

Joint Trauma System



Extremity Compartment Syndrome (CS) and the Role of Fasciotomy in Extremity War Wounds

Part of the Joint Trauma System (JTS) Clinical Practice Guideline (CPG) Training Series



Purpose



This CPG provides evidence–based guidelines for the evaluation and treatment of patients with extremity war wounds and the role of prophylactic and therapeutic fasciotomy.

This presentation is based on the JTS Acute Extremity Compartment Syndrome (CS) and the Role of Fasciotomy in Extremity War Wounds CPG, 25 Jul 2016 (ID:17). It is a high-level review. Please refer to the complete CPG for detailed instructions. Information contained in this presentation is only a guideline and not a substitute for clinical judgment.

Agenda



1. Summary
2. Background
3. Signs & Symptoms
4. Evaluation
5. Treatment
6. Risk Assessment
7. Performance Improvement (PI) Monitoring
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Summary



- Compartment syndrome requires immediate operative intervention.
- Prophylactic compartment syndrome is indicated if there is substantial risk of compartment syndrome.

Background



- Military trauma patients in general have higher overall trauma burdens and occur in remote locations compared to civilian trauma.
 - ❑ Compartment syndrome is a common and disabling problem in extremity war injuries.
 - ❑ 15% of all military orthopedic trauma casualties require a fasciotomy.
- Compartment syndrome is a clinical syndrome where high pressure within a myofascial space reduces perfusion and decreases tissue viability.
 - ❑ **Therapeutic Fasciotomy Indication:** Established compartment syndrome
 - ❑ **Prophylactic Fasciotomy Indication:** Substantial risk of compartment syndrome

Background



- Compartment syndrome can be lethal. Early diagnosis challenging.
- Prophylactic fasciotomy used in “at risk” fractures and patients with prolonged ischemia/following limb perfusion.
 - Difficulties associated with monitoring a patient’s physical exam during lengthy transport combined with inability to intervene during time should be considered.

Background



Risks for Acute Traumatic Compartment Syndrome	
Decreased Compartment Volume	<ul style="list-style-type: none">▪ Tight cast or dressing, closure of prior fasciotomy, excess traction▪ External limb compression or crush particularly in obtunded or incapacitated casualty▪ Frostbite, burns or electric injury (may include escharotomy)
Increased Compartment Contents	<ul style="list-style-type: none">▪ Edema accumulation: embolism, intravascular thrombosis, replantation, venous tourniquet, injections, extravasation, infiltration, ergotamine ingestion, ischemia-reperfusion, swelling, artery injury or spasm, revascularization procedures, prolonged arterial tourniquet use, shock hypoperfusion, angiography and catheterization, limbs positioned well above heart, mal-positioned joints (ankle dorsiflexion,) or stretched muscles▪ Prolonged immobilization and limb compression particularly with obtunded or drugged casualty, some surgical positioning▪ Hemorrhage, hemophilia, coagulopathy, anticoagulation, vessel injury▪ Large volume crystalloid resuscitation▪ Fractures particularly tibia fractures in adults, supracondylar humerus fractures in children displaced, comminuted, or open fractures increase hemorrhage, swelling, and CS risk▪ Popliteal cyst, long leg brace

Signs & Symptoms



Signs and Symptoms:

- **Pain out of Proportion:** Most important. Often obscured in combat casualties due to altered mental status/heavy sedation.
- **Palpably tense muscle compartments:** Specific. Not sensitive. Highly subjective.
- **Paralysis:** Can be due to direct neural trauma.
- **Paresthesia:** Can be due to direct neural trauma.
- **Pulselessness:** Late and ominous sign in civilian trauma. Occurs more commonly and potentially within minutes in military trauma.

Evaluation (1)



- Tissue edema peaks at 24-48 hours, but vigilance should be maintained for a week.
 - Delayed Presentation Higher Concern in: sequential surgical procedures, ongoing resuscitation, and/or ischemia-reperfusion.
- Passive stretch pain, palpation of muscles for tenseness and pulse quality combined with index of suspicion make up mainstay of evaluation.
 - Most caused by open fractures, even with traumatic fasciotomy.
 - Tibia fracture associated with 45% of compartment syndromes.
- Suggest serial exams hourly when risk is high and less frequently when risk is low.

Evaluation (2)

- Pressure measurement of compartments has significant limitations and is not recommended for routine use in theatre.
- In the absence of crush injury, fracture, multiple trauma, over resuscitation, electrical injury, or similar injury, prophylactic fasciotomy on burned extremities are not indicated.



High risk injury for compartment syndrome

Treatment (1)



- Diagnosis of compartment syndrome requires immediate intervention.
 - Delayed or incomplete compartment syndrome has been associated with increased mortality and need for amputation
- Any limb at risk of compartment syndrome in an austere location should undergo prophylactic fasciotomy when they reach a fixed surgical facility.

Treatment (2)



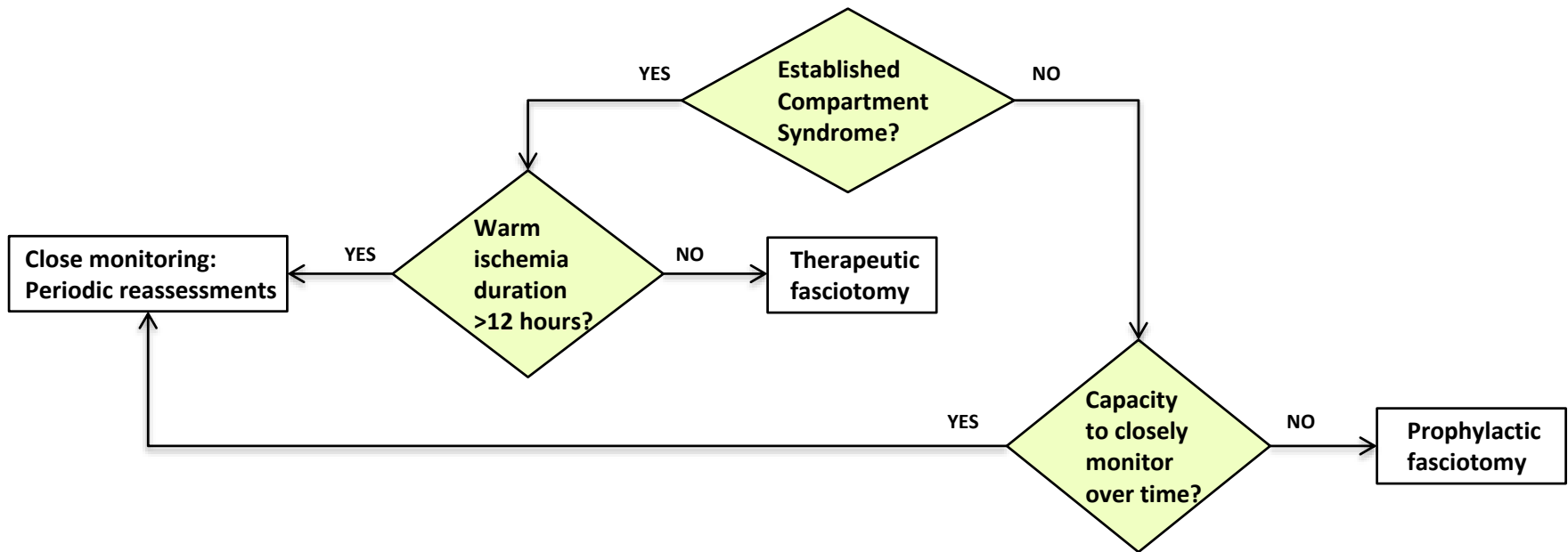
- Patients with compartment syndrome that experience delayed evacuation over 12 hours with nonviable muscle should not have fasciotomy performed.
 - Situation associated with increased risk of complication.
 - Patients are best treated with appropriate resuscitation, urine alkalization, mannitol use, and intensive support.
- Once decision is made to perform compartment release, all compartments in the affected anatomic region are over their entire length.

Treatment (3)

- ❑ Specific surgical expectations during fasciotomies:
 - **Calf:** Two incision technique
 - **Forearm:** Superficial and deep volar compartments through incision from lacertus fibrosus to carpal tunnel
 - **Foot Fasciotomy:** Consequences of fasciotomy can be worse than compartment syndrome. Carefully weigh advantages and disadvantages.
- ❑ Most commonly missed compartment syndromes are anterior and deep posterior compartments of the calf.
- ❑ Most common incomplete releases are in the calf.



Risk Assessment for Extremity Compartment Syndrome



■ Intent (Expected Outcomes)

- When fasciotomy is performed, all compartments are completely released through full skin and fascial incisions.
- When indicated, fasciotomy is performed at the time of re-vascularization of an ischemic extremity.

■ Performance/Adherence Measures

- When fasciotomy was performed, there was complete release of all compartments through full skin and fascial incisions.
- When indicated in patients with ischemic extremities, fasciotomy was performed at the time of re-vascularization.

■ Data Source

- Patient Record
- Department of Defense Trauma Registry (DoDTR)

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Appendices



- **Appendix A:** Risks
- **Appendix B:** Algorithm for Clinical Decision Making on Compartment Syndrome in a Deployed Setting
- **Appendix C:** Compartment Syndrome Healthcare Record Data
- **Appendix D:** Compartment Data Sheet
- **Appendix E:** Operative Note Template
- **Appendix F:** Additional Information Regarding Off-Label Uses in CPGs

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