

## A report on 2 cases of myositis ossificans in childhood

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### Case 1

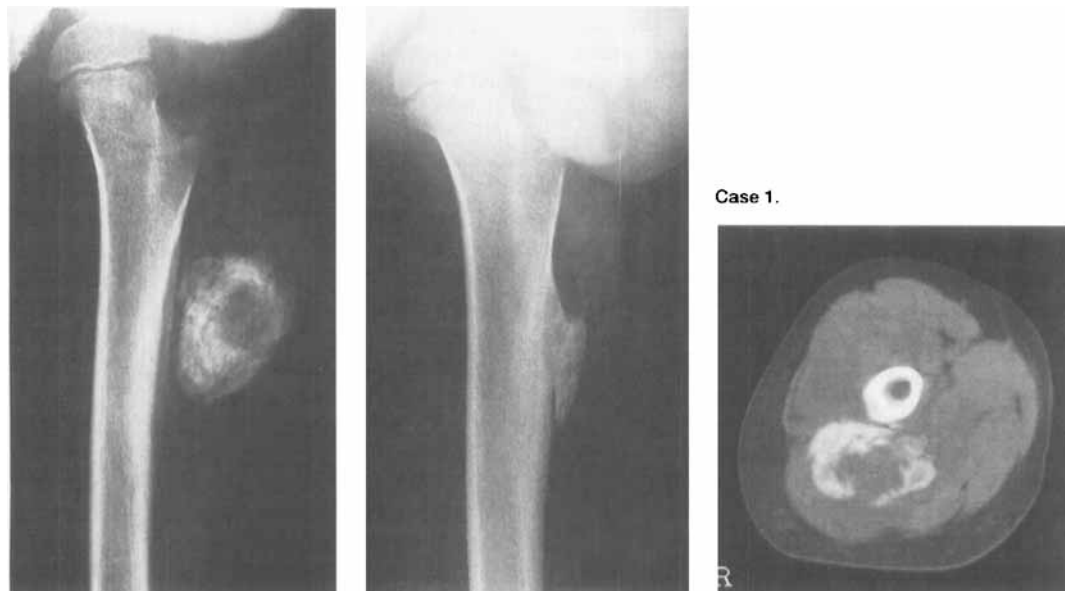
A 4-year-old boy showed a marked limp and a painful swelling in the left thigh after falling on a slope. 2 weeks after the injury, radiographs were normal. Sequential radiographs revealed an ill-defined mass in his thigh and at 6 weeks he was referred to our hospital because of a suspected bone tumor. On physical examination, he was tender over a discrete small area along the posterior aspect of his left thigh. The only other clinical abnormality was a restriction of hip flexion to 100°. The erythrocyte sedimentation rate was 35 mm in the first hour, C-reactive protein was 1.0 mg/dL. The white blood cell count and alkaline phosphatase were normal. Radiographs revealed an extraosseous radiopaque mass, measuring 4.5 × 3 cm, along the femur (Figure 1). A bone scan revealed a linear area of increased uptake in the left thigh. CT demonstrated an ossification in the gluteal muscle. MRI showed a centrally located high intensity in the

same area with a sagittal T2-weighted image. Open biopsy was performed to exclude the possibility of extraosseous osteosarcoma. The biopsy specimen was approximately 1.5 cm in diameter. Histology revealed zone phenomenon, indicating myositis ossificans. The patient was evaluated with regular radiographic examinations. 2 months after the injury, the tenderness gradually decreased and the left hip movements and serological findings became normal. After 18 months, the ossification had been gradually absorbed; only a small part remained, with no further reduction over the subsequent 12 months. After 30 months' follow-up, the patient was well.

### Case 2

A 9-year-old boy presented with a 2-month history of limited movements of his left ankle joint. Initially, no diagnosis was made. However, 13 months later, a hard mass was noticed in the left lower leg by his father. A

Figure 1. Case 1.



A densely mineralized and well-delineated mass with a periosteal reaction along the posterior aspect of the femur.

The mass has decreased after 18 months; a small portion remains attached to the femoral shaft.

CT reveals an apparent peripheral mineralization in the gluteal muscle.

Figure 2. Case 2.



A densely mineralized mass along the posterior aspect of the lower leg.

A mass has recurred in the same area 5 months after the first operation.

The size of the mass has increased 18 months later.

careful history was taken and at this point the patient could recall a sprain in his ankle prior to the first symptoms while playing soccer. On physical examination, he had markedly limited range of motion in the left ankle, with a plantar flexion contracture of 30°. Serological findings were normal. Radiographs showed an extraosseous radiopaque mass along the fibula (Figure 2). He was referred to the oncological section of our orthopedic department because of a suspected bone tumor. A bone scan revealed a linear area of increased uptake in the left lower leg. CT showed an ossification from the soleus to the gastrocnemius muscle. The lesion was diagnosed as myositis ossificans. At 16 months after the injury, surgery was performed to restore normal ankle function. An osseous mass was located in the triceps surae. This mass was covered by dense fibrous tissue, which was tightly attached to the periosteum in the middle of the fibula. It was excised, close to the fibula. Peroperatively, the ankle joint regained 5° of dorsiflexion. The surgical specimen mainly consisted of mature lamellar bone, with a minor immature component of osteoid, rimmed by active osteoblasts (Figure 3). Postoperatively, the patient was immobilized 4 weeks in a plas-

ter cast, followed by 4 weeks in a supportive orthosis.

2 months after the operation, he again had a slightly limited range of dorsiflexion in the left ankle. Radiographs were normal. During the next 2 months, radiographic examinations could not be performed due to damage to the equipment by the Great Hanshin earthquake in Japan. At 5 months after the operation, an ossified mass had recurred at the same site (Figure 2).

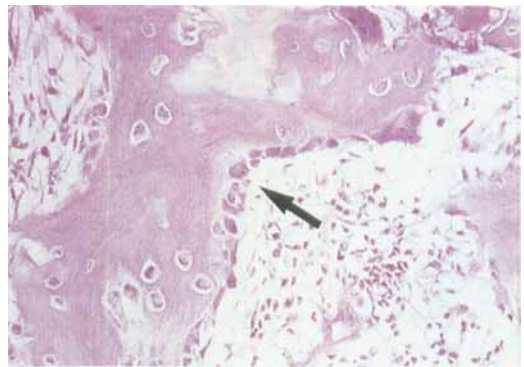


Figure 3. Case 2. Histology from the first operation shows osteoid surrounded by active osteoblasts (arrow), which suggests an immature lesion (HE,  $\times 100$ ).

The patient was then observed with regular radiographic examinations. At 18 months' follow-up after the recurrence, radiographs showed that the lesion had increased in size. At this point, a second operation was recommended because of an increasing equinus ankle contracture, but his father hesitated. At 2.5 years' follow-up radiographs showed no further increase of the lesion, but a bone scan still showed a linear area of increased uptake, as before the first operation. The ossified mass was excised to regain normal function. The surgical specimen consisted exclusively of mature lamellar bone. Postoperatively, immobilization was performed, using the same protocol as previously. 12 months after the second operation, the patient was playing tennis, instead of soccer, with no contracture and no recurrence.

## Discussion

There are few reports on myositis ossificans in the first decade of life (Enzinger and Weiss 1995). Most published series show them as accounting for less than 6.7% of myositis ossificans with or without a history of trauma (Cushner and Morwessel 1995). There is no standard management in small children because of the rare incidence and unclear pathogenesis.

In small children, this diagnosis must be considered whenever a soft tissue mass is encountered. A relationship between trauma and development of myositis ossificans may be difficult to establish, since an exact history of trauma cannot be obtained from small children. However, the characteristic features of sequential radiographic evaluation (Mirra et al. 1989) may help to establish a time of injury when a carefully history is taken. If trauma cannot be shown, the differential diagnosis of myositis ossificans progressiva may be difficult. This is a progressive autosomal dominant disease also starting in childhood, characterized by symmetrical malformations of the digits, especially microdactyly or adactyly of the thumbs and great toes, which precedes the onset of multiple ossifications (Enzinger and Weiss 1995).

Special attention is required to avoid an incorrect diagnosis of an extraskeletal bone-forming lesion, in particular, osteosarcoma (Clapton et al. 1992, Heifetz et al. 1992). Peripheral maturation of bone is necessary to distinguish myositis ossificans from osteosarcoma. Histologically, the characteristic feature of myositis ossificans is the zone phenomenon, with a peripheral zone of bone maturation, an intermediate zone of immature osteoid formation and a central undifferentiated zone (Ackerman 1958). Older or ma-

ture lesions consist only of mature lamellar bone, with interspersed fat cells, fibrous tissue and thin-walled vascular spaces. The zone phenomenon is also found in small children, the only difference being a more rapid progression of zoning maturation than in adults (Nuovo et al. 1992).

Myositis ossificans is considered to be a benign self-limiting process. However, its biological course is unpredictable. Spontaneous absorption occurred in 9 of 25 adult cases reported by Thorndike (1940). No statistical data are available for small children. In our case 1, the absorption took 18 months. In contrast, the lesion may persist and cause functional impairment, as in our case 2.

General guidelines for the management of myositis ossificans in adults recommend immediate immobilization for 2-4 weeks, with subsequent gradually increasing active exercises (Hait et al. 1970). However, children are active and restless, and the youngest are often difficult to immobilize. We believe this is not necessary because, if children feel pain, they do not use the affected site.

Surgery is indicated only when the lesion is large and painful, if it is causing a mechanical block to joint movement, or if the diagnosis is uncertain (Jouve et al. 1997). Patients having a severe joint dysfunction, such as our case 2, might also require surgery. A major concern relates to the timing of surgery. Most authors have suggested a waiting period before surgery in adults, to allow for maturation of the lesion. However, the recommendations for the duration of this period vary widely, from 6 months to 24 months (Thorndike 1940, Hait et al. 1970). In case 2, maturation of the myositis ossificans took 16 months or more after the onset of symptoms. Histology revealed that the lesion was immature at the time of the first surgery. This caused a recurrence. Bone scans have been suggested as a guide to the timing of the surgery (Cushner and Morwessel 1992). However, we did not find such scans helpful in making the decision. We believe that in small children with myositis ossificans, closed management is essential at least 18 months or more. Surgery should be considered with a delay of 18 months or more if the functional impairment persists or if there is doubt with regards to the correct diagnosis.

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## Pseudarthrosis of the spine of the scapula—case report of a minimally invasive osteosynthesis technique

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A 40-year-old man with a chronically painful right shoulder was referred to the orthopedic outpatient department. As a 10-year-old child, he had fallen from a height of about 1 meter onto his right shoulder. Since that time he had continually suffered from moderate pain over the spine of his right scapula. For about 1.5 years he had also a painful subacromial impingement at the right shoulder. Clinical examination revealed a hard tender tumor at the spine of the scapula. Impingement tests were positive and there was atrophy of the supraspinatus muscle on the right side. Ultrasonography of the shoulder showed an intact rotator cuff. An injury of the suprascapular nerve was excluded

by electromyography. Radiographs showed pseudarthrosis of the spine of the scapula (Figure 1). A technetium bone scan revealed a thin cold area along the pseudarthrosis, sandwiched between increased uptake of the isotope.

Using a short incision of about 3 cm parallel to the spine of the scapula, without detaching the muscles, an AO small fragment cancellous bone lag screw was implanted (Figure 2). High compression could be achieved because the thread was fixed very well between the two laminae of the spine of the scapula. Intraoperatively, the image intensifier showed a narrowing of the upper part of the pseudarthrosis, where it

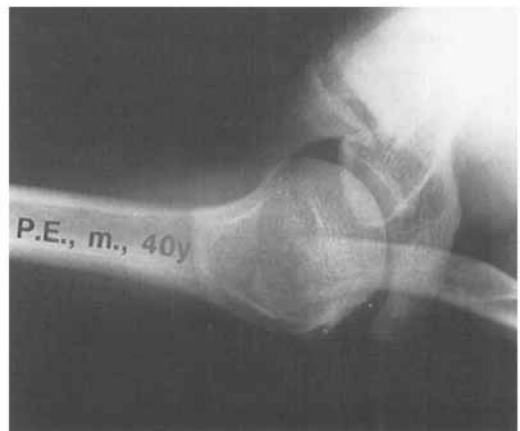


Figure 1. The anteroposterior radiograph with a 30° caudal tilt of the beam and the axial radiograph show pseudarthrosis of the spine of the scapula of a 40-year-old man.