Journal of Plastic, Reconstructive & Aesthetic Surgery (2006) **59**, 658–661

JPRAS
An International Journal of Surgical Reconstruction
www.JPRASurg.com

CASE REPORT

Lower limb salvage to allow planned trans-tibial amputation

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Received 2 February 2005; accepted 8 September 2005

KEYWORDS
Severe limb injury;
Amputation;
Surgical flaps;
Decision making;
Tibial fractures

Summary Early, primary amputations are still necessary for certain patients sustaining high impact lower limb trauma. For cases with extensive proximal tibial bone loss a turn-up bone flap technique has been described to achieve a below-knee stump suitable for a prosthesis. However, in certain circumstances, for example if posterior soft tissues are injured, this type of reconstruction is not possible. This case report demonstrates that converting a severe open proximal tibial fracture to a successful below-knee amputation is also possible with acute limb shortening, flap cover and planned subsequent trans-tibial amputation.

Large post-traumatic bone defects in tibial fractures remain challenging for orthopaedic trauma surgeons. Limb salvage can be achieved by methods such as the Ilisarov technique, bone transport over intramedullary nails or free vascularised fibula transfer.[1–5] Combined bone and soft tissue injuries often require a team approach between the orthopaedic trauma surgeon and the plastic surgeon.[6] A variety of techniques aim for early provision of a healthy soft tissue envelope for a delayed, staged skeletal reconstruction.[7]

There remain, however, arguments for early, primary amputations in non life-threatening limb injuries. It is known that primary amputation of the lower limb after injury can result in an equivalent or better return-to-work rate than reconstruction.[8] Furthermore, quality of life has been reported to be superior to reconstruction in primary amputation of grade III open tibial fractures.[9] Finally, limb salvage techniques resulting in early ambulation lead to much higher reemployment rates than those in whom ambulation is delayed.[10]

Successful ambulation with a prosthesis is more likely if the amputation is trans-tibial rather than through the knee joint or at a trans-femoral level.[11] However, if the segment of missing bone is close to the tibial plateau then above-knee amputation has been the treatment option most likely to result in an adequate stump for prosthesis fitting, although the knee joint itself may be normal. This has negative implications when compared to below-knee amputation for regaining mobility and returning to work.

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S0007-1226/$ - see front matter
doi:10.1016/j.bjps.2005.09.014

We report a limb salvage technique to allow below- rather than above-knee amputation in high tibial injuries and compare this technique with other reported concepts.

Case report

A 51-year-old man, self-employed as a potter, sustained a high energy road traffic accident resulting in a highly comminuted fracture of the proximal tibia with extensive soft tissue loss. The ipsilateral foot was not injured and remained well perfused and sensate. His other injuries included lower rib fractures with a pneumothorax, traumatic irreducible inguinal hernia and a minimally displaced distal radius fracture. Following excision of dead soft tissue and devitalised proximal tibia, a 10 cm by 15 cm soft tissue defect, exposing an 8 cm segmental defect of the proximal tibia remained (Fig. 1). Examination of the knee joint under anaesthetic showed ligamentous stability despite a grade two tear of the medial collateral ligament. A spanning external fixator was applied initially to provide fracture stability.

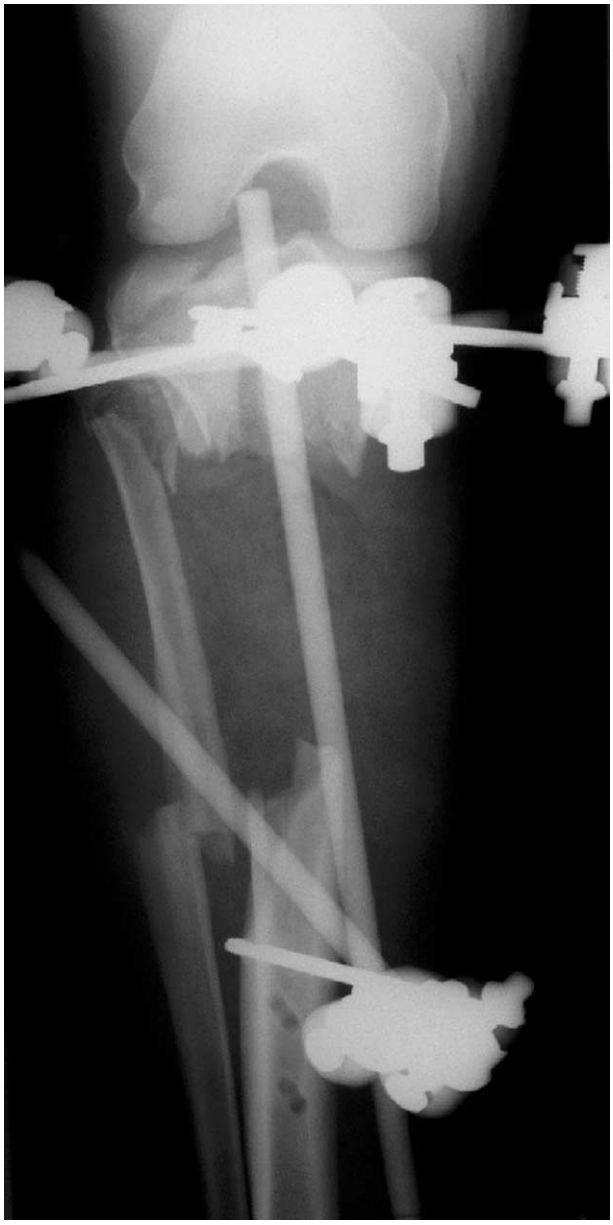

Figure 1 Post-injury AP radiograph of right tibial fracture.

Three surgical options were discussed with the patient. These were (a) immediate above-knee amputation, (b) acute limb shortening with flap cover and bone transport and (c) a technique not previously reported, acute limb shortening with flap cover and planned subsequent trans-tibial amputation once bony union had occurred. As well as details of the individual procedures, information was given on estimates for time to healing and mobility and likelihood of returning to work.

The third option of acute shortening and flap cover with subsequent amputation was decided on as giving the best compromise between the goals of minimising in-patient episodes, success of surgical procedure, early ambulation, and long-term quality of life and return to work. It was estimated that bone healing would take up to 3 months, below-knee amputation would follow this and full weight bearing could be achieved with a prosthesis 6 weeks after full bony union.

Two weeks after the initial injury the tibial ends were approximated and rigid fixation with medial and lateral plates and screws was attained. Soft tissue coverage was achieved by transposing the anterior compartment muscles over the bone and metalwork and covering these with split skin graft.

Healing was delayed by methicillin-resistant *Staphylococcus aureus* (MRSA) and *Pseudomonas aeruginosa* infections. Discharging sinuses extending to the fracture line and metalwork were explored and washed out on two occasions within 2 months of fixation and treated with appropriate antibiotics. Following eradication of the infection bony union was achieved and below-knee amputation could be performed. The metalwork was removed, and the tibia transected 15 cm below the knee joint and covered with a myocutaneous flap (Fig. 2). Healing was again delayed by infection, this time with beta-haemolytic *Streptococcus* species. This resulted in a further delay to prosthesis fitting.

Three months following amputation full ambulation with a prosthesis and a pain free amputation stump had been achieved.