Skeletal Radiol (1995) 24:298–300

Skeletal Radiology

Synovial chondromatosis

George Hermann, M.D.[1], **I. Fikry Abdelwahab, M.D.**[1], **Michael Klein, M.D.**[2], **Samuel Kenan, M.D.**[3], **Michael Lewis, M.D.**[3]

[1] Department of Radiology, Mount Sinai Medical Center, City University of New York, New York, USA
[2] Department of Pathology, Mount Sinai Medical Center, City University of New York, New York, USA
[3] Department of Orthopedic Surgery, Mount Sinai Medical Center, City University of New York, New York, USA

Clinical information

A 53-year-old man presented at our Orthopedic Clinic with a 6-month history of pain in the right hip radiating to the knee. During the previous few weeks the pain had steadily increased in severity, limiting his physical activity. He denied any recent injury and his past medical history was unremarkable. Physical examination revealed a well-nourished man. The range of motion of his right hip was limited in abduction to 30° and internal rotation was less than 5°. There were no palpable masses around the hip. The patient had intact sensation and normal pulses. Laboratory findings were within normal limits. Technetium-99^{m} methylene diphosphonate (^{99m}Tc-MDP) scan showed an increased uptake of radioisotope at the right hip region.

Plain radiography demonstrated a lytic lesion of the right acetabulum and the proximal portion of the femoral head (Fig. 1). Computed tomography (CT) showed the lesion in further detail (Fig. 2). T1-weighted magnetic resonance (MR) images revealed a low-signal-intensity lesion of the acetabulum that became homogeneously bright on T2-weighted images (Fig. 3). The differential diagnosis included metastatic malignancies, multiple myeloma, and chondrosarcoma. Supra-acetabular biopsy was performed.

Diagnosis: Synovial chondromatosis

Curettings from the ilium revealed blood and fragments of hypercellular hyaline cartilage. The cartilage had nuclear characteristics consistent with chondrosarcoma and there was infiltration of lamellar bone. The diagnosis of chondrosarcoma was considered; however, the bone destruction on both sides of the joint would have been highly unusual in association with such neoplasia.

Following biopsy the patient underwent right hip replacement. The femoral head was resected and packed into the acetabular cavity.

At the time of surgery, it was discovered that the hip joint was filled with confluent cartilaginous loose bodies that were adherent to the synovium, had caused erosion into the femoral neck and had penetrated into the acetabular roof along the ligamentum teres. Histological analysis of these masses showed the micronodular distribution typical of synovial chondromatosis (Figs. 4,5). The op-

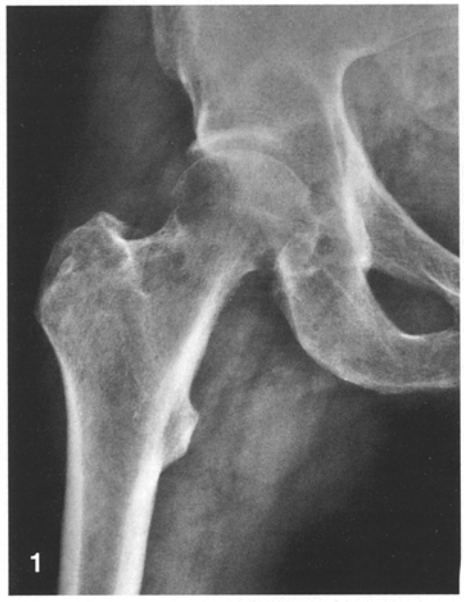


Fig. 1. Anteroposterior radiograph of the right hip shows a large lytic lesion of the acetabulum. Note the small lucencies in the femoral neck

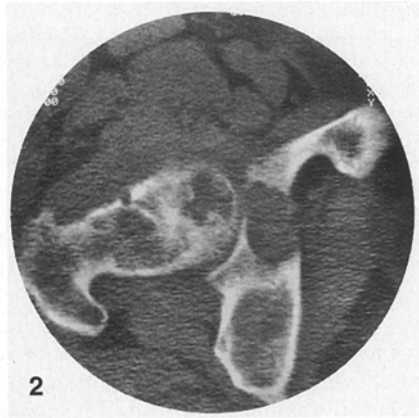


Fig. 2. A computed tomography section through the right hip shows destruction of the acetabulum with interruption of the cortex. There are ill-defined lytic lesions in the head and neck of the femur

Correspondence to: George Hermann, MD, Department of Radiology, Box 1234, Mount Sinai Medical Center, One Gustave L. Levy Place, New York, NY 10029-6574, USA

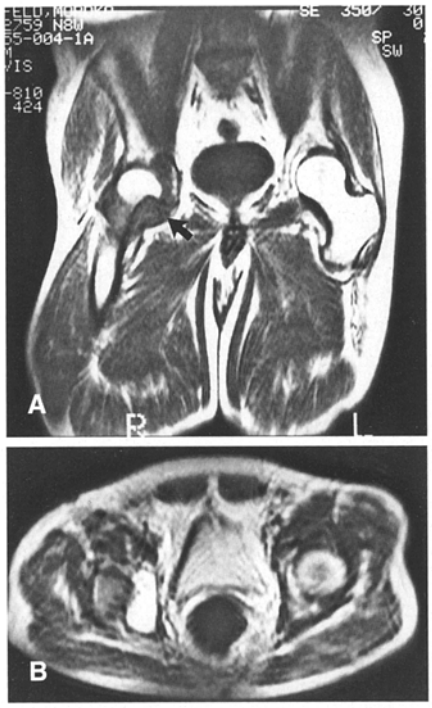


Fig. 3. A Coronal T1- (TR 350/TE 30) and **B** T2- (TR 2000/TE 80) weighted magnetic resonance images of the right hip. The T1-weighted image shows a low-signal-intensity mass of the acetabulum and the medial aspect of the femoral neck (*arrow*). Note the bright signal intensity of the acetabulum on T2-weighted imaging

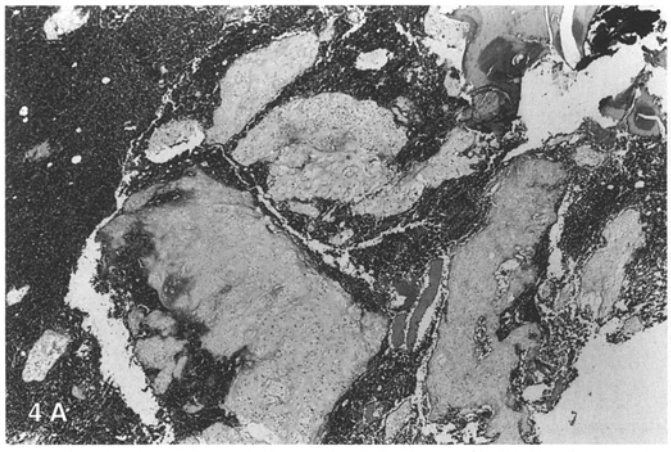
erative findings also explained the anatomic distribution of atypical cartilage within the ilium that had masqueraded as chondrosarcoma.

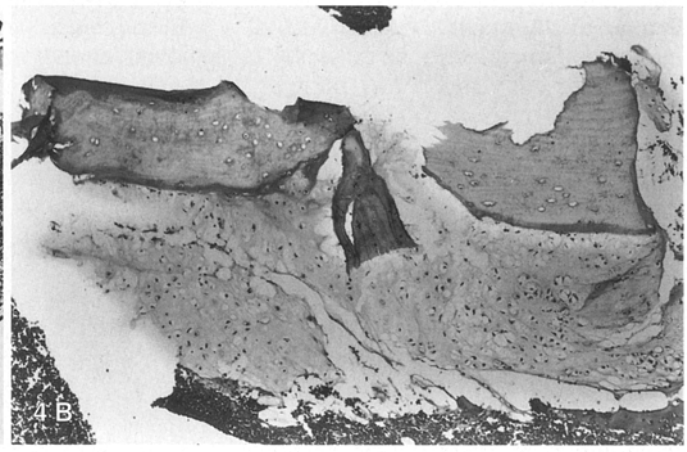
Discussion

Synovial chondromatosis is a rare benign disorder characterized by development of foci of cartilage in the synovial membrane of the joint, bursa, or tendon sheath. Since its first description by Reichel in 1900 [1], numerous reports have discussed this disorder [2–4]. In most instances it is monoarticular; occasionally, however, it may affect multiple joints [5]. In rare cases extra-articular involvement may occur when cartilaginous bodies break through the capsule and continue to proliferate [6, 7]. The most commonly affected joints are the knee, hip, and elbow, but any synovial joint can be involved. The disease usually occurs in the third to fifth decades of life. It is twice as common in male as in female patients [3]. Malignant transformation is extremely rare, but it has been reported in a few instances [8–10].

The exact etiology of synovial chondromatosis is unknown. Some authors consider it a reaction of residual embryonal cells [11], others think that it is a metaplastic transformation of the subsynovial connective tissue [2]. In the process of the disease the nodular foci or cartilage may detach from the involved synovia, forming free cartilaginous bodies in the joint. These bodies remain viable and may increase in size due to nourishment from the synovial fluid [4].

The disease process has been classified into three phases [12]. The early phase is characterized by active synovitis, without loose bodies in the joint. This is followed by the second transitional phase showing nodular synovitis along with loose bodies in the joint. In the third phase loose bodies are present, but the synovitis has resolved. Clinically, the patients usually present with pain, swelling, and palpable loose bodies [2, 3, 13], and clicking and locking of the joints are common. The disorder slowly progresses and joint pain and discomfort may last for several years [4]. At the time of presentation intra-articular loose bodies are usually





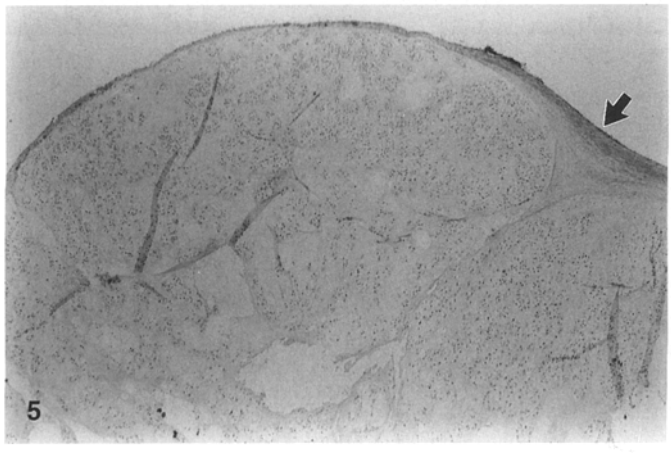


Fig. 4. A Suction curettage specimen from the supra-acetabular lesion reveals moderately cellular hyaline cartilage in a hemorrhagic background. The cellularity is consistent with low-grade chondrosarcoma. (×20) **B** Higher-power magnification shows infiltration of lamellar bone fragment by cartilage. This configuration is highly suggestive of chondrosarcoma. (×80)

Fig. 5. Details of material extracted from the joint at the time of definitive surgery. Multiple loose cartilaginous bodies in which the cartilage nuclei are arranged in micronodular aggregates are seen. Note at top right (*arrow*) a fragment of residual fibrous synovial tissue (×20)

present which may cause destruction of the cartilage with limitation of motion. Synovial effusion may be present.

Radiologically, when calcified bodies are present, the diagnosis is relatively easy. Occasionally, however, the lack of calcification in the cartilaginous bodies makes the diagnosis difficult on conventional radiographs. In these cases, air computed arthrotomography may be a reliable diagnostic method. Loose bodies may produce bony erosion, particularly in joints with tight capsules [13–16]. Norman and Steiner [17] observed intra-articular bone erosion in nine instances. In one case the nodular erosion resulted in pathological fractures of the hip. Our patient suffered from chronic hip pain. Conventional radiography and CT showed a lytic lesion that involved the right acetabulum as well as the femoral head. Neither study, however showed, evidence of calcified loose bodies in the joint. More recently, MR imaging has been a widely used modality in diagnosing musculoskeletal lesions. In synovial chondromatosis calcification can be seen as signal void on T2-weighted images against the high-signal-intensity fluid and an inflamed hyperplastic synovium [5]. In our patient, MR imaging showed a decreased signal intensity on T1-weighting and homogeneously bright signal intensity on T2-weighting. This nonspecific pattern is concordant with the observations of Cohen et al. [18], who pointed out that without significant amounts of calcification in the matrix, synovial chondromatoses have no signal characteristics that could differentiate them from a mixed group of noncartilaginous tumors or loose bodies secondary to osteoarthritis [19, 20].

The differential diagnosis includes osteoarthritis, pigmented villonodular synovitis (PVNS), synovial hemangioma, lipoma arborescens, synovial sarcoma, hemangiosarcoma, and chondrosarcoma [19, 21]. In osteoarthritic loose bodies the calcifications are fewer and larger; the articular cartilage may be destroyed. In PVNS the filling defects are more confluent and less distinct. MR imaging may show decreased synovial intensity in all sequences due to the paramagnetic effect of the deposition of hemosiderin. Synovial hemangioma usually presents as a single soft tissue mass. Lipoma arborescens consists of ill-defined nodules. Synovial sarcoma is an extra-articular process that originates from the para-articular soft tisues. The resultant bone destruction is strongly suggestive of a malignant process.

The treatment of synovial chondromatosis is removal of the loose bodies with or without synovectomy. Synovectomy along with removal of the loose bodies is necessary in cases where active synovial disease is present. In the late phase, however, when loose bodies are present but there is no evidence of intrasynovial disease, mere removal of the loose bodies is an adequate treatment.

These operations may be followed by recurrence. Therefore, in generalized intra-articular disease only limited intervention is recommended to relieve the symptoms. Because of the extensive bone destruction in our patient, a total hip replacement was performed. Six months following surgery, the patient is symptom-free and walks with a cane. He has resumed his previous activity.

In *summary,* an unusual case of synovial chondromatosis of the hip was described. The lack of cartilaginous bodies and the presence of extensive destruction of the hip, particularly the acetabulum, suggested a malignant process. Chondrosarcoma or metastatic lesions such as renal cell carcinoma or multiple myeloma were considered as diagnostic alternatives.

References

1. Reichel PF. Chondromatose der Kniegelenkkapsel. Arch Klin Chir 1900; 61: 717–724.
2. Jaffe HL. Synovial chondromatosis and other benign articular tumors. In: Tumor and tumorous conditions of the bone and joints. Philadelphia: Lea & Febiger, 1958; 558–566.
3. Madewell JE, Sweet DE. Tumors and Tumor-like lesions in or about joints. In: Resnick D, Niwayama G, eds. Diagnosis of bone and joints. Philadelphia: Saunders, 1988: 3910.
4. Wilner D. Radiology of bone tumors and allied disorders. Philadelphia, London: Saunders, 1982: 3947.
5. Tuckman G, Wirth CZ. Synovial osteochondromatosis of the shoulder: MR findings. J Comput Assist Tomogr 1989; 13: 360–361.
6. Dunn AW, Whisler JH. Synovial chondromatosis of the knee with associated extracapsular chondromas. J Bone Joint Surg [Am] 1973; 55: 1747–1748.
7. Spjut HJ, Dorfman HD, Fechner RE, Ackerman LV. Tumors of bone and cartilage. In: Atlas of tumor pathology. Washington, DC: Washington Armed Forced Institute of Pathology, 1971: 391–396.
8. Dunn EJ, McGavran MH, Nelson P, Greer RB III. Synovial chondrosarcoma: report of a case. J Bone Joint Surg [Am] 1974; 56: 811–813.
9. Kaiser TE, Ivins JC, Unni KK. Malignant transformation of extra-articular synovial chondromatosis: report of a case. Skeletal Radiol 1980; 5: 223–226.
10. Mullins F, Berard CW, Eisenberg SH. Chondrosarcoma following synovial chondromatosis: a case study. Cancer 1965; 88: 1180–1188.
11. Pope TL, Keats TE, de Lange EE, Fechner RE, Harvey JW. Idiopathic synovial chondromatosis in two unusual sites: inferior radioulnar joint and ischial bursa. Skeletal Radiol 1987; 16: 205–208.
12. Milgram JW. Synovial osteochondromatosis: a histopathological study of thirty cases. J Bone Joint Surg [Am] 1977; 59A: 792–801.
13. Felbel J, Gresser U, Lohmöller, Zöllner. Familial synovial chondromatosis combined with dwarfism: clinical case report. Genetics 1992; 88: 351–354.
14. DuFour JP, Hainels J, Maldague B, et al. Unusual aspects of synovial chondromatosis of the elbow. Clin Rheumatol 1984; 3: 247–251.
15. Goldberg RP, Weissman BN, Naimark A, et al. Femoral neck erosions: sign of joint synovial disease. AJR 1983; 141: 107–111.
16. Ginaldi S. Computed tomography feature of synovial osteochondromatosis. Skeletal Radiol 1980; 5: 219–222.
17. Norman A, Steiner GC. Bone erosion in synovial chondromatosis. Radiology 1986; 161: 749–752.
18. Cohen EK, Kressel HY, Frank TS, et al. Hyaline cartilage-origin bone and soft tissue neoplasms: MR appearance and histologic correlation. Radiology 1988; 167: 477–481.
19. Blacksin MF, Ghelman B, Freiberger RH, Salvata E. Synovial chondromatosis of the hip: evaluation with air computed arthrotomography. Clin Imaging 1990; 14: 315–318.
20. Sundaram M, McGuire MH, Fletcher J, et al. Magnetic resonance imaging of lesions of synovial origin. Skeletal Radiol 1986; 15: 110–116.
21. Maurice H, Crone M, Watt I. Synovial chondromatosis. J Bone Joint Surg [Br] 1988; 70: 807–881.