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CASE REPORT

A technique to preserve the shape of the calcaneus after massive osteomyelitis

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SUMMARY. Osteomyelitis of the os calcis challenges the reconstructive surgeon. We present the case of a patient in which massive medullary osteomyelitis of the calcaneus was treated with a technique that preserves the bone shape. The medullary cavity of the bone was first emptied, preserving the cortical shell. Then a free muscle flap was used to fill up the dead space. Three months later autologous bone grafts were packed into the cavity. Full weight-bearing was commenced 4 months after this procedure. In the latest follow-up, $2^1/_2$ years, the patient has had no recurrence or difficulty with walking.

Keywords: osteomyelitis, calcaneus, free muscle flap, bone graft.

Os calcis osteomyelitis is a reconstructive challenge.

In spite of several reports of eradication by partial or total calcanectomy,[1–4] primary amputation is still considered a good option for calcaneal osteomyelitis.[5] Unfortunately, even successful calcanectomy carries its own morbidity and weight-bearing problems are likely, especially in young patients.

We present a case of massive medullary osteomyelitis of the calcaneus treated with a technique that preserves the outer shape of the bone.

Case report

A 24-year-old male electrician sustained bilateral os calcis fractures and multiple lumbar fractures after falling from a height of 10 m while working on an electric pole. Both calcanei were reshaped primarily and filled with autologous and lyophilised bone grafts. This treatment was successful on his left foot but a chronic draining wound developed on the medial aspect of his right foot (Figs 1A, B).

He was referred for secondary treatment 3 months post-injury. Radical debridement was performed after enlarging the medial draining sinus, removing all residual graft and cancellous bone and leaving only the cortex of the calcaneus, adherent to soft tissues (Figs 2A, B). Forty-eight hours later, under continuous epidural anaesthesia, a hemigracilis muscle free flap was packed into the emptied os calcis. To fill the dead space totally and to improve bone-muscle contact we sutured the distal end of the muscle, with the help of transfixing stitches, to the outer side of the foot (Figs 3A–C). Ciprofloxacin (200 mg IV for 2 weeks and then 500 mg bd PO for 4 weeks) was prescribed. The postoperative course was uneventful.

Three months later the flap was partially elevated and cultures were taken that proved to be negative. Forty-eight hours later the flap was retrieved from the cavity and we proceeded to fill it totally with autologous cancellous bone grafts.

Progressive weight-bearing was commenced 2 months later, allowing full weight-bearing after another 2 months. He returned to his previous employment 12 months after the accident.

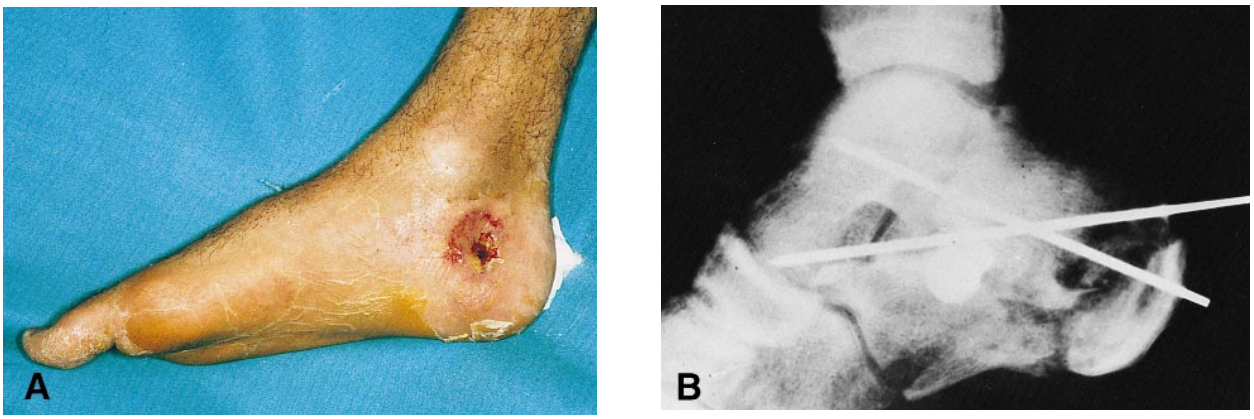

Figure 1—(A, B) Foot condition and preoperative X-ray.

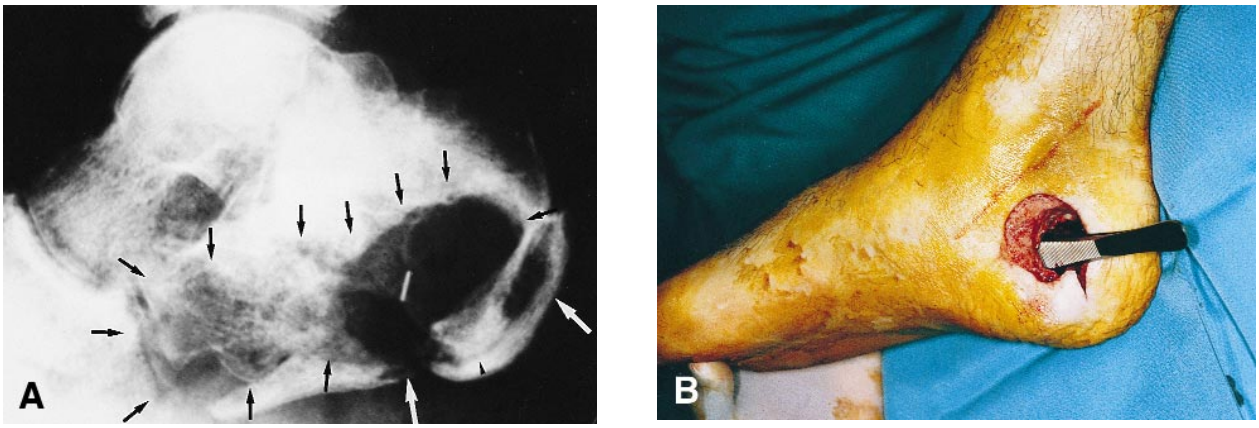

Figure 2—(A) X-ray after debridement. (B) Note the cavity left in the calcaneus.

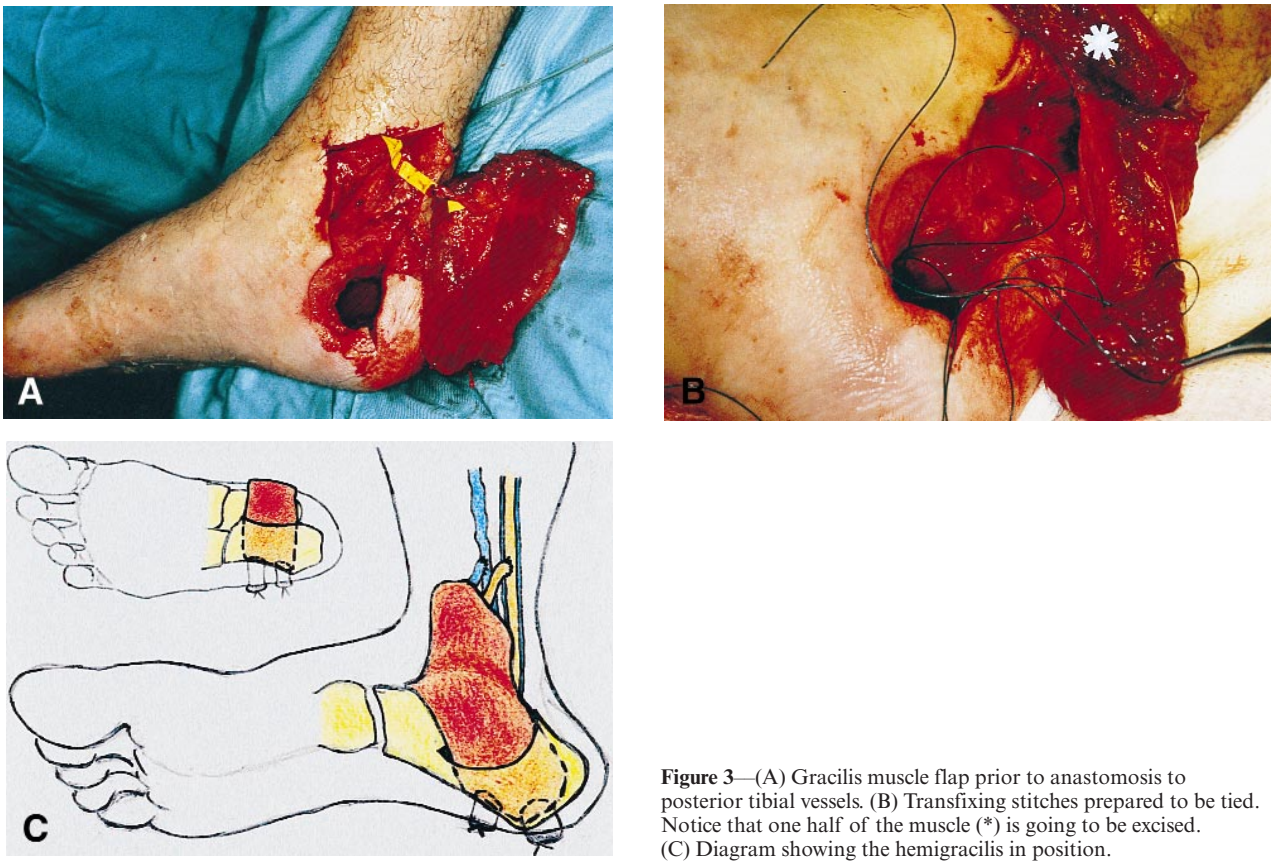

Figure 3—(A) Gracilis muscle flap prior to anastomosis to posterior tibial vessels. (B) Transfixing stitches prepared to be tied. Notice that one half of the muscle (*) is going to be excised. (C) Diagram showing the hemigracilis in position.

At the last visit, $2^1/_2$ years after the bone graft, the patient continues to do well; he does his normal job in an 8-hour shift and most of the time he his standing. There has been no report of pain or drainage to date (Figs 4A, B).

Discussion

Thorough debridement and dead space obliteration with a muscle flap are the mainstays of the treatment of chronic osteomyelitis.[6–9] The calcaneus has two specific features which make these goals difficult to accomplish: firstly, its tridimensional shape makes debridement and dead space obliteration difficult and secondly, there is a lack of local tissue, which makes a free flap nearly always a necessity.[5]

A most popular way of overcoming these obstacles has been partial or total calcanectomy.[1–4] Calcanectomy achieves at the same time all the goals: debridement, dead space filling and, as there is less tissue to cover, coverage with local tissues is nearly always possible.[10]

In spite of reports of successful eradication of the infection[1–4,10] few comments are made on the weight-bearing problems of these patients after calcanectomy. We have directed our efforts to preserving the shape of the calcaneus to allow weight-bearing. Our contention was that the cortical parts of the bone attached to soft tissues were well vascularised by their periosteal connections and hence could be left in place, filling the dead space with a flap and at a second stage, once the

Figure 4—Result at $2\frac{1}{2}$ years. (A) X-ray. (B) Weight-bearing.

cavity was judged 'clean', with autologous bone grafts. In this way the shape of the bone would be maintained, avoiding the use of orthoses.

With these considerations in mind we proceed first to thorough debridement taking care to eliminate all doubtful cancellous bone that could harbour infection and trying to leave a homogenous cavity. Antibiotic impregnated beads and continuous infusion are both well-established alternatives for cleaning and filling debrided cavities.[7] We chose a muscle flap as it has the ability to adapt to the shape of the cavity, improves local blood supply and is able to deliver antibiotics to the cavity.[6,8,11] It should be emphasised that if the debridement is not complete, the muscle, by itself, is not able to clear the infection,[8,12] and amputations have been required even with a viable free flap.[5] Bone grafting was performed 3 months later, after proving the absence of infection.

In reviewing the literature we found that Gaenslen used a similar concept in the 1930s[13] of opening the os calcis through plantar approach and debriding the inside of the bone leaving only the cortical bone intact. No bone graft was used in his approach.

In conclusion, we believe that selected cases of os calcis osteomyelitis after trauma could benefit from our approach. Calcanectomy should, in our opinion, be left for failures or debilitated patients who are unlikely to weight-bear.

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