



BOAST 4: THE MANAGEMENT OF SEVERE OPEN LOWER LIMB FRACTURES

Background and Justification:

The British Orthopaedic Association and the British Association of Plastic, Reconstructive and Aesthetic Surgeons have reviewed their 1997 guidance and now publish a review of all aspects of the acute management of these injuries using an evidence-based approach, leading to the “Standards for the Management of Open Lower Limb Fractures,” which are free to download from www.boa.ac.uk and www.bapras.org.uk. This BOAST is derived from these standards. Contrary to traditional teaching, best outcomes are achieved by timely, specialist surgery rather than emergency surgery by less experienced teams.

Included Patients:

All patients with high energy open fractures as manifest by the following injury patterns:

- Fracture Pattern:
- Multifragmentary (comminuted) tibial fracture with fibular fracture at same level
 - Segmental fractures
 - Fractures with bone loss, either from extrusion or after debridement
- Soft tissue injury:
- Swelling or skin loss, such that direct, tension-free wound closure is not possible
 - Degloving
 - Muscle injury that requires excision of devitalised muscle via wound extensions
 - Injury to one or more major arteries of the leg
 - Wound contamination with marine, agricultural or sewage material

Standards for Practice Audit:

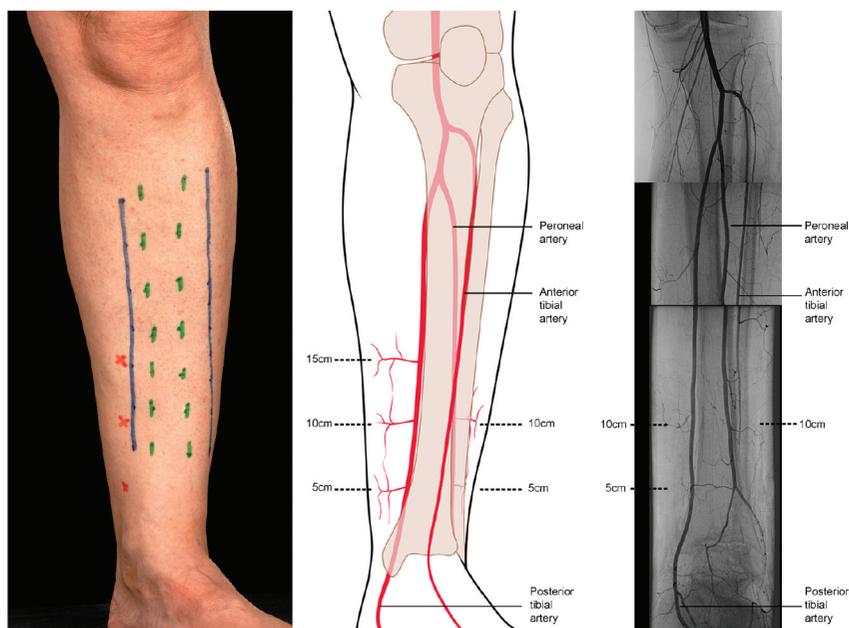
1. Intravenous antibiotics are administered as soon as possible, ideally within 3 hours of injury: Co-amoxiclav (1.2g) or Cefuroxime (1.5g) 8 hourly and are continued until wound debridement. Clindamycin 600mg, 6 hourly if penicillin allergy
2. The vascular and neurological status of the limb is assessed systematically and repeated at intervals, particularly after reduction of fractures or the application of splints
3. Vascular impairment requires immediate surgery and restoration of the circulation using shunts, ideally within 3-4 hours, with a maximum acceptable delay of 6 hours of warm ischaemia
4. Compartment syndrome also requires immediate surgery, with 4 compartment decompression via 2 incisions (see overleaf)
5. Urgent surgery is also needed in some multiply injured patients with open fractures or if the wound is heavily contaminated by marine, agricultural or sewage matter.
6. A combined plan for the management of both the soft tissues and bone is formulated by the plastic and orthopaedic surgical teams and clearly documented
7. The wound is handled only to remove gross contamination and to allow photography, then covered in saline-soaked gauze and an impermeable film to prevent desiccation
8. The limb, including the knee and ankle, is splinted
9. Centres that cannot provide combined plastic and orthopaedic surgical care for severe open tibial fractures have protocols in place for the early transfer of the patient to an appropriate specialist centre
10. The primary surgical treatment (wound excision and fracture stabilisation) of severe open tibial fractures only takes place in a non-specialist centre if the patient cannot be transferred safely
11. The wound, soft tissue and bone excision (debridement) is performed by senior plastic and orthopaedic surgeons working together on scheduled trauma operating lists within normal working hours and within 24 hours of the injury unless there is marine, agricultural or sewage contamination. The 6 hour rule does not apply for solitary open fractures. Co-amoxiclav (1.2g) and Gentamicin (1.5mg/kg) are administered at wound excision and continued for 72 hours or definitive wound closure, whichever is sooner
12. If definitive skeletal and soft tissue reconstruction is not to be undertaken in a single stage, then vacuum foam dressing or an antibiotic bead pouch is applied until definitive surgery.
13. Definitive skeletal stabilisation and wound cover are achieved within 72 hours and should not exceed 7 days.
14. Vacuum foam dressings are not used for definitive wound management in open fractures.
15. The wound in open tibial fractures in children is treated in the same way as adults

Evidence Base:

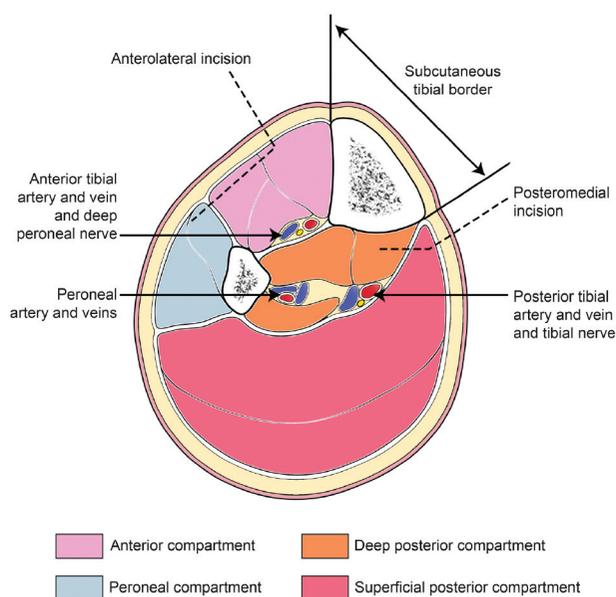
Derived from the 2009 BOA/BAPRAS Standards for the Management of Open Lower Limb Fractures. This is based upon case series, case-controlled studies and reviews together with an evolved, multi-national, professional consensus over 15 years.

Limitations:

There is inconclusive evidence to the best method of skeletal stabilisation.



Recommended incisions for fasciotomy and wound extensions. (a) Margins of subcutaneous border of tibia marked in green, fasciotomy incisions in blue and the perforators on the medial side arising from the posterior tibial vessels in red. (b) line drawing depicting the location of the perforators. (c) montage of an arteriogram. The 10cm perforator on the medial side is usually the largest and most reliable for distally-based fasciocutaneous flaps. In this patient, the anterior tibial artery had been disrupted following an open dislocation of the ankle; hence the poor flow evident in this vessel in the distal 1/3 of the leg. The distances of the perforators from the tip of the medial malleolus are approximate and vary between patients. It is essential to preserve the perforators and avoid incisions crossing the line between them.



Cross-section through the leg showing incisions to decompress all four compartments