



Tumoral calcinosis in children, a challenging and possibly underdiagnosed condition

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Tumoral calcinosis is a rare condition characterized by deposits of calcium hydroxyapatite crystals in periarticular soft tissues. Three clinical settings are possible : complication of renal dialysis, hereditary and sporadic. The condition more commonly affects adults, is rare in children and extremely uncommon in infants. A case of sporadic tumoral calcinosis of the hip is reported in a six-year-old boy for whom the diagnosis was challenging. Surgical treatment was applied because of pain and major functional impairment. A pharmacologic treatment was added for two years. After three years of follow-up, the child was completely asymptomatic and had regained full range of motion. The diagnosis of tumoral calcinosis in children remains challenging.

Keywords : tumoral calcinosis ; arthroscopy ; surgical resection.

INTRODUCTION

Tumoral calcinosis is an uncommon condition characterized by the deposition of amorphous calcium salts and calcium hydroxyapatite crystals in periarticular soft tissues (11). Three different clinical settings can be encountered. First, tumoral calcinosis can occur in adults as a complication of renal dialysis with disordered calcium and/or phosphorus homeostasis (16). Second, tumoral calcinosis can be familial with autosomal recessive transmission and is characterized by the progressive deposition of calcified masses in cutaneous and subcutaneous tis-

ues, which results in painful ulcerative lesions and severe skin and bone infections. Two major types of familial tumoral calcinosis have been recognized : hyperphosphataemic and normophosphataemic (24, 29,31). Third, tumoral calcinosis may be sporadic. These patients generally have no known abnormality of calcium or phosphorus metabolism, or have high serum phosphorus level (11).

Tumoral calcinosis occurs almost exclusively in adults, is rare in children and extremely uncommon in infants (only 16 cases reported) (1,2,4,6,9-11,15,19, 21,25,27,30).

CASE REPORT

A six year-old boy presented with right hip pain. He had been limping and complaining of knee pain for five weeks, with progressive worsening, and he

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Fig. 1. — A. Radiograph of the pelvis showing the enlarged right femoral head with loss of sphericity. Head density is increased. A large intraarticular calcified mass is lying at the lower part of the femoral neck (white arrow). B. Hip ultrasonography showed synovial effusion and a calcified mass (white arrow). C. T1-weighted magnetic resonance imaging showed synovial effusion and the calcified mass (white arrow). D. The technetium Tc^{99m} diphosphonate bone scan showed increased isotope uptake over the lower part of the right femoral neck.

had eventually been unable to walk and bear weight for several days. He was a third child, born at full term, in cephalic presentation with a weight of 3.740 kg. His family originated from Sicily. He had presented normal neuropsychomotor development. The child's past history and family history were non-contributory. The mother denied any history of trauma. On physical examination, he was unable to walk and had a flexion contracture of the right hip. Any hip movement was very painful.

The radiograph of the pelvis showed an enlarged right femoral head with loss of sphericity (fig 1). This macrocephaly reflected the chronic character of the affection. The density of the femoral head was increased, suggesting osteochondritis; the head was correctly centered. A large intraarticular

calcified mass was present under the lower part of the femoral neck. There was no interposition of calcified masses between the femoral head and the acetabulum. Computed tomography produced no additional findings. Hip ultrasonography showed synovial effusion with synovial hypertrophy and the presence of a calcified mass. A technetium Tc^{99m} diphosphonate bone scan showed increased uptake over the lower part of the right femoral neck. Magnetic resonance imaging showed synovial effusion and a calcified mass located at the lower part of the femoral neck. Leukocyte count and sedimentation rate were within normal limits. Serum calcium level was normal but phosphorus serum level was mildly elevated (6.1 mg/dl; normal range: 2.4-4.7 mg/dl). There were low levels of 25-(OH)-vitamin D (9 ng/ml, normal range: 20-50 ng/ml) and 1-25-(OH)₂-vitamin D (5.7 pg/ml, normal range: 18-45 pg/ml). The parathyroid hormone level was found to be normal.

Surgical treatment was proposed in order to remove the calcified mass and to confirm the diagnosis. First, hip arthroscopy was performed, which permitted synovectomy but not removal of the calcified mass, as the inferior part of the femoral neck was not accessible by arthroscopy (fig 2). The procedure was converted to arthrotomy, which permitted complete excision of the synovial tissue containing the calcified mass. This mass had the consistence of soft white cheese.

The definitive diagnosis of tumoral calcinosis was given by the pathology analysis. Microscopic study revealed synovial fibrosis with areas containing amorphous calcium deposits and calcium crystals. This was surrounded by many mononuclear macrophagic cells and giant cells (fig 3).

A pharmacologic treatment was administered during the two postoperative years to reduce hyperphosphoraemia, consisting of calcium carbonate (500 mg twice a day, acting as a phosphate binder) and vitamin D supplements. A low-phosphorus diet was also recommended.

Full weight bearing was allowed six weeks after surgery. Three months postoperatively, the child was asymptomatic and had regained full hip range of motion. The radiographic follow-up revealed the presence of a small calcification in the area of the

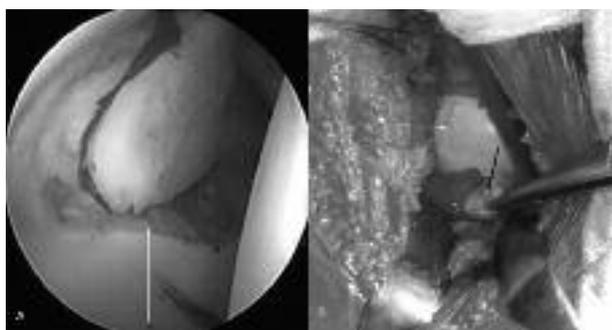


Fig. 2. — A. Arthroscopic view of the hip joint showing synovial hypertrophy and inflammation (white arrow). B. Intraoperative view after hip capsulotomy. The calcified mass (black arrow) is lying under the femoral neck. (white arrow : femoral head).

surgical approach, which subsequently disappeared. The femoral macrocephaly persisted ; nevertheless, the acetabular coverage was satisfactory.

In the post-operative course, the boy presented two episodes of pain associated with limping. The first was attributed to an ipsilateral transient synovitis. The second was on the contralateral side and was related with adductor tendinitis. Magnetic resonance imaging was performed 18 months after surgery and showed complete vascular integrity of the proximal femoral epiphysis (no signs of ischaemia). The radiograph after 3 years of follow-up (fig 4) showed no recurrence of hydroxyapatite deposits.

DISCUSSION

Tumoral calcinosis is a rare condition characterized by presence of a progressively growing mass of calcified deposit in a periarticular area. The name “tumoral calcinosis” was coined in 1943 by Inclan (13) who reported three children with large calcified masses in the region of large joints.

This condition presents a diagnostic challenge for the clinician, radiologist and pathologist. It has been reported in patients of all ages but is more commonly observed in the second decade of life (1). Patients with sporadic presentation lack a history of renal dialysis or a family history of tumoral calcinosis, making the diagnosis more difficult. In these cases, presence of amorphous calcification noted on

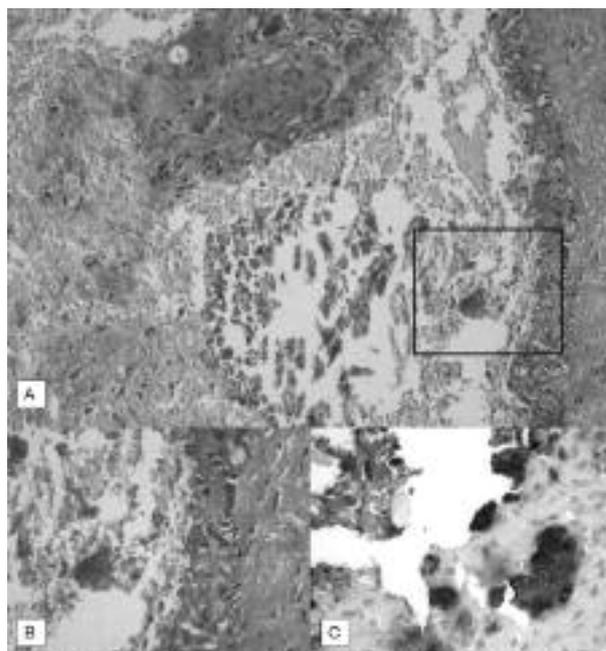


Fig. 3. — A. Photomicrograph of the pathologic tissue showing large deposits of amorphous calcium salts surrounded by fibrosis and an adjacent macrophagic reaction (haematoxylin and eosin staining ; magnification, $\times 40$). B. Zoom of the box from 3A. C. Immunostaining with CD-68 confirming the histiocytic nature of these cells : mononuclear and giant cells.

radiographs should alert the clinician to the possibility of this diagnosis.

The most common sites of occurrence are controversial : knees, ankles and wrists in some reports (11) versus hips, elbows and shoulders in others (3,8). Other sites have included the cervical spine, the supraclavicular area and the toes (11). Some patients have more than one site of involvement (6,27,30). Another controversy exists concerning the sex ratio. Mc Kee *et al* reported a female /male ratio of 2:1 (17) while for Palmer, the lesions occur with a male predominance (22). There is a need for more reported cases before making further epidemiological conclusions.

In the sporadic form, there is typically no increase in serum calcium or phosphorus levels, but, in some cases, the serum phosphate level may be high (7,11,12,32,33). Elevated plasma 1,25-dihydroxycholecalciferol (1,25 D3) levels have also been noted in some patients (34). The exact aetiology of



Fig. 4. — Radiographic follow-up. A. Radiograph 5 months after surgery showing a small calcification probably in the sutured capsule. B. Radiograph 3 years after surgery. No calcified mass has recurred. The macrocephaly remains but with excellent head coverage. The patient at this stage is asymptomatic and has regained a full range of hip motion.

the sporadic form remains a mystery as well as the pathophysiologic role of hyperphosphatemia in producing calcified deposits in soft tissue. Increased reabsorption in the proximal tubules of the kidney, independent of the action of parathyroid hormone (PTH) has been proposed by Mitnick *et al* as an aetiological factor (18).

A chemical, microscopic and ultrastructural study of the mineral deposits in tumoral calcinosis has shown that the disease is a “hydroxyapatite deposition disease” (5). It should be distinguished from other conditions in which hydroxyapatite crystals may be present, e.g., hypervitaminosis D and the milk alkali syndrome, severe renal disease, primary hyperparathyroidism, and sarcoidosis (5).

The clinical course of the disease involves progressive growth and enlargement of the calcified mass, resulting in pain, a palpable mass, functional impairment, and in some instances, compression of peripheral nerves (26). A long-standing lesion may undergo ulceration and chronic infection, with secondary amyloidosis. The clinical aspects depend on the location and size of the calcifications.

The recommended treatment remains controversial. Some authors have reported successful medical management (14,18,20) and recommend to avoid surgical excision unless absolutely necessary. They recommend trying a low-phosphorus diet with aluminium hydroxide antacids to act as phosphate binders. They consider that surgical excision does not preclude recurrence of the lesion. The possibility of adverse effects of this medical treatment in a

growing child should be borne in mind. Restriction of calcium and phosphorus intake will cause a negative balance, with the deficiency of calcium and phosphate in the skeleton resulting in osteomalacia (23). Aluminium toxicity has also been reported in children (28). Aprin and Sinha conclude that meticulous, complete excision of the lesion should be performed, and calcium and phosphate deprivation should be reserved for recurrence of the lesion (1).

In the present case, the surgical option was chosen considering the major functional impairment and persisting pain. The medical treatment was added during two years to regulate hyperphosphoraemia.

There is no well established treatment for tumoral calcinosis. The treatment should be tailored to the clinical setting. For patients requiring renal dialysis or who have a predisposing genetic abnormality, the stimulus to calcium precipitation cannot be removed, and recurrence is therefore common. In patients in these settings, medical treatment is preferable and surgical removal is only appropriate when there is significant interference with joint function or breakdown of the overlying skin. In sporadic cases, by contrast, surgical treatment can be efficient. In case of important functional impairment, surgery may be performed with definitive excision. The risk of local recurrence after surgical removal seems to be very low in children (11). For the six-year-old boy reported in this case, surgery was successful without any local recurrence but medical treatment was associated.

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