Brighton and Sussex University Hospitals NHS Trust

Sussex TRAUMA Network

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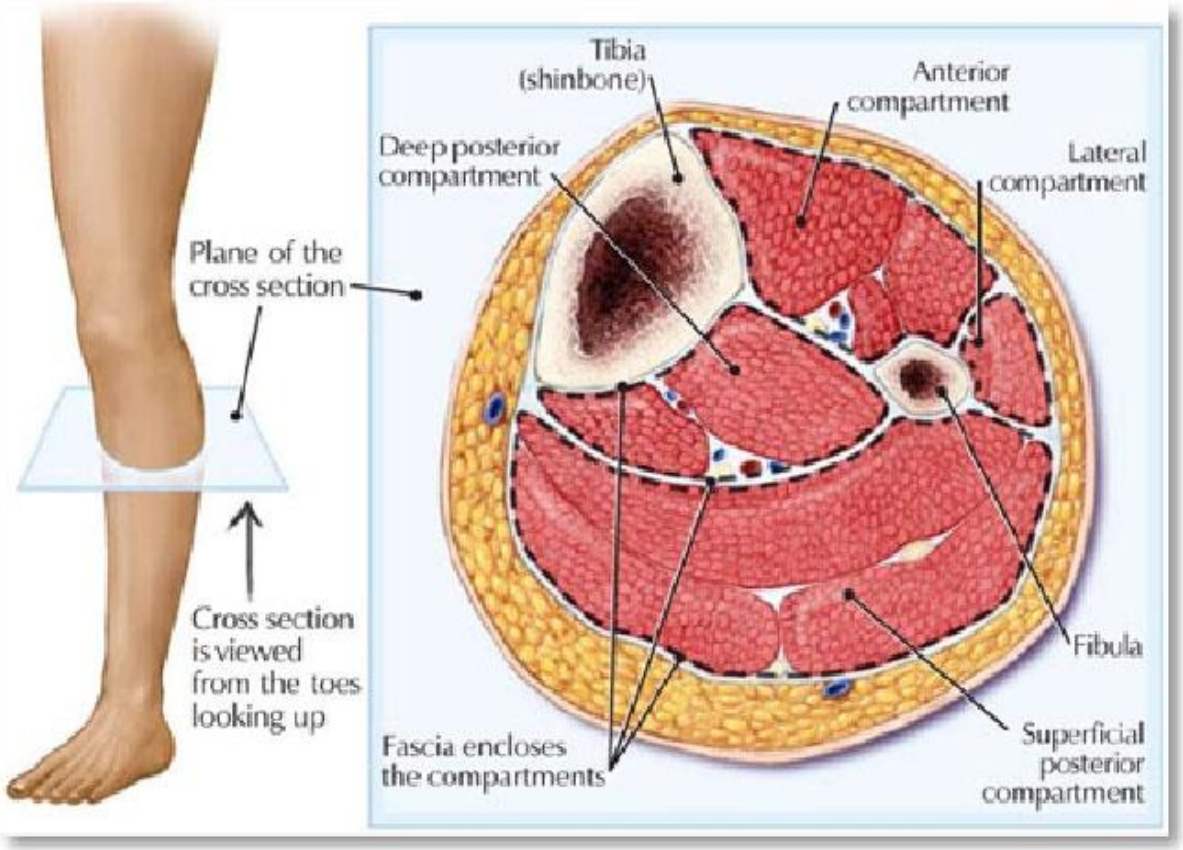
Guidelines for:

The Management of Compartment Syndrome



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Management of Compartment Syndrome

Control Page

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Contents

1. Introduction

Acute compartment syndrome of a limb is due to raised pressure within a closed myofascial compartment which causes hypoperfusion, hypoxia and local tissue ischaemia. In clinical practice, it is most often seen after tibial and forearm fractures, high-energy wrist fractures and crush injuries (including prolonged body-weight crush injury). Other important causes include restrictive dressings or casts, prolonged immobilization and reperfusion of ischaemic limbs. Early diagnosis and treatment is vital to avoid irreversible damage and subsequent severe disability. Pulses are normally present in compartment syndrome. Absent pulses are usually due to systemic hypotension, arterial occlusion or vascular injury.

2. Purpose

The purpose of this SOP is to clearly define the care pathway for patients with suspected Compartment Syndrome. This SOP will be linked to BOAST 10 guidelines (appendix 1) which are drawn from the BOA/BAPRAS national standards.

3. Definitions

Compartment Syndrome - raised pressure within a closed myofascial compartment which causes hypoperfusion, hypoxia and local tissue ischaemia.

Fasciotomy – the complete release of all compartments within the limb by dividing the fascia longitudinally.

Crush Injury – Any force applied to a limb that causes local tissue damage and/or hypoperfusion. This includes body-weight crush injury which involves a prolonged period of immobilisation on the affected limb. Body-weight crush injury is more common in intoxicated/anaesthetised patients and the clinical presentation is very variable with the possibility of compartment syndrome developing over many hours. The clinician needs to maintain a high index of suspicion in these patients.

4. Responsibilities, Accountabilities and Duties

4.1 Polytrauma Consultant on call:

The polytrauma consultant takes overall responsibility for patients with compartment syndrome once notified of their arrival. Duties include ensuring patients are managed according to the SOP and that junior orthopaedic staff are aware of the SOP and BOAST 10 guidelines. The polytrauma consultant of the day will ensure availability to assess patients with compartment syndrome and liaise with the relevant team members.

4.2 Emergency Medicine Consultant on duty (MTC):

The emergency medicine consultant on duty on the MTC takes overall responsibility for the patients with compartment syndrome from the time they arrive in the emergency department until the polytrauma consultant takes over care. They also

are responsible for ensuring that junior staff are aware of and follow this SOP and BOAST 10 guidelines.

4.3 Consultant Plastic/Orthoplastic Surgeon of day (MTC) (Monday – Friday):

The plastic surgery consultant of the day in the MTC will ensure availability to assess patients with compartment syndrome who require muscle debridement or who have had fasciotomy and require soft tissue coverage and they will liaise with the polytrauma consultant on call.

4.4 Orthopaedic Registrar on call (MTC):

The orthopaedic registrar on call (MTC) is responsible for implementation of this SOP and managing the patient accordingly.

4.5 Emergency Medicine Registrar on duty (MTC):

The emergency medicine registrar on duty (MTC) is responsible for implementation of this SOP and managing the patient accordingly.

5. Standard Operating Procedure

5.1 Assessment for compartment syndrome should be part of the routine evaluation of patients who present with significant limb injuries, after surgery for limb injuries, and after any prolonged surgical procedure which may result in hypoperfusion of a limb.

5.2 Clear documentation should include: the time and mechanism of injury, time of evaluation, level of pain, level of consciousness, response to analgesia and whether a regional anaesthetic has been given.

5.3 The key clinical findings are pain out of proportion to the associated injury and 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.

5.4 Patients documented to be at risk of 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 is mandated.

5.5 In high-risk patients, regional anaesthesia should be avoided as it can mask the symptoms of compartment syndrome. 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.

5.6 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.

5.7 Compartment syndrome is a surgical emergency and surgery should occur within an hour of the decision to operate.

5.8 For patients with diagnostic uncertainty and those with risk factors where clinical assessment is not possible (e.g. patients with reduced level of consciousness), the Orthopaedic Registrar on-call and/or Polytrauma Consultant on-call should be notified to evaluate the patient expediently. Compartment pressure monitoring can be used as an adjunct to the clinical examination and should be performed by a clinician trained in performing this and ideally the surgeon who is responsible for performing the surgical decompression (polytrauma consultant on-call).

5.9 When pressure monitoring is performed, the pressure sensor should be placed into all the compartments suspected of being abnormal or at risk.

5.10 All patients having compartment pressure measurements should have their diastolic blood pressure recorded; a difference between the diastolic blood pressure and the compartment pressure of less than 30 mmHg suggests an increased risk of compartment syndrome. It is recommended these should either proceed to surgical decompression or continue to be monitored depending on the consultant decision.

5.11 If the absolute compartment pressure is greater than 40 mmHg, with clinical symptoms, urgent surgical decompression should be considered unless there are other life-threatening conditions that take priority.

5.12 Compartment pressure monitoring is not necessary in patients who have clear signs of compartment syndrome. These patients should be taken to the operating theatre for emergency surgical decompression.

5.13 Surgery should involve 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 36-48 hours, or earlier if clinically indicated.

5.14 In compartment syndrome following crush injury (including body-weight crush injury), muscle necrosis may be present but may not be seen at initial surgical decompression. These patients should return to the operating theatre within 36-

48 hours for assessment of muscle viability. When extensive muscle necrosis is present, adequate debridement should be performed. These patients are at significant risk of life and limb threatening complication and application of a VAC dressing with negative pressure wound therapy following debridement is recommended.

5.15 For lower leg fasciotomies it is recommended to perform a two-incision four-compartment decompression (BOAST 4).

5.16 There is no consensus for the management of foot compartment syndrome and it should be managed in consultation with the on-call polytrauma consultant.

5.17 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 two consultants. Non-operative management is an option.

6. Training Implications

All within the trauma team must be aware of the Guideline and ensure that the guideline is followed

7. Monitoring Arrangements

7.1 Any patients whose treatment falls outside this guideline should be raised onto the network clinical governance log, and discussed through internal clinical governance mechanisms.

7.2 These patients should be discussed at QSPE / Clinical Governance meetings.

Equality Impact Assessment Screening

8. Links to other Guideliness and policies

This SOP should link to other trauma SOPs including polytrauma and trauma SOPs in particular the Open Fracture Management SOP.

9. Associated documentation and Appendices

Appendix 1: BOAST 10 Guidelines

Appendix 2: Version Control Sheet

Appendix 3: Plan for Dissemination of Standard Operating Procedures

Appendix 4: Version Control Sheet

Appendix 5: Plan for Dissemination of Standard Operating Procedures

10. References

British Orthopaedic Association and British Association of Plastic, Reconstructive and Aesthetic Surgeons. Standard for Trauma – 2014 BOAST 10: DIAGNOSIS AND MANAGEMENT OF COMPARTMENT SYNDROME OF THE LIMBS

British Association of Plastic, Reconstructive and Aesthetic Surgeons (BAPRAS) / British Orthopaedic Association (BAO). Standards for the management of open fractures of the lower limb. 2009

National major trauma peer review measures 2016 – 1C-107

Appendix 1

BRITISH ORTHOPAEDIC ASSOCIATION

STANDARDS for TRAUMA (BOAST)

BOAST 10: DIAGNOSIS AND MANAGEMENT OF COMPARTMENT SYNDROME OF THE LIMBS
Background and Justification Acute compartment syndrome of a limb is due to raised pressure within a closed fascial compartment causing local tissue ischaemia and hypoxia. In clinical practice, it is most often seen after tibial and forearm fractures, high-energy wrist fractures and crush injuries. Other important causes include restrictive dressings or casts, prolonged immobilization and reperfusion of ischaemic limbs. Early diagnosis and treatment is vital to avoid severe disability. Pulses are normally present in compartment syndrome. Absent pulses are usually due to systemic hypotension, arterial occlusion or vascular injury.

Inclusion Patients of all ages.

Standards for practice audit:

1. Assessment for compartment syndrome should be part of the routine evaluation of patients who present with significant limb injuries, after surgery for limb injuries, and after any prolonged surgical procedure which may result in hypoperfusion of a limb.

2. Clear documentation should include: the time and mechanism of injury, time of evaluation, level of pain, level of consciousness, response to analgesia and whether a regional anaesthetic has been given.

3. The key clinical findings are pain out of proportion to the associated injury and 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.

4. Patients documented to be at risk of 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 is mandated.

5. In high-risk patients, regional anaesthesia should be avoided as it can mask the symptoms of compartment syndrome. 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.

6. 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.

7. Compartment syndrome is a surgical emergency and surgery should occur within an hour of the decision to operate.

8. For patients with diagnostic uncertainty and those with risk factors where clinical assessment is not possible (e.g. patients with reduced level of consciousness), hospitals should have a clear, written management policy.

9. All hospitals treating patients with significant injuries should have the capability to perform intracompartmental pressure monitoring. The pressure sensor should be placed into the compartment(s) suspected of being abnormal or at risk.

10. All patients having compartment pressure measurements should have their diastolic blood pressure recorded; a difference between the diastolic blood pressure and the compartment pressure of less than 30 mmHg suggests an increased risk of compartment syndrome. It is recommended these should either proceed to surgical decompression or continue to be monitored depending on the consultant decision.

11. If the absolute compartment pressure is greater than 40 mmHg, with clinical symptoms, urgent surgical decompression should be considered unless there are other life-threatening conditions that take priority.

12. Surgery should involve 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.

13. For lower leg fasciotomies it is recommended to perform a two-incision four-compartment decompression (BOAST 4).

14. There is no consensus for the management of foot compartment syndrome.

15. 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 two consultants. Non-operative management is an option.

Evidence base Studies with level-1 evidence are lacking. Predominantly retrospective series, with some good prospective studies, meta-analyses and reviews.

Appendix 2 - Version Control Sheet

Version	Date	Author	Status	Comment
1				

Appendix 3 - Plan for Dissemination of Guidelines

To be completed and attached to any document which guides practice when submitted to the appropriate committee for consideration and approval.

Title of document:	**Management of Compartment Syndrome**		
Date finalised:		**Dissemination lead: Print name and contact details**	
Previous document already being used?	**No**		
If yes, in what format and where?	**N/A**		
Proposed action to retrieve out of date copies of the document:	**N/A**		

To be disseminated to:	**How will it be disseminated, who will do it and when?**	**Format (i.e. paper or electronic)**	**Comments:**
Orthopaedic Department	**Trust email Trauma ODN**	**electronic**	
Emergency Department	**Trust email Trauma ODN**	**electronic**	
Anaesthetic Department	**Trust email Trauma ODN**	**electronic**	
Microbiology Department	**Trust email Trauma ODN**	**electronic**	
Theatres	**Trust email Trauma ODN**	**electronic**	
Plastic Surgery Consultants (visiting from QVH)	**QVH trust email Trauma ODN**	**electronic**	

Dissemination Record - to be used once document is approved

Date put on register / library of SOPs:		**Date due to be reviewed:**	
BSUH			
ESHT			
WSHT			

Disseminated to: (either directly or via meetings, etc.)	**Format (i.e. paper or electronic)**	**Date disseminated:**	**No. of copies sent:**	**Contact details / comments:**
Network CAG	Electronic			Barbara Rayner