science and Forestry, Department of Applied Sciences, Kuopio, Finland, [3]Kuopio University Hospital, Cancer centre, Kuopio, Finland, [4]Kuopio University Hospital, Department of Clinical Neurophysiology, Kuopio, Finland.

Introduction: For visualization of the articular cartilage surface, arthroscopy serves well as the gold standard, but it gives little information on the deeper regions of the articular cartilage layer and the cartilage-subchondral bone interface. The aim of the present study is to assess the diagnostic potential of ultrasound (US) and optical

coherence tomography (OCT) as 'optical biopsy' techniques for intra-articular use during arthroscopic surgery in horses in order to retrieve information on the deeper regions of the articular cartilage layer and the cartilage-subchondral bone interface.

Materials and methods: In 18 metacarpophalangeal joints of slaughter horses, the condition of the cartilage at pre-determined sites of interest and cartilage lesions that were encountered at other sites were scored using the International Cartilage Research Society (ICRS) grading system. Subsequently, these sites were investigated using intra-articular US (diameter US probe 1.0 mm, frequency 40 MHz) and intra-articular OCT (diameter OCT-probe 0.9 mm, wave length 1305 nm) under arthroscopic guidance. Videos were qualitatively evaluated. The OCT images were also semi-quantitatively scored using the ICRS grading system and compared to the ICRS grades obtained with conventional arthroscopy.

Results: A total of 94 sites were investigated. With intra-articular US and OCT, 'optical biopsies' of the articular cartilage layer could be retrieved up to and including the cartilage-subchondral bone interface. The penetration depth of US was larger compared to OCT, the resolution of OCT (20 micrometer) was better than of US. ICRS scores based on OCT imaging were more precise compared to ICRS scores based on conventional arthroscopy, the inter-item correlation coefficient was 0.503. With intra-articular OCT, the morphological characteristics of the cartilage lesions could be well established. The following types of lesions were encountered: fibrillation (n = 25), cavitation (n = 2), fissure formation (n = 15), ulceration (n = 19), and osteochondral fragmentation (n = 1). Finally, the US and OCT transducers could be maneuvered between the articular surfaces of MC3 and P1, i.e. areas that cannot be reached during conventional arthroscopy.

Conclusions: Compared with conventional arthroscopy, arthroscope-guided intra-articular US and intra-articular OCT provides more detailed information on the articular cartilage layer. In the equine MCP-joint, an 'optical biopsy' up to and including the cartilage-bone interface could be retrieved. Arthroscope-guided US and OCT are promising new tools in equine arthroscopic diagnostics which may have implications for therapeutic interventions and prognostication of articular cartilage injuries.

COMPUTED TOMOGRAPHY AND MAGNETIC RESONANCE ANATOMY OF THE NORMAL ORBIT AND EYE OF THE HORSE

D'Août C[1], Nisolle JF[2], Navez M[2], Vander Stricht R[2], Simon V[1], Perrin R[*3], Launois T[*3], Brogniez L[3], Hontoir F[1], Clegg P[*4], Vandeweerd JM[*1]. [1]University of Namur, Namur, Belgium, [2]Hopital Universitaire Mont Godinne, Yvoir, Belgium, [3]Clinique Desbrosse, St Lambert des Bois, France, [4]University of Liverpool, Neston, United Kingdom.

Introduction. Traumatic and infectious diseases of the eye and orbit can occur in horses. For diagnosis and monitoring of such diseases, medical imaging is useful including Computed Tomography (CT) and Magnetic Resonnance Imaging (MRI). There is limited peer-reviewed documentation about the CT and MRI anatomy of the equine eye and orbit. The aim of the current study was to describe CT and MRI anatomy of the equine orbit and ocular globe.

Material and methods. The heads from 4 adult horses were scanned with a 6-slice Emotion 6 CT (Siemens, Erlangen), and a 3.0 Tesla Siemens Verio 6 MRI using T1 and T2-weighted sequences. In order to validate CT and MR reference images, these were compared to gross anatomic sections performed with a thin band saw through the heads after freezing.

Results. The bony limits of the orbital cavity, the relationship of the orbit with sinuses, and the foramina were well identified by CT. MRI was more useful to observe soft tissues and was able to identify most structures of the ocular globe, eyelids, periorbital fat, extraocular muscles, lacrymal and tarsal glands. It could not differentiate sclera from choroid and retina. Nerves could not be identified except the optic nerve. Vessels were not seen in this series of cadaver heads. Several salient anatomical features were highlighted including the absence of a bony wall caudal to the orbit where an open space was found occupied by the coronoid process of the mandible, temporo-mandibular joint and adjacent masticatory muscles.

Conclusion. The current study showed that CT and MRI are useful techniques to image the equine orbit and eye, that can have clinical applications.

SERUM AMYLOID A IS EXPRESSED IN CULTURED EQUINE SYNOVIOCYTES STIMULATED WITH PRO-INFLAMMATORY CYTOKINES IN VITRO

Ladefoged SL[1], Jacobsen SJ[2], Thomsen MHT[2], Berg LCB[2]. [1]Swedish University of Agricultural Sciences, Uppsala, Sweden, [2]University of Copenhagen, Taastrup, Denmark.

Introduction: Recognizing early stages of joint inflammation is challenging, as clinical signs may be subtle or absent. Diagnosis and monitoring may therefore include assessment of biomarkers in synovial fluid. Previous studies have demonstrated the presence of serum amyloid A (SAA) in synovial fluid of horses with experimentally induced inflammatory synovitis and septic arthritis. However, little is know about the pathophysiology of intrasynovial SAA. In order to investigate the SAA producing potential of equine synovium, mRNA expression of SAA was assessed in equine cultured synoviocytes stimulated with proinflammatory cytokines.

Materials and Methods: Synovial membranes were obtained from the metacarpophalangeal joints of 4 adult horses euthanized for non-orthopedic reasons. Synoviocytes were isolated by enzymatic digestion and dissociated cells were expanded in monolayer under standard conditions. Third passage synoviocytes were treated with recombinant human interleukin-1beta (rhIL-1B), recombinant equine tumor necrosis factor alpha (reTNFa), recombinant equine interleukin-6 (reIL-6), or a combination of each of the three cytokines. Unstimulated controls were included for all treatments. Synoviocytes were harvested at 0, 12, 24 and 48 hours. SAA mRNA expression was detected using quantitative RT-PCR. All samples were run in duplicate, and SAA mRNA expression was normalized to glyceraldehyde-3-phosphate dehydrogenase (GAPDH). Statistical analysis was conducted by non-parametric Friedman's test for repeated mesurements, and level of significance was set at $P < 0{,}05$.

Results: Stimulation with proinflammatory cytokines induced statistically significant increases in expression of SAA mRNA in synoviocytes. All samples collected at 0 hours and all control samples showed low or negligible SAA expression.

Discussion: Several functions, relevant to the understanding of the inflammatory and cartilage degrading mechanisms seen in the arthritic joint, have been ascribed to the SAA protein. Of particular interest is the fact that SAA has been reported to induce the cartilage degrading enzymes stromelysin and collagenase in cultured synoviocytes of humans and laboratory animals. An important prerequisite for further functional studies is the determination of the exact cellular origins of SAA in the equine joint.

Conclusion: To our knowledge this is the first study reporting in vitro cytokine induced SAA gene expression in equine synoviocytes. More research is needed to investigate the possible potential of intrasynovial SAA as an early marker of synovitis, and to understand the pathophysiologic role of SAA in the equine joint.

STRING-OF-PEARLS LOCKING PLATES TO CORRECT WRY NOSE IN A FOAL

Gracia-Calvo LA, Roquet I, Martín-Cuervo M, Vieitez V, Galafate JM, Jiménez J, Ezquerra LJ*. Veterinary Teaching Hospital. UEX, CÁCERES, Spain.

Introduction: Wry nose is a congenital condition of the most rostral aspects of the incisive bones. The foal's growth usually worsens the clinical signs in the cases where the deviation is severe, threating seriously the foal's survival. Surgery is a life saving procedure in those severe cases. Otherwise the foal should be humanely euthanased. There are different surgical procedures described such as the use of distraction osteogenesis, external fixation devices or osteotomy followed by the application of Steinmann pins or bone plates.

Objective: To describe the surgical correction of wry nose in a foal by String-of-Pearls locking plates (SOP) and its outcome.

Clinical case: A 6-month-old Arabian-cross foal was referred to our facilities for evaluation of an almost 90 degrees left sided deviation of the premaxilla and nasal septum. The surgical procedure was carried out in one stage with the foal in sternal recumbency. The first step consisted of the collection of a 3 cm bone graft from the 11th rib, proximal to the osteochondral junction. Secondly, the nasal septum was resected and the nasal bones were transected and aligned with 2.7 mm veterinary cuttable plate (VCP). A 14 holes VCP with 6 screws in the caudal fragment and 5 in the rostral one was applied to the nasal bone. The gap of the concave side wall was filled with a bone graft. Finally, the maxillary bones were subjected to osteotomy on the point of maximal concavity and they were aligned with one 3.5 mm SOP locking plate on each side. An 8 hole SOP with 7 screws was used in both maxillary bones. Again, the bone defect of the concave side was filled with a bone graft. Surgical incisions healed unremarkably. Radiographs taken 9 months after surgery showed that the second screw of the left SOP plate was partially mobilised. Adequate alignment of incisor teeth and prognatia inferior were observed.

Discussion: Counterclockwise rotation was present along with the left premaxilla deviation. The bone defect and the marked desituation of the bone fragments after osteotomy in the left maxilla were anticipated. Therefore, it was decided to repair the maxillary osteotomies with SOP plates. The SOP can be thought mechanically as an internal external fixator. A close contact between the SOP plate and the bone is therefore not needed which helps in the fixation of the maxillary osteotomies. This foal developed a prognatia inferior. We do not know if the prognatia is a result of the implants remaining in place for too long or because of the shorter maxilla in addition to the lateral deviation.

Conclusion: The use of maxillary SOP plates in a one-stage surgical procedure in sternal recumbency is a feasible technique to correct a wry nose.

BONE MARROW MESENCHYMAL STEM CELLS STIMULATE OSTEOGENESIS AND BONE REPAIR IN HORSES

Varanda LFO[1], Arrais ALA[1], Moraes JM[1], Dumont CBS[1], Santos-Leonardo A[1], Lima EMM[1], Godoy RF[2]. [1]University of Brasilia, Brasilia, Brazil, [2]University College of London, London, United Kingdom.

Introduction: The speed and quality of bone repair are major obstacles faced by veterinarians in equine surgery. Alternative complementary therapies that can help the

process of osteogenesis have been studied experimentally and clinically in different animal species and humans. The following study aimed to evaluate the osteogenic effect of percutaneous autologous injection of mononucleated cell fraction (MCF) from bone marrow (BM) in experimental bone defects in the fourth metacarpal bone (Mc4).

Material and methods: In five horses 1 cm critical bone defects were created in both fourth metacarpal bones. Five days after surgery BM was aspirated from the sternum of each horse. The MCF was isolated by centrifugation and separation on Ficoll Hypaque, followed by percutaneous implantation in the horses. Mononucleated cell fratcion + DMEM was injected on the right side (treated limb = TL) and only DMEM on the left side (control limb = CL) of each animal. To evaluate local bone regeneration, radiographies were taken (DLPMO) on D7 (seven days after percutaneous injection), then weekly until D56 and at 28 days intervals until D140. All radiographies were taken using, close to the plate, an aluminum step wedge. Fracture healing of each limb was graded for callus maturity by three independent radiologist who were blinded to the treatment applied. A modified Lane-Sandhu Scoring System was used: 0 no callus; 1 minimal callus formation (up to 25% of the defect); 2 callus evident but healing incomplete (from 26 to 50% of healing); 3 callus evident and stability expected (51% to 75% healing); 4 76–99% healing with initial bone remodeling; 5 100% healing with complete bone remodelling. The bone mineral density (BMD, in mmAl) was assessed using Adobe Photoshop CS5 Extended software and compared with the aluminum step wedge used.

Results: Percutaneous MCF injection was confirmed to be a low cost, minimally invasive technique that can replace other more invasive methods of stem cell delivery. The BMD values were significantly higher in TL compared to the CL in six of the eleven time-points of radiographic analysis, occuring mainly after 35 days following surgery. At D140, for instance, TL showed an mean BMD of 10,99 mmAl, and CL of 7,89 mmAl. The scores for bone healing and regeneration were higher in TL than the CL in all animals.

Discussion: The results show that MCF stimulated osteogenesis, accelerating the process of bone repair and increasing the amount of mineralised bone matrix. Therefore, it can be considered as complementary therapy for bone fractures.

DOES TIME MATTER FOR PLATELET-RICH PLASMA TREATMENT FOR EQUINE TENDINITIS?

Fonseca FA[1], Oliveira FTO[1], Rajão MD[1], Dumont CBS[1], Santos-Leonardo A[1], Lima EMM[1], Godoy RF[2]. [1]University of Brasilia, Brasilia, Brazil, [2]University College of London, London, United Kingdom.

Introduction: An alternative for treatment of tendon injuries is local injection of platelet-rich plasma (PRP), an autogenous component of low cost and easy acquisition. The aim of this study was to evaluate the effect of PRP injection 7 and 14 days after induced tendinitis.

Material and methods: Tendinitis was induced in both thoracic superficial digital flexor tendons by administration of 2.5 mg of collagenase. One limb was injected with 0.9% saline solution, either on day 7 (SAL7) or on day 14 (SAL14). The other limb was treated with PRP, either on day 7 (PRP7) or day 14 (PRP14). Therefore, each animal was its own control group. The day after treatment, the animals were submitted to controlled and progressive exercise until day 49. Horses were submitted to physical and ultrasonographic exams every seven days, for seven weeks. The ultrasonographic exams were performed before and after the induction of tendinitis, evaluating the cross-sectional area of the tendon (TA), cross-sectional area of the injury (LA), the echogenicity of the injury and parallelism of the collagen fibres.

Results: Regarding the cross sectional lesion area (LA), PRP7 showed a remarkable lesion reduction from D28 ($P < 0.05$). On D49, PRP7 lesion area was 70% smaller than SAL7. The PRP14 group showed a stable lesion from the treatment to D28. From D28, PRP14 group also showed a reduction in the LA, when compared to its control (SAL14), but it was a slower and lesser reduction. On D49, PRP14 showed only 17% of improvement of LA when compared to SAL14. We observed that LA of PRP treated groups (PRP7 and PRP14) showed a constant reduction from D28. In comparison, the control groups (SAL7 and SAL14) showed a tendency to increase in size or stabilisation of the lesion area. Both treated groups presented a similar pattern of tendon healing, starting with a reduction of LA 28 days after the application of PRP. However, the PRP14 had a slower healing than PRP7.

Discussion: The application of a single intralesional injection of PRP was enough to improve the healing in PRP7 and PRP14. Nonetheless, the most important result of this study is that this improved healing was much more evident in the PRP7 group, indicated that early PRP therapy should be aimed for. Delayed treatment can still bring some benefit, but not at its best.

After intralesional injection of PRP or saline solution, the only ultrasonographic variable that was sifgnificantly different between groups was the cross sectional area of the lesion (LA). In the groups receiving treatment with PRP, the lesion area reduced from D28. The decrease in this variable indicates healing and remodelling due to growth factors that regulate cell metabolism, accelerate healing by stimulating cell proliferation, increasing the synthesis of extracellular matrix and stimulate neovascularization.

Conclusion: A single dose of PRP was effective in the treatment of experimentally induced SDFT tendinitis in horses, and was more effective during the acute phase (seven days after injury). Nonetheless, delayed PRP therapy can still bring some benefits for tendon healing.

ENDOSCOPIC ANATOMY OF THE NORMAL EQUINE GUTTURAL POUCH

PIAT P*[1], BARONE R[2], CADORÉ JL[2]. [1]Faculté de médecine vétérinaire, Université de Montréal, St Hyacinthe, Canada, [2]VetAgro Sup, Lyon, France.

Introduction: Equine guttural pouches (GP) provide clinicians with a unique window on numerous important anatomic structures that are impossible to visualize in other species. Endoscopy allows both visualization and treatment of many clinical problems in the retropharyngeal region. However, this anatomical region is extremely complex and poorly described in the veterinary literature. The objectives of the study were to accurately identify each anatomic structure visible on GP endoscopic examination, to develop a standardized method of GP endoscopic examination and to describe variations in anatomic structures in the GP in normal horses.

Material and methods: Conventional dissections of GP (n = 12) were performed on normal horses post mortem. The identity of all nerves, vessels and other important structures adjacent to each GP was confirmed by an experienced veterinary anatomist.

The dissected heads then underwent a guttural pouch endoscopic examination to correctly map each visible underlying anatomic structure, identified by the dissection. Each structure was visualized and identified from the inside of the pouch by endoscopy, and then it's identity confirmed from the exterior of the pouch by palpation of the different dissected organs.

Results: Comparison of conventional dissections and endoscopic examination permitted an accurate mapping of all the structures associated with the GP.

Lateral Compartment structures: Arteries (external carotid, maxillary, superficial temporal and caudal auricular), veins (maxillary), nerves (VII and carotid plexus), and muscles (intern pterygoideus) were readily identified. In addition, the parotid gland and auricular cartilage were also easily identified. The mandibular and chorda tympani nerves were rarely visible.

Medial Compartment structures: Arteries (external and internal carotid, linguofacial), nerves (pharyngeal branch of the X), muscles and joints (atlanto-occipital and temporo-hyoid) were easily recognised on endoscopic examination. Furthermore the median septum, jugular process of the occipital bone and medial retropharyngeal lymph nodes, were also easily visualized. The nerves IX and XII coursed sometimes together or were separate. The nerves X and XI were occasionally visible on each side of the internal carotid artery. The Hering nerve and the laryngeal branch on the nerve X were rarely visible.

Discussion and conclusion:The current investigation provides novel information on normal endoscopic anatomy of the equine GP. We mapped already wellknown structures, but also new structures that have not been described previously on endoscopic examination. A better knowledge of all the visible underlying structures in the GP will improve the diagnosis and treatment of GP problems.

TREATMENT OF RECURRENT URETHROLITHIASIS IN A GELDING USING HOLMIUM:YTTRIUM-ALUMINUM-GARNET LASER LITHOTRIPSY

Delling U*[1], Eichel J-C[1], Oechtering G[2]. [1]Large Animal Clinic for Surgery, University of Leipzig, Leipzig, Germany, [2]Department of Small Animal Medicine, University of Leipzig, Leipzig, Germany.

Introduction: Uroliths in horses are most often located within the urinary bladder (urocystoliths). Laser lithotripsy within the urinary bladder using pulsed dye or holmium:yttrium-aluminum-garnet (Ho:YAG) laser has been reported with inconsistent success. In this case report a successful laser lithotripsy of a urethral urolith in a gelding is described.

Case description: A 20 year old, approx. 500 kg Warmblood gelding was presented with dysuria. An approximately 3.5 cm urolith was removed manually from the urethral process. A second 2.5 cm urolith was removed endoscopically with a basket snare from the urinary bladder 6 days later. Temporary perineal urethrotomy was performed to circumvent the denuded and necrotic urethral mucosa. The gelding was readmitted 7 months later for signs of dysuria. An urethrolith was identified at the level of the scrotum and a perineal urethrotomy was performed for temporary relief. The lumen of the urethra was abnormally narrowed distal to the calculus and prevented normograde removal. A retrograde repulsion was not possible either. Three days after admission, the urolith was successfully destroyed using a 30 watts Ho:YAG laser (Sphinx 30 litho, LISA laser products, Germany) and was removed. The laser fiber (3.0 m, 2.3 F) was inserted through the working channel of the endoscope and approached from the urethral process as well as from the urethrotomy side. Subsequently, the urethral stricture was incised with laser as well. The total time of laser application was less than 15 min. The procedure was performed standing under sedation. No adverse reactions during or after the surgery were observed from the

laser application. A urinary catheter was placed into the distal urethra to prevent stricture re-formation. A urine sample obtained on admission revealed >100,000 CFU/ml urine and identified two types of multi-resistant Enterobacter cloacae with an extended spectrum of beta lactamase (ESBL). The gelding was subsequently treated with amikacin intravenously for 16 days. Four months following discharge, the owner reported a possibly decreased urine flow but otherwise a normal general appearance of the horse.

Discussion: To our knowledge, this is the first description of a horse with recurrent urethral urolithiasis successfully treated by Ho:YAG laser application. Furthermore, this is the first description of a horse with ESBL bacterial urinary tract infection in a clinical context. Urinary tract infection in humans is one of the described occurrences of ESBL bacteria. It is speculated that the urinary tract infection in this horse was the cause of the recurrent urolith formation.

CAN CRYOSURGERY BE USED FOR TREATMENT OF BACK PAIN IN HORSES? A PRELIMINARY HISTOLOGICAL STUDY

Dalla Valle J[1], Canon C[1], Nicaise C[1], Perrin R[*2], Launois T[*2], Brogniez L[2], Desbrosse F[*2], Hontoir F[1], Clegg P[*3], Vandeweerd JM[*1]. [1]University of Namur, Namur, Belgium, [2]Clinique Desbrosse, St Lambert des Bois, France, [3]University of Liverpool, Neston, United Kingdom.

Introduction. Back pain can significantly influence locomotion and performance in sport horses. Osteoarthritis of the lumbar articular facets can cause back pain. The nerves innervating the articular facets of lumbar vertebrae and their ultrasound guided injection have been described in the horse. Cryodenervation of lumbar facets has been described in human studies. The objectives of the current study were to conduct an ex vivo histological study to demonstrate that cryosurgery induces histological damage to the nerves.

Material and methods. Two male ponies were euthanased for teaching purposes. Immediately after death, in each animal, 6 nerve branches were randomly selected and dissected to be used as controls while the other 6 were exposed to cryosurgery (three cycles of 2 min freezing [at minus 60°C] and 2 min thawing, using a cryogenic probe of 1.5 mm diameter, and a nitrous oxide cryogenic unit). Semi-thin section slices were viewed with light microscopy by 4 blinded different observers who compared 3 criteria (general color of the nerve, color of axons and morphology of myelin sheaths) in both groups of nerves. Lesions were described by electron microscopy.

Results. Histological scores were significantly different between control and frozen nerves at light microscopy (U 0,000; p 0,005). At electron microscopy, several morphological changes were visible in frozen nerves in comparison to unfrozen nerves. In myelinated fibers the axoplasm of frozen nerves was darker and the concentric aspect of equidistant myelin lamellae was lost. The different layers of myelin appeared detached from each other with white lines in between. The axoplasm of frozen non myelinated fibers was also darker than in control nerves. Damaged mitochondria were numerous in frozen nerves. Sometimes they formed clusters. No changes were identified in the endoneurium.

Conclusion. The protocol used in the current study induced structural changes both in large myelinated and small nociceptive fibers. This study showed that histological changes can be identified. In the future, minimal invasive cryosurgical techniques that will be developed could be assessed ex vivo by using those histological changes as outcome measures.

METALLOPROTEINASE LEVELS ARE ELEVATED IN THE INTESTINE OF HORSES SUBJECTED TO COLIC SURGERY

Marañón G[1], Manley W[1], Perrin R[*2], Launois T[*2], Rancan L[3], Vara E[3]. [1]HORSEPITAL SL, Madrid, Spain, [2]Clinique Equine Desbrosse, Saint Lambert Des Bois, France, [3]D. Biochemistry and Molecular Biology III. UCM, Madrid, Spain.

Introduction: Matrix metalloproteinases (MMPs) are produced in the gastrointestinal tract by several structural cells and it has been suggested that they could play an important role in the pathophysiology of diverse intestinal inflammatory conditions. The aim of this study was to determine whether the expression of MMP-2 and MMP-9 increased in relation to the severity of inflammation in horses with colic requiring surgery, compared with control subjects, and whether the production of MMPs correlate with proinflammatory cytokine levels.

Material and methods: Forty seven horses subjected to emergency abdominal surgery (SC group) of the small intestine and 4 horses destined to euthanasia (control group) for reasons unrelated to the cardio-vascular system or gastrointestinal tract were used. Samples were obtained from intestinal resections and include pairs of macroscopically inflamed (MI) and normal appearing (non inflamed, NI) intestine. Metalloproteinases (MMP-2 and MMP-9) and pro inflammatory cytokines (IL-1, IL-2 and TNF) were measured in tissue homogenates and in plasma samples using commercial ELISA kits. The data are expressed as the mean and the standard error of the mean. Non parametric tests were used. In addition, the Wilcoxon test for paired data was used to compare the intra-group values. Statistical significance was set at $P < 0.05$.

Results: The level of MMP-2 in the intestinal tissue showed a tendency to increase in relation with the severity of inflammation. In NI tissue, the amount of MMP-2 was elevated to a near twofold higher level compared to control tissue ($P < 0.05$). In MI tissue the MMP-2 level was even higher. MMP-9 was found to have a similar pattern to that of MMP-2. In NI tissue, MMP-9 increased nearly fourfold ($P < 0.01$), and it further increased in MI tissue up to eightfold, compared to the control group. Leves of all the analyzed proinflammatory cytokines (IL-1, IL-2 and TNF) significantly increased in the SC horses, compared with the control group, in both MI and NI tissue samples ($P < 0.01$). Plasma levels of MMP-2 and MMP-9 were significantly higher than baseline levels in the SC group during surgery and 24 hours later. A similar result was observed for cytokines.

Conclusion: The results of this study suggest that increased activity of MMPs may contribute to inflammation and intestinal tissue injury. MMP inhibition might be a new therapeutic approach to controlling inflammatory response in horses with colic.

THE IMPACT OF EQUINE LAMENESS ON HORSES AND THEIR OWNERS IN THE UK AND IRELAND

Uprichard KL, Boden LA, Marshall JF*. University of Glasgow, Glasgow, Scotland, United Kingdom.

Introduction: Lameness is a major welfare and economic issue affecting horses and their owners. While the training implications of lameness have been described, the financial impact of restricted exercise on horse owners has not been quantified. The aims of this study were to (1) quantify the daily maintenance cost including routine healthcare and (2) determine the prevalence of lameness and quantify the cost and duration of restricted exercise.

Material and methods: A study of horses in the UK and Ireland was performed between June and November 2013. Respondents were a convenience sample of horse owners. An online survey (Survey Monkey) was publicised through equestrian and social media. Questions related to (1) owner age, gender, geographical location (2) type and use of horse, purchase price, location, travel, healthcare and maintenance costs and (3) lameness episodes within the last 12 months.

Results: Horses were of mixed breed with a median age of 13 years (IQR 9–16 years, range 2–34 years) including 350 geldings (62.5%), 208 mares (37.1%) and 2 entire males (0.8%). Horses were predominantly general-purpose horses and competing in unaffiliated competition or not competing. The majority were kept within 5 miles of the owner's residence (48.5%) or on the owner's premises (28.9%). The majority of owners (38.5%) paid £2001–5000, with 18.5% paying £1001–2000. Of these horses, 47% underwent a pre-purchase examination and 53% of the population were insured following purchase. Median basic cost of maintenance per year was £2660 (IQR 1581–3953, Range 130–10730), equating to £7.29 per day and £221.68 per calendar month. 71.3% (318/446) had experienced an episode of lameness within the last 12 months. Veterinary examination was performed in 72% of cases. Horses were categorised as those able (58.4%) or unable (30%) to return to previous level of work and those currently undergoing treatment (12.6%). For horses that returned to their previous level of work, the median period of time spent completely rested (box or small paddock) and in rehabilitation was 14 days (IQR 7–46, range 0–640) and 21 days (IQR 5–60, range 0–365) respectively. Horses that did not return to their previous level of work had a considerably longer period of restricted exercise with a median of 40 days (IQR 14–180) complete rest and 56 days (IQR 0–120) of rehabilitation before being either fully retired or performing at a lower level than before the episode of lameness.

Discussion: This study has quantified both the financial and time impact of lameness on the horse owner by defining the duration of restricted exercise and the basic daily cost of ownership. This information will be of significant value to the veterinary surgeon and owner when considering the potential benefits of surgery or other treatment.

IN VITRO COMPARISON OF THREE TECHNIQUES FOR ANCHORING THE MUSCULAR PROCESS IN EQUINE LARYNGOPLASTY FOR THEIR ABILITY TO OPEN THE LEFT ARYTENOID

Brandenberger O[1], Lechartier A[2], Rossignol F[*1], Mespoulhes-Rivière C[*2], Rossignol A[1], Vitte A[1], Boening KJ[*1]. [1]Clinique de Grosbois, Boissy St Léger, France, [2]Ecole Nationale Vétérinaire d'Alfort, Maisons-Alfort, France.

Introduction: Loss of abduction is a major reason for laryngoplasty failure and is related to the force exerted on the implant: the lower the force used to open the arytenoid in a satisfactory position, the greater the stability of the construct. We commonly use three different techniques and observed that each technique requires a different force to open the left arytenoid. In this study, we compare three techniques to anchor the muscular process for their ability to open the left arytenoid at 5 different forces of impact.

Material and Methods: The larynges were randomly assigned to either a single loop technique (SL, n = 17), a double loop technique (DL, n = 12) (2 mm Fibertape and a 14G Jamshidi needle) or a screw technique (SC, n = 20) (3.5 mm Corkscrew® device) and were all implanted by the same surgeon (FR). Larynges were fixed in a stand, and the force applied to the suture was measured with a suture tensiometer. A

digital photograph was taken of each larynx at 0 N, 5 N, 10 N, 15 N and 20 N. The left and right arytenoid angle and the arytenoid left-right quotients (LRQ) were calculated from each photograph.

The mean angles and quotients between force steps and techniques were compared using a Welch TwoSample t-test and simple linear regression analysis.

Results: The LRQ of the SL and the SC were significantly different at 0 N ($P = 0.002$), 5 N ($P = 0.0001$) and 10 N ($P = 0.031$). The LRQ of the DL and the SC differed significantly at 0 N ($P = 0.008$) and 5 N ($P = 0.0045$) and the LRQ of the SL and the DL at 20 N ($P = 0.0497$).

The mean left arytenoid angles only showed significant differences between the SL and the SC at 5 N ($P = 0.008$), and between the DL and the SC at 5 N ($P = 0.007$). No significant differences were found between the single and double loop technique. Regression analysis did not reveal any significant effects of the three techniques on the LRQ or the left arytenoid angle.

Discussion: The results of this in vitro study imply that despite the mechanical differences between the three different methods of anchoring the muscular process, their ability to open the left arytenoid at normal forces seems to be equal. The difference between the DL and the SL at low forces, as compared with the SC, could be explained by the fact that both the DL and the SL consist of a prosthesis with a medial and lateral suture branch, whereas the SC only has one line of tension. As the medial branch has to be tightened before retrenching the lateral branch, the remaining force can already open the arytenoid minimally. Furthermore, the consequences of these mechanical differences need to be considered and special care must be taken to avoid slippage of the knot with the screw technique, as the resulting loss of distance cannot be split between the two branches.

SURGICAL TREATMENT OF TRACHEAL COLLAPSE IN A PONY USING STERILE ZIP-TIES

Brandenberger O[1], Rossignol F*[1], Ouachée-Flée E[1], Mespoulhes-Rivière C*[2]. [1]Clinique de Grosbois, Boissy St Léger, France, [2]Ecole Nationale Vétérinaire d'Alfort, Maisons-Alfort, France.

Introduction: Tracheal collapse in small breed horses is a specific condition where the trachea is flattened as the C shaped tracheal rings loose their rigidity and open to shallow arcs with a stretched tracheal muscle between the ends. Surgical treatment involving placement of either intraluminal or extraluminal prostheses has been reported, but complication rates are high. We report the use of sterile polyvinyl chloride (PVC) zip-ties to reshape the flattened trachea in a pony.

Case description: A ten year old Shetland pony stallion was admitted for surgery due to severe collapse of the entire trachea. The trachea was exposed from the cricoid to the manubrium using a ventral median approach. In the rostral quarter of the trachea, four extraluminal C-shaped polypropylene prostheses from 60 ml syringe cases were sutured around the trachea. In the remaining three quarters of the trachea, nine sterile 0.5 cm width PVC zip-ties were placed around the tracheal rings and tightened until the flattened tracheal rings regained their round shape. The now flaccid trachealis muscle was seized and sutured externally to the cartilage to avoid its aspiration into the lumen and creation of an obstruction. Post operatively the pony suffered from respiratory distress due to obstruction of the trachea in the rostral quarter. The pony was euthanased two months postoperatively because the four syringe cases had created severe blunt damage to the underlying tissue. The cartilage rings had been destroyed and the submucosa and mucosa were highly inflamed. Complete dissection of the trachea revealed a healthy distal part, with no reaction to the zip-ties which were embedded in thin fibrous tissue and kept the tracheal tube in a round shape.

Discussion: The use of PVC zip-ties to restore tracheal shape in tracheal collapse of small breed horses needs less preparation time, placement around the trachea is easy and rapid, the size can be adjusted very precisely and the small diameter of the zip ties guarantees better vascular support of the underlying trachea. Furthermore, the rigid but still flexible texture of the zip-ties is sufficient to keep the round shape of the trachea but does not harm the surrounding tissue in case of neck movement.

Conclusion: The use of PVC zip-ties may be considered as an alternative surgical technique for treatment of tracheal collapse in small breed horses. Further investigation in clinical cases is warranted.

USE OF MICRO-LIGHTGUIDE SPECTROPHOTOMETRY (O2C®) IN THE SMALL AND LARGE INTESTINE IN HORSES

Reichert C[1], Hopster K[1], Rohn K[2], Franz S[1], Wogatzki A[1], Rötting AK*[1]. [1]Clinic for Horses, University of Veterinary Medicine Hannover, Foundation, Hannover, Germany, [2]Institute of Biometry, Epidemiology and Information Processing, University of Veterinary Medicine Hannover, Foundation, Hannover, Germany.

Introduction: Lightguide tissue spectrophotometry is a non-invasive method to determine tissue microperfusion. The purpose of this study was to evaluate the use of O2C®-micro-lightguide tissue spectrophotometry in equine intestine. We hypothesized that the O2C®-system is easy to use and can provide reliable information about the microcirculation of the intestinal wall.

Material and methods: In 13 horses the O2C® was used to determine oxygen saturation, relative amount of haemoglobin, and tissue blood flow in the equine small and large intestine. Spectrophotometric measurements were taken under various conditions that were considered to have a potential effect on the accuracy of measurements.

Results: 12.791 single measurements were taken in which 381 (2.98%) measurement errors occurred. Most measurement errors occured when surgical lights were pointing at the measuring site. Covering the probe with the surgeon's hand was not enough to eliminate this error source. No measurement errors were observed when the probe was positioned on the intestinal wall with room light, at the mesenteric side or between the mesenteric and antimesenteric side. Values for flow had a higher variability, and this was most likely caused by motion artefacts of the measured intestine.

Conclusions: The O2C® was easy to use on the intestine of horses and provided a quick evaluation of the microcirculation. Measurements should be performed with room light and motion should be minimized. Flow values should be taken over a longer period of time to minimize any variability caused by intestinal motility.

ARTHROSCOPIC REMOVAL OF LARGE EXTENSOR PROCESS FRAGMENTS: OPTIMIZATION OF TECHNIQUE FAVOURS LONG-TERM OUTCOME IN FRIESIAN HORSES

Compagnie E, Ter Braake F*, Drumm NJ. Veterinary Clinic Emmeloord, Emmeloord, Netherlands.

Introduction: Arthroscopy of the distal interphalangeal (DIP) joint has replaced arthrotomy for small intra-articular fragment removal, as it has in other joints. However for the removal of large (>25 % of the joint surface of the DIP joint) extensor process fragments, there is still no consensus about the optimal treatment method. Insertion of lag screws has been described, but only in some individual cases with a positive outcome. In cases of recurrent lameness, surgical removal of the fragment is recommended, but arthrotomy only results in a fair prognosis for a return to athletic performance. Arthroscopic removal of these large extensor process fragments has been described in only a small number of cases, but with a relatively good outcome.

Material and methods: The medical records of patients in which an arthroscopy of the DIP joint was performed between 1999 and 2013 at the Veterinary Referral Hospital Emmeloord were collected. In particular the Friesian horses from which a large extensor process (>25% of the joint surface of the DIP joint) fragment had been removed arthroscopically, were included. Their surgical reports and perioperative radiographs were evaluated, including their clinical follow-up and telephonic interview of owners.

Results: The total group of n = 20 Friesian horses ranged in age from 1 to 19 years (mean = 4.4 years). All horses showed a forelimb lameness ranging from 1 to 4 out of 10 (mean = 2.8/10). The degree of involvement of the articular surface ranged from 27 to 37 % (mean = 31.75%). In all horses fragments were of chronic nature. After fragment removal, remodelling of the angle of the remaining extensor process ranged from 2° to 32° (mean = 11.9°). The follow-up time ranged from 2 to 96 months (mean = 42,8 months). Of the 20 horses, 2 had been lost to follow-up and 2 others are still rehabilitating. Of the 16 remaining horses 3 (18.75%) stayed persistently lame and 13 horses (81.25%) could be used for the intended level of work.

Discussion: Arthroscopic removal of large extensor process fragments of the distal phalanx has a surprisingly good long-term prognosis for return to intended use. Following fragment removal the extensor process appeared to become part of a subsequent remodelling process.

USE OF A MOBILE SWINGLIFTER FOR CONTINUOUS RELIEF OF THE MUSCULOSKELETAL SYSTEM IN HORSES WITH WEIGHT BEARING DIFFICULTIES

Elmas CR, Weinberger T, Beluche LA. Pferdeklinik Burg Müggenhausen, Weilerswist, Germany.

Introduction: Equine slings have been used successfully in horses to rescue them from hazardous situations or to facilitate anesthetic recovery. We describe our clinical experience, complications and advantages when using the PM Horse-Swinglifter for a variety of musculoskeletal disorders including laminitis, bone fractures and tendon injuries.

Material and methods: Medical records of cases that were placed in the swinglifter between May 2010 and November 2013 were reviewed. Descriptive statistics were used to evaluate the data.

Results: There were a total of 27 cases that fulfilled the inclusion criteria. Diagnoses included laminitis (10); fracture (10) of which 4 were olecranon fractures, 2 radius fractures, 2 tibia and 2 third metatarsus fractures; septic tarsal sheath (2), laceration (3), chronic implant infection (1), and ataxia (1). Weight relief ranged from 80 to 170 kg. Nine horses needed to be sedated for placement in the swinglifter, whereas one horse was recovered in the swinglifter after general anesthesia. Two horses developed pressure sores after being in the swinglifter for 20 and 38 days respectively, which resolved with topical treatment. One horse had been able to lie down after karabiner hooks of the swinglifter broke and a non-displaced radial fracture turned into a complete, comminuted radius fracture. Ten horses were

euthanized while in the hospital because of complications related with the primary disease process. None of the horses developed supporting limb laminitis while in the swinglifter; one horse developed a cecal impaction and was euthanased after colic surgery. Application of the swinglifter has a steep learning curve and requires a minimum of three people. The total procedure takes an average of 15 minutes.

Discussion: Horses generally tolerated the sling well. We believe this is in part because of the immediate support the swinglifter gives the horse, thereby instantly reducing the horses' pain and stress response. The relatively silent operating mode and comfortable cushioned belt system further facilitates the ease with which the horse can walk around. The degree of relief provided by the swinglifter can be adjusted, as can the size of the belt system. This makes the swinglifter usable for horses of different weights and heights. Another advantage is that during the disease process, the degree of relief provided by the swinglifter can be adapted to the weight bearing capabilities of the horse. In our study there were no cases developing laminitis while in the swinglifter. The low rate of gastrointestinal complications, together with our clinical experience that horses within the swinglifter appear more comfortable and maintain a good appetite, indicate that the swinglifter is a valid additional therapeutic measure for horses with longer-term, painful musculoskeletal injuries.

CONGENITAL BILATERAL APLASIA OF THE METACARPOPHALANGEAL JOINTS IN A FOAL

Jordana M*[1], Martens A*[1], Van Brantegem L[2], Chiers K[2]. [1]University of Ghent, Faculty of Veterinary Medicine, Department of Surgery and Anesthesiology of Domestic Animals, Merelbeke 9820, Belgium, [2]University of Ghent, Faculty of Veterinary Medicine, Department of Pathology, Bacteriology and Poultry Diseases, Merelbeke 9820, Belgium.

Introduction: Congenital skeletal malformations occur occasionally in horses and can affect a variety of anatomical sites. The most commonly reported anomalies of the distal limbs are polydactilia, adactilia or hypoplasic malformations of the digit. To the authors' knowledge, only one case of congenital bony ankylosis of the distal interphalangeal joint has been documented. We report a case of bilateral congenital aplasia of the metacarpophalangeal joints with resulting synostosis between the third metacarpal bone (MC-III) and the proximal phalanx (P1) in a 2-day-old Warmblood filly.

Case Report: A two-day-old Warmblood filly was presented for examination of a valgus deformity of the left front limb and a steep position of both metacarpophalangeal joints. The foal was not lame. Radiologic examination revealed bilateral absence of the metacarpophalangeal joint space with fusion of the MC-III and P1. No treatment was performed at that stage. Ten weeks later the filly was readmitted to the clinic for bilateral front limb lameness, more accentuated on the left. On radiologic examination the synostosis of the front metacarpophalangeal joints was still present. Moreover, physitis of the distal growth plate of the right MC-III and a fragment on the palmaromedial and proximal aspect of the left middle phalanx (P2) with a cystic lesion on the medial and distal aspect of P1 and proximal P2 were diagnosed. Because of the marked lameness resulting from the secondary complications, the inability to restore the primary abnormality and the subsequent poor prognosis to keep the animal on a long term for any athletic activity, the foal was euthanased. Post mortem examination confirmed the absence of the metacarpo-phalangeal joint space with a trabecular bony union between MC-III and P1. A rudimentary joint capsule was present at the level of the absent joints as well as a small zone of articular cartilage, which invaginated over a short distance into the dorsal trabecular bone on the right front limb. The physitis at the level of the distal growth plate of the MC-III as well as the articular cartilage and subchondral bone lesions at the medial aspects of P1 and P2 were also confirmed.

Conclusion: This is the first case report of a foal born with congenital aplasia of both front metacarpophalangeal joints. Although skeletal congenital malformations are not frequently observed in horses, they should be considered in the differential diagnosis of lame foals or foals born with angular or flexural limb deformities.

ARTHROSCOPIC REMOVAL OF OSTEOCHONDRAL FRAGMENTS IN THE DORSAL POUCH OF THE PROXIMAL INTERTARSAL (TALOCENTRAL) JOINT VIA DIRECT APPROACH IN 11 HORSES

Drumm NJ*, Compagnie E, Ter Braake F*. Veterinary Clinic Emmeloord, Emmeloord, Netherlands.

Introduction: The tarsus is one of the most common sites for osteochondral (OC) fragmentation in the horse with the majority of fragments found in the tarsocrural joint. However, fragments located in the proximal intertarsal joint (PIJ) have been described.

Retrieval of the fragments from the dorsal pouch of the PIJ has been accomplished by blind grasp through a standard dorsolateral portal in the TCJ, an arthrotomy incision into the dorsal capsule of the PIJ via the TCJ after resection of the membrane between TCJ and PIJ and via a third portal medial and distal. In our hospital OC fragments of the PIJ are routinely removed through a direct approach under arthroscopic control combined with a standard lateral portal and without resection of the membrane between TCJ and PIJ.

Material and methods: Medical records of patients in which an arthroscopy of the tarsus was performed between 1998 and 2012 at Dierenkliniek Emmeloord were reviewed. Cases where OC fragments from the PIJ were removed were included. The surgery reports, arthroscopic videos and perioperative radiographs were reviewed. Follow up information was obtained by telephone conversations with the owner and/or review of the race records where amenable.

Results: Eleven horses met the inclusion criteria. The median age was 2.2 years (range 1–9 years), and the breed distribution represented the hospital population (six Standartbreds, three Warmbloods, one Frisian and one Frisian-Mix). In all horses lesions in the TCJ were present in addition to the fragments removed from the PIJ. Lesions were located at the distal intermediate ridge of the tibia in four cases, the medial malleolus in four cases and at multiple locations in three cases. Ten of the eleven cases were re-evaluated six to eight weeks after surgery and all were free of lameness and with excellent cosmetic results. Long term follow up was available for 9 of the 11 cases. Of the six Standardbreds intended for racing, three raced, two did not due to reasons unrelated to the operated leg and one was lost to follow up. Of the five horses intended for riding, four were used as intended and one was lost to follow up.

Conclusion: OC fragments in the PIJ are rare and removal via standard arthroscopy portals in the TCJ with one additional portal directly into the dorsal pouch of the PIJ and without resection of the membrane between TCJ and PIJ results in favourable outcome.

ARE EQUINE VENIPUNCTURE SITES EQUAL WITH REGARD TO PACKED CELL VOLUME AND TOTAL SOLIDS RESULTS?

Dahan R, Sutton GA, Oreff GL, Kelmer G*. Veterinary Teaching Hospital-Koret School of Veterinary Medicine, The Robert H. Smith Faculty of Agriculture, Food & Environment, The Hebrew University of Jerusalem., Rehovot, Israel.

Introduction: Consistent and accurate packed cell volume (PCV) and plasma total solids (TS) values that can be obtained from several blood collection sites are crucial for the initial assessment and continuous monitoring of hospitalized horses. The primary objective of this study was to determine the agreement between the PCV and TS values in blood collected from the jugular vein (JV) compared with blood collected from the cephalic vein (CV) and the transverse facial venous sinus (TFVS) in healthy adult horses.

Material and methods: Blood samples were taken from 3 collecting sites: JV, CV and the TFVS. The PCV was measured using a standard Micro-Haematocrit Capillary Tube Reader and TS values (g/dl) were determined using a refractometer. The strength of linear correlation between the measurements was evaluated by Pearson correlation coefficient. The reproducibility was assessed by intraclass correlations. Agreement between PCV and TS results of TFVS and CV sampling sites to the JV sampling site was evaluated by limits of agreement (LOA). The degree of variation between the sampling sites was demonstrated by calculation of the coefficients of variation. Statistical analysis was carried out by SPSS 18.0 and Excel.

Results: Seventy two samples were taken from 24 healthy adult horses. Pearson correlations for the PCV and TS values between two of the collecting sites in comparison to the jugular vein were high ($r = 0.89–0.97$). The intra-class correlation coefficients were 0.92 (95% CI: 0.85–0.96) and 0.93 (95%CI: 0.87–0.97) for PCV and TS respectively. In comparison to the JV samples, the PCV sampled from the CV and the TFVS and the TS sampled from the CV were within 2 standard deviations of each other over 95% of the time and for the TFVS, 92% of the time in graphs of limits of agreement (LOA). The coefficients of variation were 2.6% (95% CI: 1.7–3.5%) for the PCV and 1.7% (95% CI: 1.3–2.1%) for the TS.

Conclusion: The high agreement and correlation reflect no clinically relevant differences between the PCV and TS values obtained from the cephalic vein or the transverse facial vein sinus in comparison to the jugular vein in healthy adult horses.

ALLEVIATION OF CHRONIC EPIPHORA BY REDIRECTION OF NASOLACRIMAL DRAINAGE INTO THE CAUDAL MAXILLARY SINUS

Robinson CS, Compston PC, Payne RJ*. Rossdale and Partners, Newmarket, United Kingdom.

Introduction: Nasolacrimal duct obstruction has multiple aetiologies including congenital atresia of the distal punctum and maxillary fracture. Described techniques to create distal punctum patency include endonasal dacryocystorhinostomy and catheterisation of the nasolacrimal duct. However, these techniques do not alleviate duct obstruction in other locations. Creation of a fistula from the lower eyelid canaliculus into the maxillary sinus has previously been described; follow-up in one horse showed no signs of epiphora three years postoperatively. The objective of this study is to describe minimally invasive diversion of lacrimal drainage into the caudal maxillary sinus (CMS).

Materials and Methods: Five horses were included in the study. Nasolacrimal duct obstruction aetiology included ductal atresia ($n = 3$), facial trauma ($n = 1$) and lymphoma ($n = 1$). The skin around the eye was clipped and aseptically prepared. A 10G-intravenous catheter is placed through the upper eyelid into the dorsal fornix of

the conjunctival sac and its stylet is removed. A 5-Fr-gauge Foley catheter (FC) is threaded through the intravenous catheter, which is subsequently removed. A tunnel is drilled through the lacrimal bone at the medial canthus into the CMS. A second, modified 10G-intravenous catheter (MIC; cannula cut-off to length = 3 cm) is placed into this tunnel. The FC is threaded through the MIC into the CMS, and its balloon is inflated. The MIC is withdrawn and cut away from the underlying FC. The FC is sutured to the skin above the eyelid, and then plaited into the forelock. The FC is deflated and removed 3-weeks postoperatively.

Results: There were no intraoperative problems. One horse dislodged the FC requiring replacement under general anaesthesia three days postoperatively. No further complications occurred. Follow-up data are available for four horses. One was euthanized for unrelated reasons 10-weeks postoperatively. For three horses no epiphora had occurred 28–46 months postoperatively.

Conclusions: This is the first reported case series of a minimally invasive technique using an indwelling FC to create lacrimal drainage. No long-term care is required after FC removal. Postoperative complications are few and long-term outcome appears favourable.

FACTORS INFLUENCING SURVIVAL AND MORTALITY RATES. A RETROSPECTIVE STUDY OF 1588 EQUINE DANISH COLIC CASES

Christophersen MT[1], Dupont NH[1], Andersen PH[2]. [1]Department of Large Animal Sciences, Faculty of Health and Medical Sciences, Copenhagen University, Taastrup, Denmark, [2]Department of Clinical Sciences, Swedish Agricultural University, Uppsala, Sweden.

Introduction: Outcome of colic treatment is of great interest to clinicians, horse owners and insurers. We therefore decided to describe and analyze characteristics in horses with signs of colic referred to the University Hospital for Large Animals (UHLA) over a 10-year period.

Material and methods: In this retrospective descriptive study each horse was, before admittance, evaluated by a referring veterinarian on one or several occasions. Records were screened for variables relating to the history and signalment of the horse, for diagnosis and treatment of the colic (medical or surgical) and for outcome. The number of horses surviving to the point of discharge in the medical and surgical group was used to calculate overall short-term survival rates. Mortality for horses in the surgical group was noted at several critical control points.

Results: The overall survival rate for colic horses was 68%. In the medical group survival was 87%. Overall, 31% of horses were given a diagnosis requiring surgical intervention. Surgical survival rate varied from 28% of all horses with a surgical diagnosis, to 42% of horses that underwent surgery, to 75% of horses that were allowed to recover. Horses suffering from a small intestinal lesion had a higher rate of mortality than those with a large intestinal disease, regardless of whether the disease was medical or surgical. Strangulating lesions had a poorer prognoses than non-strangulating lesions. Euthanasia during hospitalization was a major impact-factor on short term survival. Reasons for euthanasia were financial constraints, in some cases linked to lack of insurance, and the anticipation of weak athletic performance postoperatively. The proportion of medical and surgical cases differed among the other reported studies in a statistically significant way.

Conclusion: When a horse is allowed to recover from surgery, the chances of short-term survival are good, regardless of nationality. Wide variations exist in attitudes to euthanasia including cultural aversion to euthanasia. By contrast, in Denmark, there is pronounced concern about suffering among companion animal owners, and euthanasia is therefore often preferred as a way of ending suffering. We conclude that studies of owner's attitudes to suffering and euthanasia will need to be conducted in qualitative interview studies. If survival rates are to be used as an indicator of the quality of care in colic treatment, and if they are to permit institutions, techniques and surgeons to be compared, the use of illness severity scores and a predefined set of reasons for euthanasia will be needed in prospective studies conducted in the future.

SURGICAL TREATMENT OF STRESS URINARY INCONTINENCE IN A 20 YEAR OLD SB BROODMARE BY A MODIFIED HUMAN TRANSVAGINAL TAPE SLING (TVT) TECHNIQUE

De Beauregard T*, De Vendin C, Lowery K. Equine clinic Meslay du maine, Meslay du Maine, France.

Introduction

Urinary incontinence in the mare is a rare clinical condition and to our knowledge no effective treatment has been published. Our goal was to adapt a human surgical technique called TVT (TransVaginal Tape Sling) to improve the horse's quality of life and if possible a return to reproduction.

Case description

A 20 yo SB brood-mare was presented with signs of urovagina. A Mckinnon procedure was performed which resulted in an immediate disappearance of the urovagina, but signs of urine scalding were still present. Urine scalding was abundant and the mare showed signs of "female stress urinary incontinence" a human pathology, describing that when the mare was moving, urine expelled out of the vulva. On palpation, the urethral sphincter seemed to be at least a little potent and contractions were felt. Cystoendoscopy revealed a contractile bladder with a layer of very thick discharge on a very irritated mucosa.

Surgery: The mare was restrained in stocks, sedated and an epidural anaesthesia was performed. A mare speculum was used to access the urinary meatus. A urinary catheter was placed and dissection of the vaginal floor dorsally to the meatus was performed in order to dissect and isolate the neck of the bladder. When the neck was isolated, a wire passer was inserted ventrally to the bladder's neck in order to pass a hand-made mesh. Two polyamide monofilament Crinoruban proplapsus mesh (40 × 1,5 cm) were attached on each side of a Polyester mesh (50 × 30 cm) wrapped on itself, with a polyamide 1 suture. This was passed under the bladder's neck placing the polyester mesh under the bladder neck.Then a 25 cm half curved drain passer was passed in the lateral wall of the vagina, exiting in the muscles just medially to the tuber ischiaticum. This allowed us to pass the left part of the combined mesh. The same procedure was performed on the right side. The mesh was attached to the skin. As the mesh was tightened on each side, the bladder neck rose dorsally and slightly caudally.

Results

The mare urinated normally. However, tension on the mesh released with time and when opening the vulva lips, a small amount of translucent urine was escaping.

Discussion

Urinary stress incontinence can occur in mares after a difficult foaling. The exact pathogenesis of the disorder is not totally understood but it is presumed that pelvic muscles are not strong enough to keep the opening from the bladder neck closed when physical stress occurs. In this mare concomittent intrinsic sphincter deficiency could not be proven and sphincter contractions seemed to occur. Elevation of the bladder neck with a transvaginal tape exiting medially to the tuber ischiadicum was efficient in resolving incontinence in an old broodmare. However, the exact tension to be applies on the tape at the time of surgery can be the critical point of the surgery.

PROGNOSIS FOLLOWING INTERNAL FIXATION OF CHRONIC PROXIMAL PHALANGEAL FRACTURES IN HORSES: 31 CASES

Velloso Alvarez A, Coté N*, Desjardins MR*. Milton Equine Hospital, Campbellville, Ontario, Canada.

Introduction: In the literature, there are several reports that confirm a favorable prognosis for return to racing after recovering from a midsagittal proximal phalangeal fracture repair. These fractures are observed mostly in racehorses due to the surfaces they train or race on. In this review, we focus on 31 cases of chronic midsagittal fractures that were unresponsive to conservative management or undiagnosed in the acute phase.

Material and methods: Medical records of all horses admitted at Milton Equine Hospital with chronic midsagittal proximal phanageal fractures treated surgically by lag screw fixation were reviewed. In some horses conservative management was first attempted and in the rest of them the time since the horse had sustained the fracture was unknown. In order to consider a fracture as chronic, a periosteal reaction had to be observed.

Results: Seventy-seven percent continued with their athletic career. Of this group, 91% percent returned to the same or better level of performance. There was a significant correlation between prognosis and fracture type, with a better prognosis for short fractures (Type 1).

Discussion: Noncomminuted midsagittal fracture of the first phalanx can be approached by conservative or surgical treatment. Even though there is evidence that some horses can respond favorably to conservative management, no study has clearly identified the factors that would render a conservative approach appropriate or inappropriate. In the present study we found that internal fixation of chronic fractures of the proximal phalanx carries a good prognosis (77% return to athletic carreer). The literature cites two studies in which the prognosis for return to racing at a similar or lower level was 89% or 88% respectively. However, those studies did not make a clear distinction between chronic and acute fractures. We believe that acute phalangeal fractures are best treated with internal fixation. The current study can however be used as evidence to promote internal fixation also for chronic, non-healing fractures.

3T MRI AND HISTOLOGICAL EVALUATION OF VASCULARIZATION OF EPIPHYSEAL GROWTH CARTILAGE OF FEMORAL TROCHLEAS OF FOALS PREDELICTED TO OSTEOCHONDROSIS

Martel G[1], Kiss S[2], Gilbert G[2], Moser T[2], Laverty S*[1]. [1]Comparative Orthopaedic Research Laboratory, Faculty of Veterinary Medicine, Uni. of Montreal, Montreal, Canada, [2]Hôpital Notre Dame, Université de Montréal, Montreal, Canada.

Introduction: A focal disturbance of vascularization of epiphyseal growth cartilage (EGC) during endochondral ossification is now recognized as one of the earliest events on the pathway to osteochondrosis (OC) and is hypothesized to occur early in

life. The aim of this study was to evaluate a novel 3T MRI susceptibility-weighted imaging (SWI) sequence for visualization of blood vessels and to identify abnormalities in EGC of distal femoral trochleas of foals (Day 1) predisposed to OC. This project was part of a larger study involving embyo transplant and imaging of foals with an OC background (both parents OCD; n = 5) and control foals (obtained from the hospital following euthanasia).

Material and methods: Hindlimbs (n = 17) of the foals were imaged post-mortem in a 3T MRI using a VISTA sequence for morphological analysis and SWI to map EGC femoral vessels. Site matched histological sections were obtained and stained with Safranin O and fast green. Regions of interest (ROIs; n = 9), including OC predilection sites of the distal femoral trochlea, were selected and MRI and corresponding histological data were assessed. Cartilage thickness, ossification front irregularity and vascular area were assessed quantitiatively employing Image J software on MRI and corresponding histological sections. Vascular patterns of EGC of the distal femur could be observed on SWI images. Small focal and mutifocal areas lacking vessels were identified on histologic slides, but both in control and OC specimens. These focal avascular regions could not be seen on SWI images because of the insufficient resolution. There were no significant differences between cartilage length, ossification front irregularity and vascular area between control and OC in the 9 ROIs.

Conclusion : SWI MRI sequence permitted the evaluation of vascularization of EGC, but the resolution was insufficient to reveal small focal areas of lack of vessels. No differences in vascular area were identified between control and OC specimens, indicating that no abnormal vascular changes in the EGC are seen in the first hours of life of foals.

EVALUATION OF THE PHARMACOKINETICS OF MARBOFLOXACIN IN COMBINATION WITH IMIPENEM FOLLOWING REGIONAL LIMB PERFUSION IN HORSES

Dahan R[1], Britzy G[2], Segev G[1], Sorek S[1], Kelmer G[*1]. [1]Koret School of Veterinary Medicine, the Hebrew University of Jerusalem, Rehovot, Israel, [2]The Kimron Veterinary Institute, National Residue Control Laboratory, Rehovot, Israel.

Introduction: Combining antimicrobials of different classes can aid in broadening the antimicrobial spectrum as well as decreasing the emergence of resistant bacteria. Our goal was to evaluate the pharmacokinetics, feasibility and safety of using a combination of marbofloxacin/imipenem in regional limb perfusion of standing horses.

Material and methods: Six healthy adult horses participated in the study. After being sedated, a tourniquet (Esmarch Bandage) was applied on a randomly selected front leg, approximately 10 cm proximal to the site of injection. A perfusate of 1 gram of marbofloxacin and 500 mg of imipenem diluted to 100 ml was injected using a 22 g butterfly catheter. Synovial samples were collected from the metacarpophalengeal (MCP) joint and blood samples were collected from the jugular vein on times: 0, 0.5 (immediately after the tourniquet was released), 2, 6, 12, 24 and 36 hours after injection. All samples were analyzed for marbofloxacin and imipenem concentration using liquid chromatography tandem mass spectrometry.

Results: Maximum concentration (Cmax) of imipenem and marbofloxacin in the MCP joint was 71 and 73 μg/ml, respectively. The area under the curve (AUC) of imipenem and marbofloxacin in the MCP joint was 148 and 186 μg-hr/ml, respectively.

Conclusions: The results of this study indicate that using IV-RLP with the combination of marbofloxacin and imipenem is safe, offers a broad spectrum of antimicrobial coverage and has no negative pharmacokinetic effects compared to using each antibiotic on its own.

EVALUATION OF EQUINE FEMOROTIBIAL JOINT SPACE WIDTH

Trencart P, Alexander K, Delasalle J, Laverty S. Comparative Orthopaedic Research Laboratory, Faculty of Veterinary Medicine, Uni. of Monntreal, Monntreal, Canada.

Introduction: Lesions of the femorotibial (FT) joints are an important cause of lameness in horses and osteoarthritis (OA) of the FT joints is poorly described in the literature. Radiographic examination including an assessment of the joint space width (JSW) remains a common form of assessment of FT OA in both lameness cases and prepurchase examinations. We hypothesized that minimal JSW (mJSW) measurement varies with radiographic view angle in the equine FT.

The aims of this study were to: 1) Measure the mJSW in both lateral and medial FT compartments on standing caudo-cranial (Cd-Cr) radiographic views of normal joints 2) Compare the accuracy of measurements with a software program designed for human patients and 3) Identify the ideal angled Cd-Cr view to measure mJSW.

Material and methods: Standing caudo-cranial (Cd-Cr) views of 22 healthy FT joints in racehorses (n = 11) were taken at various angles in both a sagittal (5°, 10° and 15°) and transverse plane (+5° and −5°). Minimal JSW of the medial or lateral FT joint compartments were measured manually by 2 readers and also employing a digital image analysis system. Inter-reader reproducibility of mJSW measurements and comparison to digital measurements were assessed with an intraclass correlation coefficient [ICC]. Post hoc tests were employed to identify the view angle that provided the largest JSW measurements.

Results: There was an excellent agreement between the 2 readers on manual measurements of mJSW in the medial FT compartment (ICC = 90.7%), but not the lateral compartment (ICC = 62.0%). The agreement between the radiologist's manual assessment and the software measurements, on the same images, of the medial or lateral FT joint compartments, was excellent in the medial (ICC 90.1%) compartment but lower in the lateral (ICC 81.3%) compartment.

Software measurement results: There was a significant difference ($P = 0.0009$) in the mean mJSW in the medial FT compartment on software measurements obtained from different view angles. The angle of the Cd-Cr view in the sagittal, but not the transverse plane, had a significant effect on JSW measurements The mean mJSW measurement in the medial compartment, was significantly higher in the sagittal 10° angle group when compared to 5° and 15°. The measurements of the lateral JSW were non- interpretable, because of variation due to view angle.

Conclusion: Manual and digital measurements of mJSW in the medial FT joints are reproducible and optimal on the 10° Cd-Cr views. Measurements of mJSW in the lateral compartment are unreliable due to excessive variation because of anatomy and radiographic angle.