Clinical rheumatology, 1995, **14**, N° 5 511-514

Chondrocalcinosis: Sonographic Study of the Knee

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Summary **Sonography of the knee was performed in 28 patients with chondrocalcinosis and in 46 normal subjects. In each joint the authors examined synovial membrane, articular cartilage of femoral condyles, synovial fluid and menisci; they also searched for Baker's cysts. A significant thickening of synovial membrane was present. In 43 joints sonography showed linear hyperechoic images within condylar cartilage; they were parallel to bone surface and were interpreted as calcifications because of the coincidence with radiographic images. A significant thinning of articular cartilage was also found. Sonography of the knee is a useful method of examination for the evaluation of articular changes in chondrocalcinosis.**

Key words **Chondrocalcinosis, Sonography, Knee**

INTRODUCTION

Sonography (SN) has not yet been applied (1-11) to the study of articular changes caused by chondrocalcinosis (CC). For this reason the authors examined articular structures of the knee in patients with CC and evaluated the appearance of calcifications within articular cartilage and menisci.

MATERIALS AND METHODS

The knees of 28 patients (14 males and 14 females) with CC were examined; their mean age was of 58.8 years (range 32-81). All subjects were hospitalized in the Rheumatology Department of Rome University «La Sapienza». In all patients anteroposterior and lateral radiographs of the knee had been performed. The diagnosis of CC was made according to criteria reported by McCarty (2). Cartilaginous calcifications of femoral condyles were verified by radiological examination (25 subjects). Birefrangent crystals were found in synovial fluid of 23 patients. Meniscal calcifications checked on radiographs were present in 41 knees (73.2%). The mean illness duration was of 6.8 years (range 2-9).

The diagnosis of CC was definite in 18 cases and probable in 10. In the 3 patients with negative radiographs the crystals were found in the synovial fluid (Table I).

SN was performed using a 7.5 MHz linear probe. Synovial membrane, articular cartilage of femoral condyles, synovial fluid and the calf were studied. Synovial membrane was examined in lateral and supra-patellar compartments; its thickness was measured and villi and septa were searched for.

The thickness of articular cartilage was measured. Changes of the two surfaces (cartilage-bone and cartilage-soft tissues) and scattered echoes within the translucent band were detected. When the presence of effusion prevented the correct evaluation of the cartilage, measurements were done after arthrocentesis; in 2 knees it was not possible to completely evacuate synovial fluid and measurement was not reliable. Using Aisen's technique (12, 13), measurements were taken at 3 specified points (A, B and C) just above the superior margin of the patella and then they were repeated 2 cm above it. Afterwards the mean value of each set of results was calculated. The quality of cartilage surfaces was examined classifying them as regular or irregular. Moreover hyperechoic images, parallel to the surfaces, were searched for. They were examined both in longitudinal and transverse scannings along femoral condyles. They were classified as punctiform when their length was less than 1.5 mm and linear when it was longer. They were interpreted as cartilaginous calcifications due to the deposition of calcium pyrophosphate, comparison of radiographs having shown the coincidence of the two findings (Fig. 1).

Effusion was searched for and its sonographic aspect was evaluated indicating whether it appeared anechoic or if it had scattered echoes. In the calf, Baker's cysts were searched for and their volume was calculated. Meniscal calcifications were also detected.

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Table I: *Changes in the joints examined*

	No. of knees 56	%
Radiographic changes		
present	50	89.3%
absent	6	10.7%
Pyrophosphate crystals in synovial fluid		
examination	46	
present	46	100%
absent	–	
Symptoms		
present	42	75%
absent	14	25%

Incidence of diagnostic criteria for CC in the joints examined.

Results were compared with those obtained by examination of 46 healthy subjects of the same mean age. "Chi-square" test and Student's t-test were used for statistical analysis.

RESULTS

Table II reports the results obtained by the examination of the knees of patients with CC and of healthy subjects. The mean thickness of synovial membrane was 5.3 mm (range 3-11 mm); the higher values were 11 mm in one case and 9 mm in two cases. Synovial villi were present in 10.7% (6 knees) of joints and septa were never found. Articular cartilage appeared thinner in patients with CC as compared to normal subjects; there were significant differences: in A its mean thickness was 0.96 mm, in B it was 1.48 mm and in C it was 1.16 mm.

The surfaces were irregular in 43 knees (76.8%). In 43 joints (76.8%) hyperechoic images, parallel to the surfaces were present. They were linear in 26 knees (60.5%) and punctiform in 30 joints (69.8%); both findings were present in 13 cases (30.2%). Statistical analysis of the results obtained did not show any significant differences between radiographic and sonographic findings of cartilaginous calcifications.

In 3 joints (5.4%) calcifications within the posterior horn of medial meniscus were visible. Significant differences were present between radiographic and sonographic findings (Table III).

Table II: *Survey and results*

	Subjects with CC	Normal subjects	Statistical significance
No. of subjects	28	46	
males	14	21	
females	14	25	
Mean age	58.5 (32-81)	53.1 (42-74)	
Mean illness duration	6.8 (2-9)	–	
No. of knees	56	92	
Synovial membrane:			
Thickness mm	5.3 (3-11)	2.9 (2-5)	$p<0.001$
Presence of villi	6 (10.7%)	0	
Presence of septa	0	0	
Condylar cartilage:			
Thickness at A mm	0.96	1.91	$p<0.0005$
B mm	1.48	2.03	$p<0.001$
C mm	1.16	1.92	$p<0.001$
Aspect: regular	13 (23.2%)	80 (86.9%)	$p<0.000.001$
irregular	43 (76.8%)	12 (13.1%)	$p<0.000.001$
Calcifications:	43 (76.8%)	0	
linear	26 (60.5%)		
punctiform	30 (69.8%)		
meniscal	3 (5.4%)		
Effusion:	7 (12.5%)	0	
anechoic	5 (71.4%)		
scattered echoes	2 (28.6%)		
Baker's cysts	1 (1.8%)	0	

Sonographic study of synovial membrane and articular cartilage of the knee showed significant differences between patients with CC and normal subjects.

Table III: *Presence of calcifications*

		Sonographic finding					
		Femoral cartilage			Menisci		
		+	–	total	+	–	total
Rx finding	+	40	10	50	3	38	41
	–	6	0	6	0	15	15
	total	46	10	56	3	53	56

Correlation between cartilaginous and meniscal calcifications at radiographic and sonographic examinations.

Effusion was found in 7 knees (12.5%); it was anechoic in 5 joints (71.4%) and it had scattered echoes twice.

Only one Baker's cyst was found. Its volume was 37,2 ml, there were scattered echoes within it and appeared to be no connecting channel with the joint.

CONCLUSIONS

In CC changes of synovial membrane (thickening, synovial villi, effusion) were similar to those found in inflammatory diseases (14-17); those findings show that CC is a disease with inflammatory factors which often attack the AC with degenerative changes caused by old age of patients (18-19). Moreover synovial phlogosis may increase cartilaginous damage and it could justify the thinning of cartilage in CC, which is similar to that of serious osteoarthritis. The typical finding of CC was the presence of hyperechoic, linear images within the cartilage, parallel to bone surface (Table III). They appeared both in longitudinal and transverse scannings and were found only in CC.

The high sensibility of radiography should not lead us to underestimate the importance of SN: in 3 patients without radiologic findings of the disease the diagnosis of CC was suspected by the sonographic demonstration of cartilaginous calcifications and it was confirmed by the examination of synovial fluid.

In the 46 normal subjects linear hyperechoic images were never present. Upon sonographic examination of cartilage the rare possibility of the appearance of artifacts simulating cartilaginous calcifications must be considered; for this reason the diagnosis of CC must always be confirmed. There were significant differences between the radiologic and sonographic indications of meniscal calcifications (Table III). This confirms that SN is not sensitive enough for a correct and complete study of menisci.

It must be acknowledged that SN is a useful imaging technique in the study of CC both for diagnosing and monitoring of articular damage and appraising the effects of possible therapy.

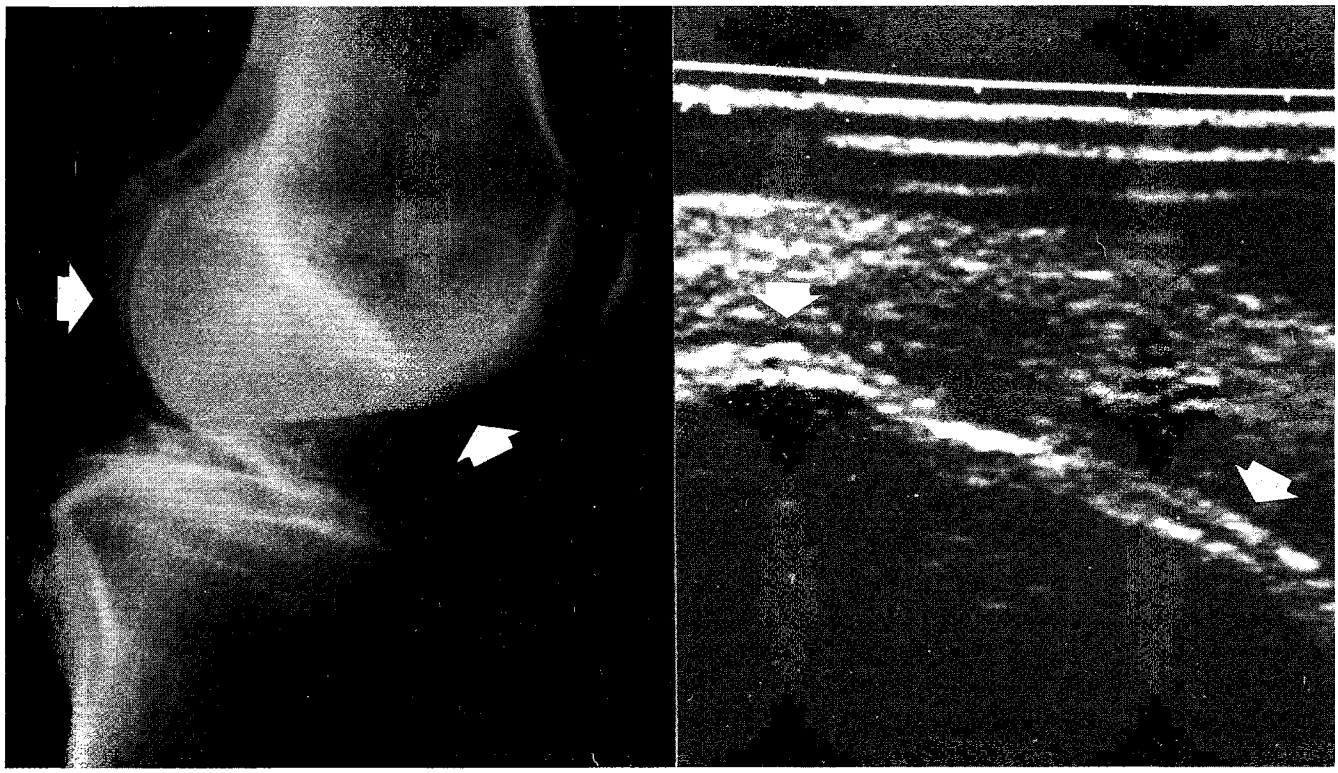

Fig. 1: Radiographic (a) and sonographic (b) findings of cartilaginous calcifications in CC.

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Received: 21 March 1994
Revision-accepted: 28 December 1994
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