OSTEOMYELITIS OF THE METATARSAL SESAMOIDS

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Acute haematogenous osteomyelitis of the metatarsal sesamoids has been reported at least five times in the world literature. The occurrence of three further cases in the author's experience in four years suggests that the diagnosis may at times be overlooked.

**Previous reports**—Lange (1928) described a case of "typical sesamoiditis" in a nineteen-year-old man, which proceeded to suppuration and eventual sequestration over a course of seven years. The degree of pain and swelling, together with the high temperature (over 39 degrees Centigrade) at onset, suggested that this was in fact osteomyelitis.

Bennet (1935) reported the case of a twelve-year-old boy with pain and swelling of the foot with pyrexia. The symptoms settled with conservative management except that some swelling remained. Two months after the onset he developed a fistula medial to the first metatarsal. Radiographs showed two sequestra in the soft tissues and a defect in the medial sesamoid. Sequestrectomy gave complete cure. Bennet also described two cases with less cut-clear pathology, one in a boy of fifteen with subchondral necrosis proceeding to sequestration, and one in a woman of twenty-four who developed metastatic osteitis after a septic abortion.

Smith (1941) described a thirteen-year-old girl with a five-month history of pain in the foot in whom repeated radiographs eventually showed the lateral sesamoid completely detached and lying between the proximal ends of the first and second metatarsals, the shafts of which showed evidence of periostitis. Pus discharged spontaneously and the condition eventually responded to sequestrectomy. Scrutiny of the earlier radiographs revealed a small abscess cavity in the sesamoid.

Frank (1943) described a fifty-six-year-old woman with a six-month history of pain under the metatarso-phalangeal joint, who eventually developed redness and a blister on the dorsum of the foot, followed by web-space infection from which thick pus was released. It continued to discharge for two weeks, the sinus tracking down between the first and second metatarsals. Radiographs revealed partial destruction and proximal displacement of the lateral sesamoid. Sequestrectomy resulted in complete cure.

Rowe (1963) in a review of osteomyelitis of the sesamoids reported a case in a young man who developed pain and swelling under the metatarso-phalangeal joint. Radiographs were normal, but showed a bipartite medial sesamoid. He was treated as a case of gout, with no response, and then as cellulitis with penicillin and rest. Two weeks later he developed a sinus. Further radiographs showed proximal migration of the sequestrated sesamoid. Excision resulted in rapid cure.

**CASE REPORTS**

**Case 1**—A twelve-year-old boy was awakened by severe pain in his left foot. There was no history of recent injury. The combination of pyrexia and inflammation in the region of the left first metatarso-phalangeal joint led to a diagnosis of cellulitis and to treatment with oral penicillin. Six days later, because of persistent pain he was admitted to hospital. On admission he was flushed and febrile (temperature 37.7 degrees Centigrade). There was an inflamed, swollen and extremely tender area on the medial and plantar aspect of the left first metatarsal and metatarso-phalangeal joint. Radiographs did not show any abnormality (Fig. 1). The erythrocyte sedimentation rate was 20 millimetres in the first hour, the leucocyte count 9,400 per cubic millimetre (87 per cent polymorphonuclear leucocytes). Blood culture was negative. Serum uric acid was 4 milligrams per 100 millilitres.

Treatment consisted of intramuscular penicillin, and a plaster-of-Paris splint. The symptoms and signs regressed, though some local redness persisted. Radiography eighteen
days after admission was again considered normal (Fig. 2) and he was discharged, but on review of the radiograph later it was seen that relative density of both halves of the sesamoid was present, with some irregularity and proximal migration of the proximal fragment.

**Progress**—Over the next three months the redness persisted, but he was able to walk without pain until, after a minor injury, he developed a local blister followed by marked inflammation and the discharge of a quantity of thick pus. Radiographs at this time showed obvious osteolysis of the medial sesamoid (Fig. 3).

Exploration revealed a chronic abscess cavity containing the sequestrum of the sesamoid, which was removed; the cavity was curetted. Culture from the abscess grew a coagulase-

![Fig. 1](image1)

![Fig. 2](image2)

![Fig. 3](image3)

Case 1. Figure 1—Radiographs at onset of infection are normal. Figure 2—Radiographs eighteen days after the onset were considered normal at first. They show relative increase in density of the medial sesamoid, with some irregularity and proximal migration of the proximal fragment. Figure 3—Osteolysis is obvious on this radiograph taken three months later.

positive staphylococcus aureus (penicillin resistant). The foot was immobilised in a plaster-of-Paris splint. Healing was complete in one month and he has remained free from symptoms for four years.

**Case 2**—A sixteen-year-old boy developed pain under the ball of his right foot twenty-four hours after playing football. The pain became severe enough to keep him awake. Two days later redness, tenderness and swelling on the dorsum and medial aspect of the forefoot were present. He was thought to have a soft-tissue injury of the forefoot and was treated with strapping, with improvement over the next two days.

A week later the pain became severe again, and he was found to have an inflamed, swollen tender area on the plantar surface of the first metatarsal. Radiographs taken at this time (Fig. 4) were thought at first to be normal and he was treated with tetracycline as a case of cellulitis. The symptoms settled and he returned to normal activities, including football, but he continued to have intermittent pain. Five months later he developed further pain together with a red fluctuant swelling on the medial aspect of the first metatarsal. He was afebrile. An attempt at aspiration was unsuccessful. The erythrocyte sedimentation rate was 13 millimetres in the first hour, and the leucocyte count was 7,000 per cubic millimetre with normal differential count. Radiographs showed that the proximal half of the lateral sesamoid was
eroded and had migrated proximally (Fig. 5). At exploration a sequestrum was removed from a granulation-filled cavity under the first metatarsal. Culture from the cavity grew a coagulase-positive staphylococcus aureus which was sensitive to penicillin. After operation he was given a course of cloxacillin and the foot was immobilised in a plaster-of-Paris splint. The wound healed uneventfully. Two months later he was free from symptoms and has remained so for two years.

On review, the radiographs taken nine days after the onset of pain show the proximal half of the lateral sesamoid to be relatively dense, while the distal half is eroded (Fig. 4).

Case 2. Figure 4—Radiograph at onset of infection, at first thought to be normal. It shows the proximal half of lateral sesamoid to be dense, and the distal half eroded. Figure 5—Radiograph five months later shows the proximal half of lateral sesamoid to have migrated proximally.

Case 3—A girl aged nine developed pain in the right foot, making her limp and keeping her awake at night. There was no history of injury, but she had had an episode of mild gastro-enteritis a week earlier. She was admitted to hospital two days after the onset of pain, at which time she was flushed, looked ill and was febrile (temperature 37 degrees Centigrade). There was a red warm tender swelling under the ball of the foot, with possible fluctuation. There was full passive movement of the metatarso-phalangeal joint but active movement was painful. Aspiration yielded a small quantity of fluid, in which gram-positive cocci were seen, but culture was sterile. The erythrocyte sedimentation rate was 10 millimetres in the first hour, the leucocyte count 6,800 per cubic millimetre. Radiographs showed a bipartite medial sesamoid, in the proximal half of which was a small, poorly demarcated translucent area (Fig. 6). In view of the fever and other clinical findings it was felt that an abscess was present. Cloxacillin was given orally. Two days later the pain and tenderness had gone, and she was
afebrile. The redness gradually disappeared and she was able to walk with no symptoms after ten days. She has remained free of symptoms since that time (eight months). Three weeks after admission radiography showed involvement of both halves of the sesamoid (Fig. 7). Six months later not only had bone texture returned to normal, but there had been fusion of the two halves of the sesamoid (Fig. 8).

DISCUSSION

Anatomy—Sesamoid bones (named after the seeds of the sesamum indicum plant because of their shape) are always present in the tendon of flexor hallucis brevis, although congenital absence has been reported (Hubay 1949). They lie within the fibres of the tendons except superiorly where they articulate with a prolongation of the articular surface of the metatarsal head. Below them lies the thick fibrous pad of the ball of the foot. Sometimes a bursa is present, for example in claw foot.

Embryology—The cartilaginous anlage is present by the third month of foetal life (Nesbitt 1736). Ossification begins at about seven and a half years of age and by fourteen is present in all cases (Kewenter 1936). It is often irregular, which may result in bipartite or multipartite sesamoids. Divided sesamoids occur in 10-7 per cent of the population (Inge and Ferguson 1933), the medial being involved much more commonly than the lateral. Seventy-five per cent of cases are unilateral. Eighty-five per cent of bilateral cases are symmetrical.

Pathology—Trauma to a divided sesamoid may produce distraction of the segments with local haematoma formation (Schütz 1928). Symptomless bacteraemia could then produce local infection. A small abscess in a sesamoid bone presumably soon breaks into the subperiosteal region, interfering with the blood supply and producing a sequestrum in the bone. The articular cartilage of the upper surface of the sesamoid may act as a barrier to intra-articular spread.

Radiology—The medial sesamoid is the larger, and lies under the metatarsal head, while the lateral lies a little to the lateral side of the head. Their structure is obscured in the usual radiographs of the foot. More information can be obtained by axial views of the sesamoids in the antero-posterior and lateral planes, with tomography when necessary. The bipartite sesamoid may easily be mistaken for one with a fracture, particularly since the edges may be sharp, serrated or even separated. Contrary to general belief comparison with the other foot is unreliable, since the condition is by no means always bilateral or symmetrical. The diagnosis of fracture is therefore hard to make without previous radiography or evidence of healing. The radiological changes of Renander's sesamoiditis (1924) are similar to those of aseptic necrosis in other sites with patchy alteration of density and fragmentation. Osteomyelitis, as at other sites, shows no obvious radiological change in the early phase. It is sometimes possible to see a small intra-osseous abscess (Case 3). Subsequent changes

Fig. 6  Fig. 7  Fig. 8

Case 3. Figure 6—Radiograph at onset of infection shows a bipartite medial sesamoid with a translucent area in the proximal part. Figure 7—Radiograph at three weeks shows involvement of both parts of the sesamoid. Figure 8—Six months later bone texture is normal and the sesamoid halves have fused.
may include osteolysis or avascular necrosis with relatively increased density of one fragment followed by sequestration and migration of the dead fragment. There may also be periostitis of the adjacent metatarsal shaft.

Clinical course—A major feature of the cases described was delay in diagnosis. Pain, swelling and redness in the region of the metatarso-phalangeal joint are frequently misdiagnosed as gout, cellulitis, or trauma. The condition may settle partially with rest or inadequate antibiotic therapy but the swelling persists. In time septic blisters and sinuses develop and the sesamoid sequestrates. Sequestrectomy is then required to obtain a cure.

SUMMARY
1. Three cases of osteomyelitis of a metatarsal sesamoid bone are described.
2. The diagnosis should be considered in patients with acute pain under the first metatarso-phalangeal joint, particularly if the temperature is elevated.
3. Failure of diagnosis may lead to persistent disability until sinus formation and sequestration dictate operative intervention.
4. Early antibiotic therapy may lead to resolution of the infection.

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REFERENCES