

EXTREMITY COMPARTMENT SYNDROME - Adults & Children

Compartment syndrome is a severe time-dependent condition characterised by challenges to its diagnostics, a straight forward therapeutic management, and detrimental irreversible consequences if it is neglected.

It arises from an increase in intrafascial pressure in the compartments. It can affect all regions of the extremities, primarily the tibial region. Causes include direct trauma, burns and compression as a result of prolonged positioning (eg lying on leg in an unconscious state).

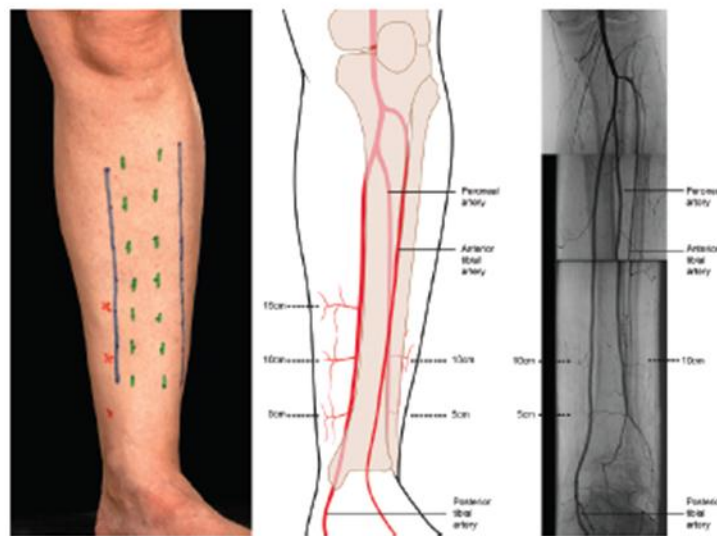
RECOMMENDED STANDARDS: (adaptation of BOAST 10)

- Assessment for compartment syndrome must be part of the routine evaluation of patients who present with significant limb injuries, OR after surgery for limb injuries, AND after any prolonged surgical procedure which may result in hypo perfusion of a limb.
- Clear documentation should include:
 - Time and Mechanism of injury
 - Time of evaluation
 - Level of Pain
 - Level of Consciousness
 - Response to Analgesia
 - Whether a Regional Anaesthetic is given.
- The Key Clinical Findings are
 - Pain out of proportion to the associated injury
 - Pain on passive movement of the muscles of the involved compartments
 - Limb neurology and perfusion, including capillary refill and distal pulses, should be clearly documented but do not contribute to early diagnosis of the condition.
- Patients Documented to be AT RISK for compartment syndrome should have routine nursing limb observations for these early signs and these should be recorded.
- These observations should be performed hourly whilst the patient is deemed still to be at risk. If pain scores are not reducing, then SENIOR CLINICAL REVIEW i.e. ONCALL MTC / ORTHOPAEDIC CONSULTANT or ONCALL SENIOR REGISTRAR is mandated.
- In high-risk patients, Regional Anaesthesia with long acting local anaesthetics should be avoided as it can mask the symptoms of compartment syndrome. Lignocaine can be used for nerve blocks for fracture manipulation / splintage but ensure the receiving team are aware. In addition Patient-Controlled Analgesia with intravenous opiates can also mask the symptoms. When evaluating these patients, the rate and dose of opiates and other analgesics must be taken into consideration and recorded in the medical records.
- Patients with symptoms or clinical signs of compartment syndrome should have All Circumferential Dressings Released to skin and the Limb Elevated to Heart Level. Measures should be taken to maintain a normal blood pressure.

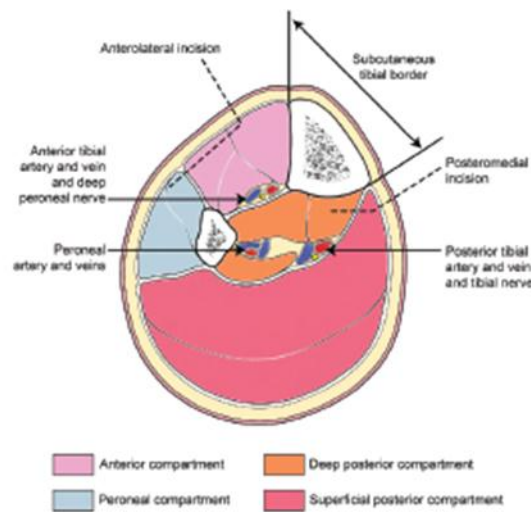
- Patients should be re-evaluated within 30 minutes. If symptoms persist then urgent surgical decompression should be performed. Alternatively, in situations where the clinician is not completely convinced by the clinical signs, compartment pressure measurements should be undertaken. All actions should be recorded in the medical records.
- Compartment Syndrome is a Surgical Emergency and surgery should occur within an hour of the decision to operate.
- FOR PATIENTS WITH DIAGNOSTIC UNCERTAINTY and those with risk factors where clinical assessment is not possible (e.g. patients with reduced level of consciousness):
 - Intrafascial Pressures should be measured objectively and documented without delay
 - Compartment Pressures exceeding 40 mmHg, OR, in the case of hypotension, exceeding a difference between the DBP (diastolic) and the intrafascial chamber pressure of <30 mmHg are classed as critical values and are an indication for fasciotomies in the unconscious patient
 - It must be noted that the accuracy of the compartment pressure measurement depends on the examiner and can be false-positive/negative.
 - Following measurement - should either proceed to Surgical Decompression or continue to be monitored. This decision should be made by an orthopaedic / plastic surgical or vascular consultant.

SURGERY

- Immediate open fascial decompression of all involved compartments, taking into account possible reconstructive options.
- Necrotic muscle should be excised. The compartments decompressed must be documented in the operation record.
- All patients should undergo re-exploration at approximately 48 hours, or earlier if clinically indicated. Early involvement by a plastic surgeon may be required to achieve appropriate soft tissue coverage.
- For lower leg fasciotomies it is recommended to perform a two-incision four-compartment decompression (BOAST 4).
- Patients with Late Presentation or Diagnosis (greater than 12 hours) have a high risk of complications with surgery. Decision-making is difficult and should involve 2 consultants. Non-operative management is an option.
- In case of Vascular Reconstruction the indication for fasciotomies should be considered and applied early; if necessary it should be carried out even before the vascular reconstruction.
- Postoperatively the patient should be covered with Antibiotics as per the relevant (adult or paediatric) open fracture guidelines.



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

