Radiological features of knee joint synovial chondromatosis

E. Boninsegna[1], A. Fassio[2], M. Testoni[1], D. Gatti[2], O. Viapiana[2], G. Mansueto[1], M. Rossini[2]

[1]Department of Radiology; [2]Unit of Rheumatology, University of Verona, Italy

SUMMARY

Synovial chondromatosis (SC) is a rare condition with a very variable clinical presentation, thus making the diagnosis not immediate. We report a case of massive primary SC of the knee, properly evaluated with X-rays, ultrasonography and magnetic resonance imaging and successfully treated with an arthroscopic approach.

Key words: *Rheumatology; radiology; synovial chondromatosis.*

Reumatismo, 2019; 71 (2): 81-84

INTRODUCTION

Synovial chondromatosis is usually divided into primary and secondary forms. Secondary chondromatosis develops in the setting of prior trauma, osteoarthritis, osteonecrosis or other intra-articular pathology (1). The intra-articular bodies in the secondary form are usually fewer and more variable in size than in the primary form. Primary synovial chondromatosis (SC) is an uncommon benign condition whose exact prevalence is still unknown. The current literature seems to suggest a male-to-female ratio of 2:1 and most cases have been reported in patients aged 20-40 years (1, 2). SC is a metaplastic chondroid proliferation within the joint, bursa or tendon sheath, in which mesenchymal cells located in the synovial membrane form one or more cartilage nodules (3). These nodules can detach and become uniform loose bodies within the joint and may undergo secondary calcification and proliferation (1). To date, case series have described its location in more than thirty sites (4), the knee (70%) and hip (20%) being the most frequent (5). Tenosynovial involvement has been reported as well (6). We report a case of massive primary SC of the knee, properly evaluated with X-rays, ultrasonography and magnetic resonance imaging (MRI) and successfully treated with an arthroscopic approach.

CASE REPORT

We present the case of a 26-year-old man complaining of mild pain and tenderness in the left knee and consequent worsening limping gait for 12 months prior to our first evaluation. The symptoms first occurred after a mild trauma. Clinical examination revealed a swollen left knee with limited flexion; at plain radiographs bone lesions were not present, but some small, well-defined, juxta-articular calcified nodules were visible (Figure 1). Crystal deposition diseases, psoriatic arthritis or infective arthritis were initially suspected, but blood laboratory tests and autoimmunity were all negative. Blood cultures and synovial fluid examinations and cultures were completely negative as well. At ultrasonography (images not available) synovial effusion with several synovial deposits were documented. To better estimate the amount of synovial effusion and to exclude damage to cartilages and ligaments, MR was performed. It revealed an effusion in the knee with synovial bodies (Figure 2); during the scan the high mobility of the nodules inside the joint was also demonstrated, making the diagnosis of SC highly suggestive.

Corresponding author:
Enrico Boninsegna
Department of Radiology,
University of Verona, Italy
E-mail: boninsegnae@gmail.com

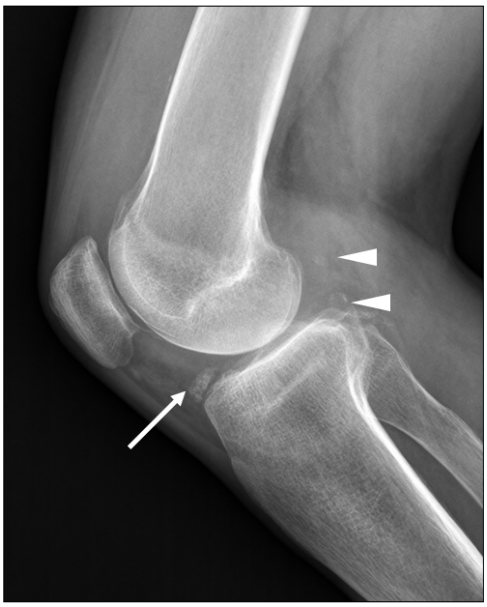

Figure 1 - Left knee X-rays, lateral view. A well-defined mineralized nodule is observed anterior to the tibial plateau (arrow). Other small bodies are present in the popliteal space (arrowheads). There are no signs of bone erosions.

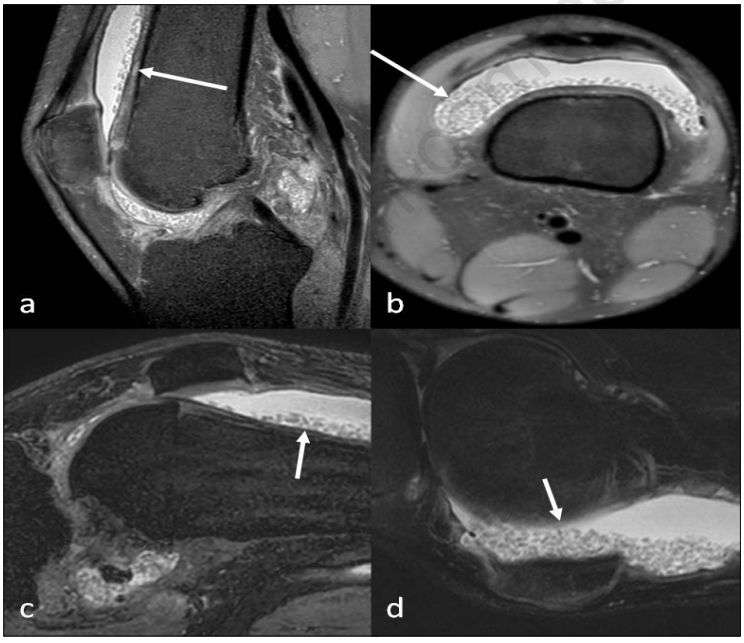

Figure 2 - Sagittal (A) and axial (B) proton density weighted sequences. Several small joint bodies with intermediate signal are observed (arrows), and the capsule is distended by significant free fluid. No injuries are affecting the joint ligaments and there are no signs suggestive of cartilaginous erosions either. Sagittal T2-weighted images in supine (C) and prone (D) position. Joint bodies (arrows) are always dependent.

A decision was made to perform an arthroscopy: multiple chondral loose nodules were removed and partial synovectomy was also performed. At histopathological examination, the loose bodies were found to be chondral and the synovium analysis revealed multiple chondral inclusions, confirming the diagnosis of SC. After 8 weeks from arthroscopy, the patient was walking normally and at the end of 6 months' follow-up there were no signs of recurrence and clinical examination did not reveal any fixed deformity.

DISCUSSION AND CONCLUSIONS

SC is a rare condition with a very variable clinical presentation according to the severity of the joint involvement, thus sometimes making the diagnosis not immediate. Its first presentation can be an incidental finding at radiological examinations performed for different reasons, but often patients present symptoms and signs such as pain associated with clicking sensations from the joints, joint-line tenderness and a palpable mass (7); instability and effusions have also been described (7). In the initial stage of the disease, cartilaginous nodules are not yet calcified and therefore a plain radiograph may be completely normal; sometimes only non-specific findings are present, such as soft-tissue mass surrounding the joint or widening of the joint space. MRI shows high sensitivity and can reveal multiple joint bodies of uniform size, hyperintense in T2-weighted images (Figure 2); focal areas of hypointensity both in T1- and T2-weighted images represent foci of mineralization (8). The natural history tends to be chronic and progressive and a late diagnosis is often associated with irreversible joint damage (1, 9). In the advanced stages, multiple small juxta-articular calcified nodules are visible at plain radiographs, with mild erosions of adjacent bones. CT scan can reveal the typical aspect of *rings and arcs* calcifications (10), however MRI allows better details of the free fluid amount, cartilaginous erosions and, when present, of the injuries to the joints' ligaments.

The case we described was identified at an early stage and successfully treated, but a close follow-up is mandatory to early detect any recurrence of the disease. Malignant degeneration of synovial chondromatosis into synovial chondrosarcoma is rare but necessitates prompt surgery, since it is a life-threatening condition (3). Concerning clinical risk factors for malignant degeneration, the most relevant ones include rapid clinical progression of pain, local recurrence within 12 months after resection and large size (3). At plain radiographs it is difficult to depict features of malignant degeneration: the *moth-eaten* appearance of the adjacent bones is a very late sign (8). On the contrary, MRI allows the identification of early signs of bone invasion and can reveal the presence of soft tissue infiltrating the cortical bone, with high contrast enhancement (11).

Ultrasound imaging usually shows multiple intra-articular foci that are hyperechoic and do not shadow posteriorly, located within the thickness of the synovial membrane or also often loose and freely fluctuating in the effusion (12). Nuclear medicine can also be useful, because increased uptake on bone scan is suggestive for malignant behaviour (8).

The differential diagnosis for SC should include any condition which may present with either the presence of intra-articular loose bodies or joint effusions, such as crystal deposition diseases, psoriatic arthritis, rheumatoid arthritis, infective arthritis and osteochondritis dissecans. The patient's age and synovial fluid tests, combined with the above described imaging (especially MRI) findings, can lead to the correct diagnosis in most cases. Indeed, other benign synovial conditions, such as pigmented villonodular synovitis, can present similar clinical findings and should be taken into account. In chronic synovitis, tuberculous arthritis and rheumatoid arthritis, some *rice bodies* can be visible, mimicking SC. Again, MRI is often a problem-solver, since in patients with villonodular disease, chronic synovitis and arthritis there is a diffuse hypointensity both in T1- and T2- weighted images, whereas SC bodies are usually hyperintense in T2-weighted images (1, 7, 8). Furthermore, SC nodules are more numerous and more uniform in size (8).

The treatment of SC is strictly of surgical nature and include the removal of the tumour(s) using arthrotomy with or without partial synovectomy for large lesions or arthroscopic removal for small to medium-sized bodies attached to the synovium (13-15). Local recurrence rates are reported from 3% to 25% (1).

Clinical message

Clinical symptoms in SC of the knee are subtle and clinical diagnosis can be difficult to achieve. MRI is the best imaging technique currently available in the diagnostic process and assessment of the disease at an initial stage and for planning the proper treatment. MRI is also indicated for early detection of disease recurrence. Nodules removal during arthroscopy is the first-choice treatment due to its safety and effectiveness.

Conflict of interests

The authors declare no conflict of interests.

REFERENCES

1. Adelani MA, Wupperman RM, Holt GE. Benign synovial disorders. J Am Acad Orthop Surg. 2008; 16: 268-75.
2. Evans S, Boffano M, Chaudhry S, et al. Synovial chondrosarcoma arising in synovial chondromatosis. Sarcoma. 2014; 2014: 647939.
3. Ng VY, Louie P, Punt S, Conrad EU. Malignant transformation of synovial chondromatosis: a systematic review. Open Orthop J. 2017; 11: 517-24.
4. Bojanić I, Vuletić LB, Troha I, et al. [Synovial chondromatosis]. Lijec Vjesn. 2010; 132: 102-10.
5. Neumann JA, Garrigues GE, Brigman BE, Eward WC. Synovial chondromatosis. JBJS Rev. 2016; 4.
6. Mata BA, Eward WC, Brigman BE. Pancarpal synovial and tenosynovialchondromatosis in a 65-year-old man: a highly unusual presentation of a common condition. Am J Orthop Belle Mead N J. 2013; 42: E60-63.
7. Alexander JE, Holder JC, McConnell JR, Fontenot E. Synovial osteochondromatosis. Am Fam Physician. 1987; 35: 157-61.

8. Murphey MD, Vidal JA, Fanburg-Smith JC, Gajewski DA. Imaging of synovial chondromatosis with radiologic-pathologic correlation. Radiogr Rev Publ Radiol Soc N Am Inc. 2007; 27: 1465-88.
9. Lim S-J, Chung H-W, Choi Y-L, et al. Operative treatment of primary synovial osteochondromatosis of the hip. J Bone Joint Surg Am. 2006; 88: 2456-64.
10. Narváez JA, Narváez J, Ortega R, et al. Hypointense synovial lesions on T2-weighted images: differential diagnosis with pathologic correlation. AJR Am J Roentgenol. 2003; 181: 761-9.
11. Varma DG, Ayala AG, Carrasco CH, et al. Chondrosarcoma: MR imaging with pathologic correlation. Radiogr Rev Publ Radiol Soc N Am Inc. 1992; 12: 687-704.
12. Levine BD, Motamedi K, Seeger LL. Synovial tumors and proliferative diseases. Rheum Dis Clin North Am. 2016; 42: 753-68.
13. Gilbert SR, Lachiewicz PF. Primary synovial osteochondromatosis of the hip: report of two cases with long-term follow-up after synovectomy and a review of the literature. Am J Orthop Belle Mead N J. 1997; 26: 555-60.
14. Derek Stensby J, Fox MG, Kwon MS, et al. Primary synovial chondromatosis of the subtalar joint: case report and review of the literature. Skeletal Radiol. 2018; 47: 391-96.
15. Raval P, Vijayan A, Jariwala A. Arthroscopic retrieval of over 100 loose bodies in shoulder synovial chondromatosis: a case report and review of literature. Orthop Surg. 2016; 8: 511-15.