

Annamaria Iagnocco · Giulio Coari · Giulia Buzzi
Raffaele Guerrisi · Guido Valesini

Magnetic resonance imaging of peripheral osteoarticular tuberculosis compared with sonography and standard radiographs

Received: 5 June 2002 / Accepted: 27 December 2002 / Published online: 11 February 2003
© Springer-Verlag 2003

Abstract An increased incidence of osteoarticular tuberculosis (TBC) has been reported during recent years. We report a case of TBC arthritis of the knee in which magnetic resonance tomography (MRI) provided images suggestive of this finding, in contrast to plain radiographs and joint sonography. The diagnosis was confirmed with culture for tuberculous bacilli. As far as we know, this is the first study comparing radiographs, joint sonography, and MRI.

Keywords Joint sonography · Magnetic resonance imaging · Osteoarticular tuberculosis

Introduction

Recently, important changes in the epidemiology of tuberculosis (TBC) have led to increased incidence of the disease in industrialized nations. This is considered due to different factors such as increased numbers of foreign-born people, the rise in the incidence of human immunodeficiency virus (HIV), and the more frequent use of intravenous drugs [1, 2]. In particular, osteoarticular involvement has recently shown a marked rise and it presently accounts for 10% of extrapulmonary TBC [3]. Five different articular clinical syndromes are commonly recognized: Pott's disease, peripheral

arthritis, osteomyelitis and dactylitis, tenosynovitis and bursitis, and Poncet's disease [3]. Spondylitis (Pott's disease) is the most common clinical syndrome, occurring in about 50% of patients. Peripheral arthritis accounts for 30% of cases and shows monoarticular involvement in 90% of subjects; it usually results from the hematogenous spread of tuberculous bacilli from a primary focus, either pulmonary (30%), genitourinary (20%), or unidentified (50%). The weight-bearing joints are usually affected, involvement of the knee and hip representing about 50% of cases of peripheral arthritis [3]. Poncet's disease, which is considered an aseptic polyarthritis with the clinical appearance of reactive arthritis, appears less often. The other clinical syndromes are more rare.

We present a clinical report of knee joint arthritis due to tuberculous bacilli studied with plain radiographs, sonography, and MRI. The MRI provided images specifically suggestive of TBC arthritis.

Case report

A previously healthy, 46-year-old white female presented with a 2-month history of right knee pain, swelling, and limited motion with a progressive worsening of symptoms. Weakness was also present. On examination, knee swelling was apparent, and palpation demonstrated the presence of mild effusion; no other organs involvement was shown. Erythrocyte sedimentation rate (ESR) was elevated at 30 mm/h, routine biochemistry was within normal laboratory ranges, and autoantibody screen was negative.

Chest radiography was normal. Plain radiographs of both knees showed narrowing of the joint space and juxta-articular osteoporosis of the right knee (Fig. 1). Ultrasound revealed joint effusion of the right knee and mild proliferation of the synovial membrane (Fig. 2); power Doppler sonography showed slightly increased vascularity. Right-knee MRI revealed synovial proliferation, with enhancement of the signal after gadolinium injection, and the presence of joint effusion (Fig. 3); several chondral and subchondral bone erosions were also shown (Fig. 4). The MRI findings were suggestive of TBC arthritis. Synovial fluid analysis was then performed: white cell count showed 16,000 cells/mm³, 68% of neutrophils were found, glucose gradient was 70 mg/dl, synovial fluid smear for acid-fast bacilli was negative, and culture for tuberculous bacilli was positive. Skin testing for TBC was positive.

A. Iagnocco · G. Coari · G. Valesini
Medical Therapy Department, Rheumatology Unit,
"La Sapienza" University, Rome, Italy

G. Buzzi · R. Guerrisi
Experimental Medicine Department Imaging Unit,
"La Sapienza" University, Rome, Italy

A. Iagnocco (✉)
Cattedra di Reumatologia, Dipartimento Terapia Medica,
Policlinico Umberto I., Viale del Policlinico 155,
Rome 00161, Italy
E-mail: aiagnocco@tiscali.it
Tel.: +39-06-49970678
Fax: +39-06-49970386

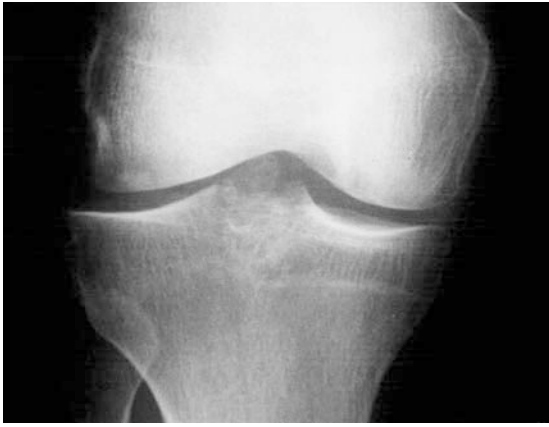


Fig. 1 Plain radiograph of the right knee demonstrating narrowing of the joint space and juxta-articular osteoporosis

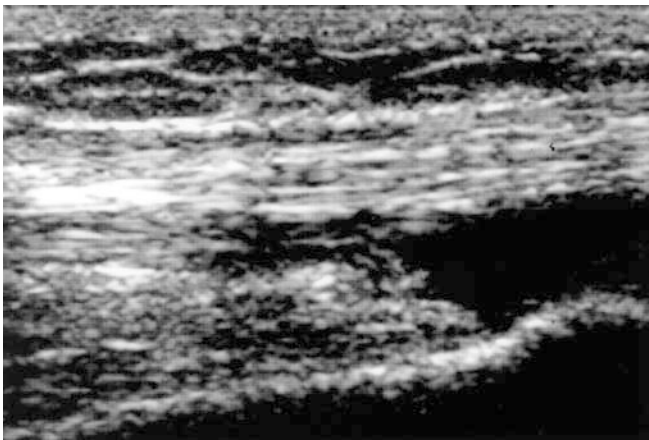


Fig. 2 Sonography of the right knee revealing joint effusion and mild proliferation of the synovial membrane

Discussion

Peripheral arthritis accounts for 1–3% of osteoarticular TBC. Following hematogenous spread of the tuberculous bacilli from the primary focus of infection, a mild, slowly progressive synovitis usually appears. Monoarticular involvement accounts for about 90% of cases [4], and the knee and hip are often affected (50%). The more frequent involvement of weight-bearing joints is probably due to the effects of trauma [3]. Tuberculous arthritis presents with slight symptoms: joint swelling and pain exacerbated by walking and activity are the most common manifestations. They are due to synovial proliferation and effusion. Inflammatory signs are mild or absent. Limited range of motion may be present and is caused by pain and synovial hyperplasia. The synovial membrane is the main anatomic structure involved, with marked proliferation and caseating and noncaseating granulomata with multinucleated giant cells.

Diagnosis is very difficult, and failure in early recognition of the disease is frequent. In fact, tuberculous



Fig. 3 MRI of the right knee. T1-weighted, axial image after gadolinium plus diethylene triaminopentaacetic acid (DTPA). Visible are synovial proliferation, with enhancement of the signal after gadolinium injection, and joint effusion



Fig. 4 MRI of the right knee. Gadolinium enhanced, T2-weighted, coronal image. Severe chondral and subchondral bone erosions are seen associated with a meniscal dislocation

arthritis is an indolent process, symptoms are mild and nonspecific, there is usually no evidence of disease in other organs, and radiographic and laboratory findings are not helpful. Radiography shows soft tissue swelling and periarticular osteopenia for several months after the appearance of symptoms. Blurring of the subchondral bone, marginal erosions, and joint space narrowing are late findings. Routine biochemistry does not show any specific alteration, synovial fluid is inflammatory [5], and ESR is usually elevated. Reliable diagnostic methods include synovial biopsy, which demonstrates granulomata in more than 90% of specimens, and cultures of synovial fluid that are positive in 80% of cases [5].

We present a case of peripheral TBC arthritis involving the right knee in which imaging study was conducted, as biochemical and clinical investigations showed only generic signs of inflammatory process. In particular, radiographs indicated the presence of early arthritis. Joint and power Doppler sonography showed signs of mild and nonspecific synovitis. In contrast, MRI findings were suggestive of TBC arthritis, as they showed erosive changes within the joint cartilage and the subchondral bone that were not evidenced with plain radiographs or ultrasound; moreover, synovial proliferation (with enhancement of the signal after gadolinium injection) and joint effusion were revealed. The lack of evidence of the disease in other organs, the indolence of the process, and the presence of mild and nonspecific symptoms made early recognition of the disease difficult.

Previous imaging studies about osteoarticular TBC describe almost exclusively tuberculous spondylitis [6, 7, 8] and osteomyelitis [9, 10, 11]. In contrast, TBC arthritis is rarely reported [12, 13, 14, 15], and imaging studies comparing radiographs, joint sonography, and MRI have never been described. In particular, this study proved the high sensitivity of MRI for diagnosing TBC arthritis, as it provided images that were suggestive of this disorder.

References

1. Haas DW, Des Prez RM (1994) Tuberculosis and acquired immunodeficiency syndrome: a historical perspective on recent developments. *Am J Med* 96:439–450
2. Cantwell MF, Snider DE, Cauthen GM, Onorato IM (1994) Epidemiology of tuberculosis in the United States. *JAMA* 272:535–539
3. Bocanegra TS (1999) Mycobacterial, brucella, fungal and parasitic arthritis. In: Klippel JH, Dieppe PA (eds) *Rheumatology*. Mosby, London, 6.4.1–6.4.12
4. Garcia-Kutzbach A (1988) Tuberculosis arthritis. In: Espinoza LR, Goldenberg DL, Arnett F, Alarcón GS (eds) *Infections in the rheumatic diseases. A comprehensive review of microbial relations to rheumatic disorders*. Grune and Stratton, New York, pp 131–138
5. Wallace R, Cohen AS (1976) Tuberculous arthritis. A report of two cases with review of biopsy and synovial fluid findings. *Am J Med* 61:277–282
6. Mehta JS, Bhojraj SY (2001) Tuberculosis of the thoracic spine. A classification based on the selection of surgical strategies. *J Bone Joint Surg Br* 83:859–863
7. Bhojraj SY, Shetty N, Shah PJ (2001) Tuberculosis of the craniocervical junction. *J Bone Joint Surg Br* 83:222–225
8. Cusmano F, Calabrese G, Bassi S, Branislav S, Bassi P (2000) Radiologic diagnosis of spondylodiscitis: role of magnetic resonance. *Radiol Med* 100:112–119
9. Gouliamos AD, Kehagias DT, Lahanis S, Athanassopoulou AA, Mouloupoulou ES, Kalovidouris AA, et al (2001) MR imaging of tuberculous vertebral osteomyelitis: pictorial review. *Eur Radiol* 11:575–579
10. Shah J, Patker D, Parikh B, Parmar H, Varma R, Patankar T, Prasad S (2000) Tuberculosis of the sternum and clavicle: imaging findings in 15 patients. *Skeletal Radiol* 29:447–453
11. Dhillon MS, Singh P, Sharm R, Gill SS, Nagi ON (2000) Tuberculous osteomyelitis of the cuboid: a report of four cases. *J Foot Ankle Surg* 39:329–335
12. Moore SL, Rafii M (2001) Imaging of musculoskeletal and spinal tuberculosis. *Radiol Clin North Am* 39:329–342
13. Soler R, Rodriguez E, Remuinan C, Santos M (2001) MRI of musculoskeletal extraspinal tuberculosis. *J Comput Assist Tomogr* 25:177–183
14. Ehara S (2001) Osteoarticular tuberculosis. *Semin Musculoskelet Radiol* 5:107–111
15. Kluppel D, Grunewald T, Hillrichs B, Sangmeister M (2000) Tuberculous coxitis. Case report and surgical treatment. *Unfallchirurg* 103:401–404