

# “Squeeze Me?” The Pressure is On

A Review of Pressure Related  
Injuries and Syndromes

Robert Vroman, BS NREMT-P  
Robert @Robert-Vroman.com

## Objectives

- Discuss the epidemiology and etiology of pressure syndromes
- Define compartment syndrome, crush injury, and crush syndrome
- Review the pathophysiology of these injuries
- Identify the need for recognition of these injuries
- Describe the clinical presentation of these injuries
- Identify the need for rapid intervention and transport
- Discuss treatment modalities
- Discuss the role of reperfusion

## Compartment Syndrome

Compartment syndrome:

- Confined space
- Increasing pressure
- Necrosis

---

---

---

---

---

---

Osteofacial compartments

- Locations
- Significance
- Pressures

---

---

---

---

---

---

Microcirculation and Perfusion

- Components
- Function
- Daily amounts

---

---

---

---

---

---

Pathophysiology

- Components
- Results
- Significance

---

---

---

---

---

---

Causes of Compartment Syndrome

- Trauma
- Fractures
- Others

---

---

---

---

---

---

Patient Identification

- Gender
- Age
- Risk factors

---

---

---

---

---

---

Case One

- 17 yo male
- Presentation
- Diagnoses
- Sequelae

Conclusion: ACS should be suspected in athletes who present with worsening pain, with or without sensory symptoms following heavy exertion

---

---

---

---

---

---

---

---

---

---

Case Two

- 28 yo male
- Presentation
- Pressures
- Sequelae

---

---

---

---

---

---

---

---

---

---

Other Cases

- 
- 
- 

---

---

---

---

---

---

Last Case

- 36 yo male
- Presentation
- Dx and Treatment
- Sequelae

---

---

---

---

---

---

Clinical Presentation

- Pain out of proportion to the injury
- Pain on passive stretch
- Progressively worse pain
- Decreased sensation
- Loss of motor function
- Swollen tense extremity

---

---

---

---

---

---

The six P's of Ischemia

- P \_\_\_\_\_
- P \_\_\_\_\_
- P \_\_\_\_\_
- P \_\_\_\_\_
- P \_\_\_\_\_
- P \_\_\_\_\_

---

---

---

---

---

---

Specific Compartment Syndromes of the Lower Leg

Compartment	Pain	Paresthesia	Weakness
Anterior	Pain upon dorsiflexion and plantarflexion of the toe	Sensory loss in the first web space	Weakness in toe extension
Lateral	Pain upon active and passive foot eversion and inversion	Sensory loss in the top of the foot	Weakness in foot eversion
Deep Posterior	Pain upon active and passive toe extension	Sensory loss in the sole of the foot	Weakness in toe plantarflexion
Superficial Posterior	Pain upon active and passive plantar flexion and dorsiflexion of the foot	Sensory loss in the lateral aspect of the foot	Weakness in plantarflexion of the foot

## Advanced Evaluation

- Measurements
- Lab tests
- 
- 
- 
- Pressure Monitoring

---

---

---

---

---

---

---

---

## Management

- Recognition
- BLS Care
- ALS Care
- ED Care

---

---

---

---

---

---

---

---

---

---

---

---

---

---

## Crush Injury

- Definition
- Presentation
- Sequelae
- Considerations
- MESS

---

---

---

---

---

---

---

---

---

---

---

Variable	Score
<b>Skeletal / Soft Tissue Injury</b>	
Low energy (stab, simple Fx, Pistol GSW)	1
Medium energy (open or multiple Fx, dislocation)	2
High energy (High speed MVA, Crush injury, Rifle GSW)	3
Very high energy (High energy + contamination)	4
<b>Limb Ischemia</b>	
Pulses reduced or absent but perfusion is normal	1*
Pulseless, paresthesia, diminished capillary refill	2*
Cool, paralyzed, insensate, numb	3*
<b>Shock</b>	
Systolic BP always > 90 mm Hg	0
Hypotensive transiently	1
Persistent hypotension	2
<b>Age (years)</b>	
Less than 30	0
30 – 50	1
Greater than 50	2
* Score doubled for ischemia > 6 hours	

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

Table 4: Mangled Extremity Severity Score  
Adapted from Johansen et al. Objective criterion accurately predict amputation following lower extremity trauma. *J Trauma*. 1990; 30:568

## Crush Syndrome

- Definition
- Complications
  - Electrolytes
  - Rhabdomyolysis
  - DIC
  - Reperfusion
- Management
  - Basic
  - Advanced

---

---

---

---

---

---

---

---

---

---

---

---

## Summary

Compartment syndrome has many etiologies, both traumatic and non traumatic. There have been several documented cases of spontaneous compartment syndrome, as well as following minor athletic activity. The pre-hospital medical professional must maintain a high index of suspicion for compartment syndrome whenever a patient presents with pain that is out of proportion to an injury, or that has no explanation. Anterior compartment syndrome secondary to tibial fractures remains the leading cause of compartment syndrome. Crush injury on the other hand is the result of traumatic injuries to the extremities and has a different pathophysiological process that is not well understood. Both processes however are potentially limb and life threatening. Compartment syndrome and crush injury can both lead to systemic complications, which are classified as crush syndrome. Treatment focuses on the prevention and reduction of these systemic complications. Pre-hospital actions can have dramatic effects on patient outcome.