Calcium Pyrophosphate Crystals Detected by Ultrasound in Patients without Radiographic Evidence of Cartilage Calcifications

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There is a consistent body of evidence supporting the role of ultrasound in patients with rheumatoid arthritis (RA)[1,2]. More recently, ultrasound is gaining interest among rheumatologists for the assessment of calcium pyrophosphate dihydrate (CPPD) disease[3,4,5], because it has demonstrated high specificity in the detection of pathological findings indicative of pyrophosphate crystal deposits[6,7,8].

The definite diagnosis of CPPD disease requires identification of CPPD crystals in the synovial fluid by polarizing light microscopy. However, aspiration of the synovial fluid is not always possible for many reasons. In those cases, imaging modalities are important as surrogate diagnostic tools.

We describe 2 cases showing the diagnostic potential of ultrasound in the detection of pyrophosphate crystal deposits in patients with negative radiographic evidence of cartilage calcifications.

Case 1. A 58-year-old woman presented to our clinic for a history of recurrent attacks of monoarthritis at right knee level, associated with slight fever. These episodes were characterized by a rapid onset of severe pain, marked swelling, and functional impairment of the right knee joint. She had started treatment with nonsteroidal antiinflammatory drugs, with poor control of symptoms.

At admission, the physical examination revealed marked swelling of the knee with positive bulge sign. The laboratory tests showed an increase of the erythrocyte sedimentation rate (ESR; 33 mm/h, range 0–20) and C-reactive protein (CRP; 2.28 mg/dl, range 0–0.8). The uricemia was normal.

While the knee radiographs did not show relevant abnormalities (Figure 1A), the ultrasound examination documented the presence of moderate enlargement of the suprapatellar pouch, associated with huge bilateral calcifications within the hyaline cartilage of the femoral condyles (Figure 1A'-A"). Right knee arthrocentesis was performed under ultrasound guidance and the subsequent synovial fluid analysis confirmed the presence of CPPD crystals by compensated polarized light microscopy. On the basis of this, definite diagnosis of CPPD disease was made. Treatment with colchicine associated with a short-term course of oral 6-methylprednisolone was started, with satisfactory clinical control.

Case 2. A 62-year-old woman was admitted to our clinic for recent-onset synovitis of the left wrist and severe functional impairment associated with fever. Physical examination revealed a moderate joint swelling and marked tenderness in flexion-extension movements. Laboratory analyses documented an increase of both ESR (35 mm/h, range 0–20) and CRP (3.45 mg/dl, range 0–0.8). The other laboratory tests were all normal or negative (liver and renal function, uricemia, antinuclear antibody, antiextractable nuclear antigen, RA factor, antihepatitis B virus and antihepatitis C virus antibodies, p-antineutrophil cytoplasmic antibodies, and cytoplasmic antineutrophil cytoplasmic antibodies).

No relevant abnormalities were documented on the wrist radiograph (Figure 1B). Sonographic examination showed the presence of hyperechoic spots at the triangular fibrocartilage complex of the wrist (Figure 1B'). We extended the ultrasound examination to the contralateral wrist and to the knees, detecting mild synovitis of the left knee and calcifications at the knee meniscal level. Left knee arthrocentesis was carried out and CPPD crystals were observed in the synovial fluid by polarizing light microscopy. Diagnosis of CPPD disease was made and treatment with colchicine together with nonsteroidal antiinflammatory drugs was started, with good response.

Reasons for the relatively low sensitivity of radiographs in the detection of cartilage calcifications may include the bidimensional representation of the conventional radiography, which limits the whole evaluation of the cartilage because of superimposition of the bone. In addition, the lateral and tangential views, appropriate for the visualization of femoral hyaline cartilage, are not carried out as routinely as the posterior-anterior (PA) view. The PA view allows only for the detection of meniscal and hyaline cartilage calcifications between the femur and the tibial plate. Finally, pathological concomitant conditions such as severe knee osteoarthritis, frequently present in the elderly and in patients with CPPD, may impair the correct visualization of the cartilage because of relevant joint space narrowing.

To our knowledge, this is the first report demonstrating the potential of ultrasound to detect calcifications at both the hyaline cartilage and fibrocartilage level, revealing the diagnosis of CPPD disease in patients with negative radiographs.

The evidence suggests the use of ultrasound in patients with strong clinical suspicion of CPPD disease, in spite of negative radiographic findings.

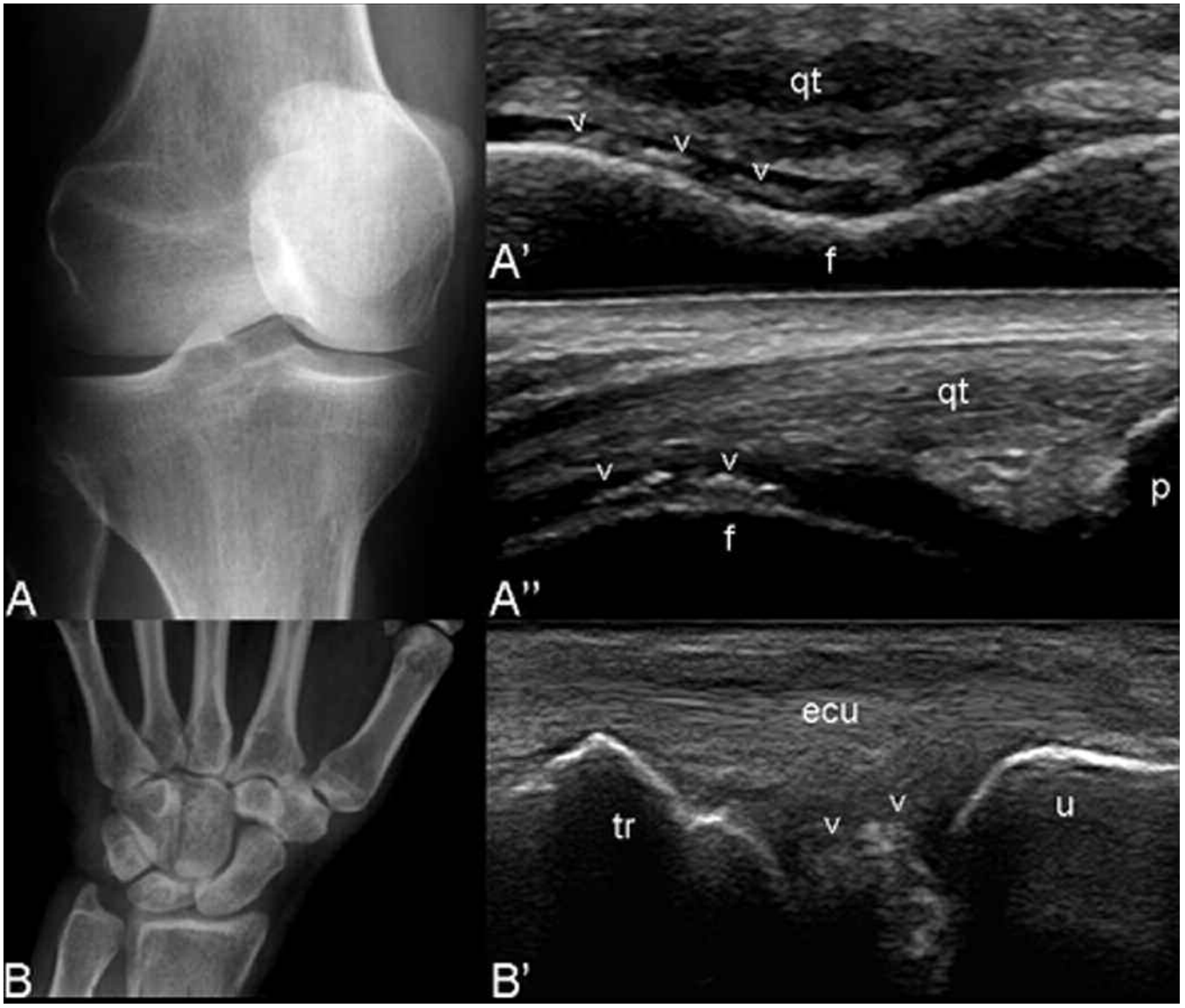

Figure 1A-B. Conventional radiography of the posterior-anterior view of the left knee (A) without evidence of calcifications at both the hyaline cartilage and lateral menisci level. Sonographic examination on suprapatellar transversal (A') and parapatellar longitudinal view (A") with the knee in maximal flexion, showing crystal deposits within the femoral hyaline cartilage (arrowheads). B. Conventional radiography of the anteroposterior view of left wrist without evidence of calcifications. B'. Longitudinal scan of the wrist showing crystal deposits within the triangular fibrocartilage (arrowheads). f: femur; p: patella; tr: triquetrum bone; u: ulna; qt: quadriceps tendon; ecu: extensor carpi ulnaris tendon.

REFERENCES

1. Filippucci E, Iagnocco A, Meenagh G, Riente L, Della Sedie A, Bombardieri S, et al. Ultrasound imaging for the rheumatologist. VII. Ultrasound imaging in rheumatoid arthritis. Clin Exp Rheumatol 2007;25:5-10.
2. Naredo E, Bonilla G, Gamero F, Uson J, Carmona L, Laffon A, et al. Assessment of inflammatory activity in rheumatoid arthritis: a comparative study of clinical evaluation with grey scale and power Doppler ultrasonography. Ann Rheum Dis 2005;64:375-81.
3. Grassi W, Meenagh G, Pascual E, Filippucci E. "Crystal clear" sonographic assessment of gout and calcium pyrophosphate deposition disease. Semin Arthritis Rheum 2006;36:197-202.
4. Fodor D, Albu A, Gherman C. Crystal-associated synovitis — ultrasonographic feature and clinical correlation. Ortop Traumatol Rehabil 2008;10:99-110.
5. Ciapetti A, Filippucci E, Gutierrez M, Grassi W. Calcium pyrophosphate dihydrate crystal deposition disease: sonographic findings. Clin Rheumatol 2009;28:271-6.
6. Filippucci E, Riveros MG, Georgescu D, Salaffi F, Grassi W. Hyaline cartilage involvement in patients with gout and calcium pyrophosphate deposition disease. An ultrasound study. Osteoarthritis Cartilage 2009;17:178-81.
7. Filippucci E, Scirè CA, Delle Sedie A, Iagnocco A, Riente L, Meenagh G, et al. Ultrasound imaging for the rheumatologist. XXV. Sonographic assessment of the knee in patients with gout and calcium pyrophosphate deposition disease. Clin Exp Rheumatol 2010;28:2-5.
8. Frediani B, Filippou G, Falsetti P, Lorenzini S, Baldi F, Acciai C, et al. Diagnosis of calcium pyrophosphate dihydrate crystal deposition disease: ultrasonographic criteria proposed. Ann Rheum Dis 2005;64:638-40.