Post-traumatic Osteomyelitis of the Calcaneus: Results of Treatment

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Purpose. Osteomyelitis of the calcaneus may cause severe consequences and disability. The aim of this study is to analyze the treatment of post-trauma osteomyelitis of the calcaneus and the results seen in a series of patients.

Materials and methods. This is a retrospective study of 15 cases of osteomyelitis of the calcaneus treated in the ASEPEYO Hospital of Sant Cugat. The initial diagnosis was confirmed in all cases by means of bone culture. In all cases surgical treatment was radical debridement with a second phase in which defect coverage was performed. Functional results were assessed using the Kitaoka rearfoot and ankle scale.

Results. Bacteria were isolated from all the bone cultures (11 Staphylococcus aureus, 3 Pseudomonas aeruginosa and 1 Bacillus sp.). Antibiotic treatment was carried out for a mean period of 45 days according to the antibiogram of the isolated microorganism. There were two relapses with isolation of Pseudomonas aeruginosa both in the initial and relapse cultures. Functional results with a mean score of 62 points were achieved according to the Kitaoka scale for rearfoot and ankle, with favorable clinical and radiological outcomes in all cases.

Conclusions. Osteomyelitis of the calcaneus is a severe complication in which radical debridement of all necrotic, dead and infected tissue is essential, using the same criteria as those used in oncological surgery. This treatment frequently creates large defects that must be covered, if possible with tissue with a good blood supply.

Key words: foot, calcaneus, osteomyelitis, osteitis.

Palabras clave: pie, calcáneo, osteomielitis, osteitis.
Of all calcaneal osteomyelites, post-traumatic osteomyelitis has the worst prognosis, since infection is added to the usually not overly encouraging outcome of a complex fracture treated surgically. Therefore, for a long time, surgical treatment of calcaneal fractures remained in second place due its complications.

Currently, many authors prefer conservative or functional treatment of calcaneal fractures, partly to overcome the complications of surgery, amongst them calcaneal osteomyelitis.

There are different therapeutic alternatives for treating osteomyelitis: calcaneotomy, Burri or Papineau techniques, local, free or attached flaps that contribute muscle, fascia, adipose and skin tissue, or a combination of all of these. But opinions are unanimous when it comes to the necessity of radical ample debridement using oncological criteria and antibiotic treatment.

The aim of this study is to show how we treated calcaneal post-trauma osteomyelitis and the results of our treatment. We carried out a retrospective review of calcaneal osteomyelitis cases treated in our hospital during 1996-2003.

MATERIALS AND METHODS

From 1996 to 2003 a total of 15 calcaneal osteomyelitis cases were treated. The initial diagnosis, determined by clinical exam, preoperative culture, blood chemistry and imaging, was corroborated in all cases by bone culture and histology of surgical samples.

Surgical treatment consisted in the removal of osteosynthesis material in those patients who had any in place, radical debridement of tissue suspected of being infected down to healthy bleeding bone, and, if a significant cavity remained, initial filling of the dead space with antibiotics (polymethylmethacrylate [PMMA] beads + gentamicine). In cases in which after postsurgical dressing, scaling, devitalized tissue or non-bleeding bone was found, a new debridement was carried out. Subsequently, in a second procedure, with a good 2-3 week evolution after debridement, the defect was covered and the wound closed. The route of approach used depended on the location of the fistula. Fistulectomy was the first step carried out during surgery. As to antibiotic treatment, in all patients antibiotics were first given by the intravenous route and then orally according to antibiogram.

Healing was determined based on X-rays signs of fracture healing, no fistula of the surgical wound and erythrocyte sedimentation rate (ESR) and PCR with normal values.

Finally a hindfoot and ankle functional study was carried out using the Kitaoka scale.

RESULTS

All the patients affected were men of different ages (mean: 46 years; range: 30-58 years), with a minimum 9 months and maximum 60 months followup (average 30 months). No predominance of one side over the other was seen (8 on the left and 7 on the right).

Of the 15 calcaneal osteomyelitis, 10 were in calcaneal fractures treated by plate osteosynthesis, 3 cases were secondary to insertion of a pin in the calcaneus as an external fixator (Figure 1) (2 fractures of the tibial pilon and 1 Chopart fracture-dislocation), 1 was secondary to an open calcaneal fracture, treated orthopedically and 1 osteomyelitis was a consequence of a plantar puncture.

Mean time between diagnosis of osteomyelitis and initial treatment was 82 days except in 1 case in which this period was 8 years after the initial surgical treatment and which was due to infection of a pin inserted in the calcaneus as an external fixator to treat a tibial pilon fracture.

Microbiology: samples were taken in all patients before starting antibiotic treatment, also bone cultures, and the agent was isolated in all cases with the following results: methicillin sensitive Staphylococcus aureus (MSSA) (n = 11), Pseudomonas aeruginosa (n = 3), including the case caused by plantar puncture, and Bacillus sp. (n = 1).

The first surgical procedure (Figure 2) consisted in removal of the osteosynthesis material if there was any in place (n = 13), radical debridement of necrotic or possibly infected tissue in all cases, and initial closure of dead space with antibiotics, polymethylmethacrylate [PMMA] beads + gentamicine if a significant cavity remained (n = 6). In other cases dead space was closed with dressing material such as tuss gras or gauze soaked in saline with the aim of achieving good granulation tissue that would prove their was good blood supply to the area. In 4 cases a second debridement was performed due to the presence of devitalized tissue and non-bleeding bone. Subsequently, in a second surgical procedure the defect was filled in and the wound closed. In 2 cases iliac crest autologous bone graft was used (Figure 3) in a step previous to closure. A graft of bone with a blood supply was not necessary. The mean time between debridement and closure was 23 days (range: 15-40).

In 5 cases the defect was covered by a pedicled muscle flap from the abductor digiti minimi, in 3 cases by pedicled fascia and skin flaps from the sural, in 2 cases by free skin grafts and in 5 cases closure was by second intention (with a secondary suture).

Antibiotic treatment was carried out according to the antibiogram of the isolated agent, for a mean period of 45 days (range: 28-94). Initial treatment was by injections for 7 to 15 days (average: 10 days), followed by oral antibiotics for a mean period of 36 days (range: 14-80), until normalization of clinical, radiological and analytical parameters.
Two cases suffered a relapse of osteoartitis (14.2%). *Pseudomonas aeruginosa* was isolated in these, both initially and during the relapse, and in both cases medical and surgical treatment was repeated according to protocol; 1 case required coverage by means of a skin graft and the other by means of a free perforating fascia and skin graft taken from the anterolateral aspect of the thigh. Both cases have evolved well up to date without any remission detected clinically, radiologically or by laboratory tests.

Finally, in all cases, radiological signs of fracture healing were seen, there was no fistula of the surgical wound and test variables such as ESR and PCR were normal. We therefore considered that poiliomyelitis was cured.
As to functional results, a review was carried out of 14 cases (one did not come in for review) using the Kitaoka scale for hindfoot and ankle that assesses pain, function and alignment. We had average results of 62 points (range 48-100) on this scale, which we consider fair results.

As to pain, 71.4% of the patients reported moderate daily pain (slight, 21.4%; painless, 7.1%; severe, 0%). And 57.1% of patients reported limitation of their daily activities (sports limitations, 35.7%; no limitations, 7.1%). And 78.6% of the patients could walk 4-6 blocks (14.2% from 1 to 3 blocks, 7.1% more than 6 blocks). And 42.8% reported severe difficulties in walking on irregular surfaces (some difficulty, 42.8%; no difficulty, 14.2%); 64.2% walked with evident lameness (no lameness, 28.6%; marked lameness, 7.1%).

Sagittal ankle movement was normal in 57.2% of cases and slightly limited in the rest, with hindfoot inversion/retroversion clearly affected (severely limited, 5.7%; moderately limited, 7.1%; normal, 7.1%). All ankles were stable and the feet were plantigrade at the end of treatment. Mean time before return to work was 12 months (range: 6-18 months). Six cases were unable to return to their former job, due to disability.

DISCUSSION

Osteomyelitis is a severe complication in which radical debridement of necrotic infected tissue is essential using the same criteria as for oncological surgery. This frequently gives rise to significant defects that must be filled, if possible with a tissue with a good blood supply, these can be pedicled flaps from neighboring tissues (muscular or not) or free microsurgical flaps. A good blood supply to the area is a factor that helps cure infection, we therefore consider it essential to prepare a bleeding bed and good granulation tissue to help with coverage, blood supply, antibiotic therapy and, in summary, healing.

Treatment by means of debridement and skin coverage in a second surgical procedure shortens treatment time and hospitalization and achieves good quality skin coverage. Mean time between debridement and coverage in this series was 23 days (range: 15-40); this is less time than that needed for classical techniques such as Burri or Papineau, although we think that the ideal time to coverage should be about 2 weeks from debridement.

In the literature infection relapses are seen in 5% to 20% of cases and additional treatment is necessary in these with new debridements, prolonged antibiotic therapy and new coverage if necessary. In our series there were relapses in 14% of cases.

In conclusion, in spite of the small number of patients, we think that the infection caused by Pseudomonas has the worst prognosis, in this series it caused 2 relapses.

As far as functional assessment, for hindfoot on the Kitaoka scale, we obtained 62 points and we consider this a fair result. It must be kept in mind that in these cases infection is added to the already poor prognosis of calcaneal fracture, making the perspective even gloomer.

REFERENCES


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