Case reports

Persistent osteomyelitis of the femur—2 cases of exchange intramedullary nailing with gentamicin beads in the nail

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Case 1

A 31-year-old man sustained multiple injuries when a coal face fell on him. He sustained a comminuted fracture of the right distal femur which communicated with his knee joint, a Gustilo grade II open fracture of the proximal right tibia (Gustilo and Anderson 1976), and a fracture of the right glenoid and scapula. The femoral fracture was fixed with a dynamic condylar plate. The tibial wound was debrided before the fracture was fixed with a T-plate. 1 year after his injuries he developed a swollen knee from which cloudy fluid was aspirated. Radiographs showed a lytic area around the lower part of the femoral fixation. Intravenous antibiotic treatment and a partial synovectomy did not bring the infection under control. All metalwork was then removed, and plaster of paris spica was applied to protect the femoral fracture. He continued to have knee pain and inflammation, and then developed an oozing sinus in the distal femur. A bone scan showed increased uptake in the knee and midfemur. After several months of oral and intravenous antibiotic treatment, the infection seemed to have settled and a further bone scan, 2 years after injury, was normal. Because of increasing knee pain with virtually no knee movement, a knee arthrodesis was carried out, using a long intramedullary nail from the greater trochanter to the ankle to treat both the tenuous union of the femur and the extremely painful knee. Pain and swelling recurred 1 month later and did not respond to intravenous antibiotic treatment. An exchange nailing was carried out after debridement and overreaming. A sinus on the distal tibia was also excised. This time, the IM nail cavity was packed with 3 strings of gentamicin beads (polymethylmethacrylate beds impregnated with gentamicin on stainless steel wire). Following this, he felt well and his symptoms improved for a period of 4 months. A recurrence of his symptoms was treated with further exchange nailing, the cavity of the nail again being packed with strings of gentamicin beads. Blood gentamicin levels were measured. The preoperative level was 0.1 mg/L, the postoperative level was 0.4 mg/L, and the level at 10 days was 0.3 mg/L. These were randomly measured levels. The normal therapeutic levels when using intravenous gentamicin are considered to be 2.0 mg/L (pre-dose) and 5–10 mg/L post-dose. His fractures and arthrodesis had healed well enough to allow removal of the nail 6 months (10 months from first nail) after the last surgery. 3 years after the procedure, he remains well and there are no signs of recurrent infection.

Case 2

A 20-year-old man sustained mainly right lower limb injuries in a motor cycle accident. He had a Gustilo grade III open fracture of the right mid-shaft of the femur and a short oblique fracture of the right midshaft of the tibia, with a major laceration across the pretibial area. He also had a central dislocation of his right hip. He underwent a debridement of his wounds and application of external fixators to his fractured femur and tibia. The femoral head dislocation was reduced and treated with traction. Soon after these procedures, he required compartment decompression of his right lower leg. He had some discharge from the proximal pin sites of the femoral fixator, which settled with the use of oral antibiotic treatment. 3 months after injury, there was no indication of tibial fracture healing, so the fixator was removed and a tibial IM nail was inserted 1 month later. 4 months after the injury, there were no signs of femoral fracture healing. Here again, the fixator was removed and an intramedullary nail was inserted 1 week later. However, 2 months after this, he developed an abscess in his right thigh which drained pus. Later on, he developed a further abscess cavity at the right greater trochanter at the insertion point of the IM nail. This also drained pus. Prolonged treatment with oral and intravenous

antibiotics did not improve the situation. 8 months later (14 months from injury) an exchange femoral nailing was planned. The old nail was removed and the medulla was overreamed to 15.5 mm to remove all the necrotic material. A further nail was inserted, but this time strings of gentamicin beads were placed in its cavity. Initially he was also treated with oral antibiotics. 1 year later (26 months after injury) his various sinuses had settled, apart from a small one on the anterior thigh. The femoral fracture had healed and the femoral nail was therefore removed, the medullary canal being reamed again. The anterior sinus was also laid open. A few months later, a sequestrum had developed on the anterior femur. This was removed along with some pus and a muscle flap was placed in the cavity. 1 year after this procedure, he has had no further recurrence of infection and has regained good mobility.

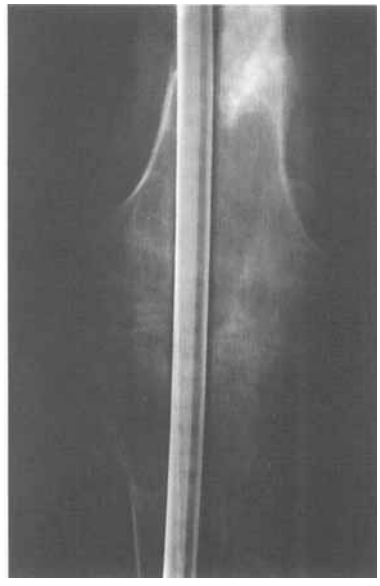

Figure 1. An Intramedullary nail with gentamicin beads inside it.

Discussion

In a case of osteomyelitis following intramedullary (IM) nailing of a long bone fracture, most surgeons would remove the old IM nail, overream the medullary canal, and insert a new nail (Brumback et al. 1989, Court-Brown et al. 1991). We did the same in these 2 cases but placed strings of gentamicin beads in the central cavity of the IM nail.

Gentamicin beads placed directly in the medullary cavity will become trapped in a few weeks. They are then difficult to remove. Beads left in the medullary cavity restrict the choice of the type of fixation subsequently used to hold the healing fracture. At a later stage, these beads may themselves act as foreign bodies, causing persistent infection. Although some authors have reported more success after longer periods of implantation (Henry et al. 1993, Klemm 1993), removal became very difficult or impossible and early removal is therefore recommended (Klemm 1993, Data sheet–Merck).

Gentamicin beads are 7 mm in diameter, which is less than the internal diameter of most intramedullary nails. Use of these enabled us to insert 2 or 3 strings of beads to fill the full length of the central cavity of the nail. The nail used must be of the slotted variety to allow seepage of gentamicin from the beads into the medullary canal (Figure 1). The nail cannot be interlocked since the screws cannot pass the beads, but the fracture is usually rotationally and axially stable by the time this technique is necessary. At the time of removal of the fixation, the intramedullary nail and beads come out as one unit, avoiding the need for extensive surgery to remove the beads. It has been shown that patients with osteomyelitis treated with gentamicin beads are at no more risk of ototoxicity than patients treated with conventional long-term systemic antibiotics (Stabile and Jacobs 1990, Blaha et al. 1993, Haydon et al. 1993, Klemm 1993). The systemic blood levels of gentamicin in case 1 were well below toxic levels. There are more adverse reactions related to the use of parenteral antibiotics than to the use of gentamicin beads (Blaha et al. 1993).

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Ankle stability without the lateral malleolus—a report of 2 cases

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Case 1

A 30-year-old man fell out of his motorboat and the screw of his outboard engine hit his left ankle, resulting in a 10 × 20 cm open wound, with large skinflap on the lateral side of the ankle. The lateral malleolus had disappeared (Figure 1). The talus was uncovered but the peroneal tendons were intact. In spite of the pain, the plantar and dorsal flexions were normal and stability was remarkably good.

After debridement, the wound was closed. The ankle was immobilized in a below-knee leg cast. For 5 days i.v. antibiotics were given.

After 1 week, partial weight bearing was started, with a below-knee walking cast. The skinflap became necrotic and complete secondary healing of the wound took several months. After 2 years, the patient had problems only with sport activities. The lateral stability was comparable to that on the other side. Plantar flexion of the right ankle was 25° and 20° on the left. The dorsal flexion was 5° on both sides.

Case 2 (Bongers 1995)

A 14-year-old male cyclist, hit by a truck, sustained a large soft tissue and bone defect on the lateral side of the left ankle. At surgery, 8 cm of the distal fibula was missing. On the anterior side, however, part of the periost remained, to which the remaining parts of the lateral ligaments were sutured. There was little instability on the lateral side as compared to the right ankle. The ankle was immobilized with an external fixator from tibia to calcaneus.

The fixator was removed after 8 weeks and the ankle was further treated by means of a custom-made brace.

Figure 1. Case 1. AP view of the left ankle at the time of presentation.

Figure 2. Case 2. AP and lateral views of the left ankle after treatment for 1 year.