Sideline Emergencies: Acute Compartment Syndrome of Lower Extremity

JOE BELLAMY, MD
SPORTS & ORTHOPAEDIC SPECIALISTS

Disclosures

No disclosures/ conflicts related to this discussion.

Overview

- History
- Anatomy
- Pathophysiology
- Epidemiology
- Causes
- Presentation/Diagnosis
- Treatment
- Complications

History

- "For many years I have noted on occasion, following the use of bandages too tightly applied, the occurrence of paralysis and contraction of the limb, not … due to the paralysis of the nerve by pressure, but as a quick and massive disintegration of the contractile substance and the effect of the ensuing reaction and degeneration."

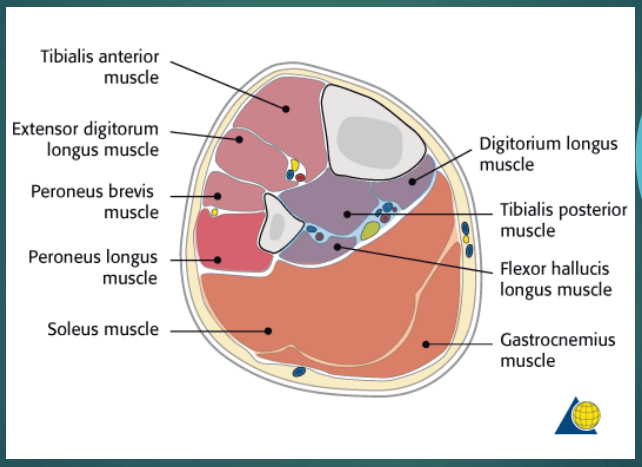
  - Richard vonVolkmann 1881

www.ota.org

Lower Leg Compartments

- Anterior
- Lateral
- Superficial Posterior
- Deep Posterior
- Posterior Tibial*

Anatomy



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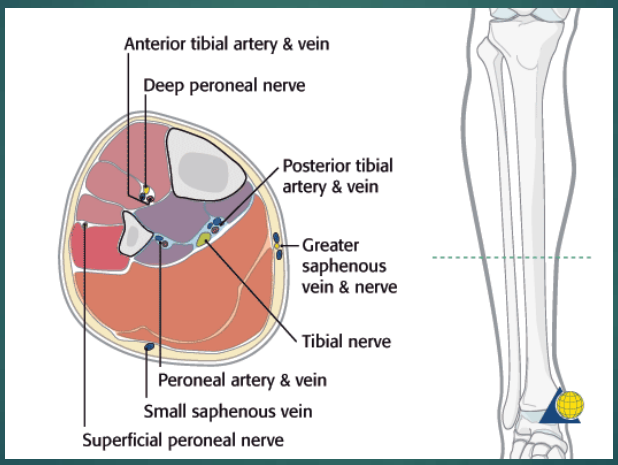
Anatomy



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Pathophysiology

- "Acute compartment syndrome is a potentially devastating condition in which the pressure within an osseofascial compartment rises to a level that decreases the perfusion gradient across tissue capillary beds, leading to cellular anoxia, muscle ischemia, and death."

  Olson SA & Glasgow RR. Acute Compartment Syndrome in Lower Extremity Musculoskeletal Trauma. *J Am Acad Orth Surg.* 2005 13(7): 436-447

$$LBF = (PA-PV) / R$$

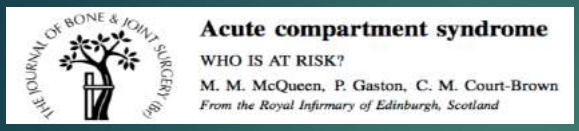
Pathophysiology

- Ischemia Effects on Muscle
  - 4 hours: Reversible Injury
  - 4-8 hours: Questionable
  - 8 hours: Irreversible
- Ischemic Effects on Nerve
  - 1-4 hours: Reversible Neuropraxia
  - 8 hours: Irreversible and Axonotmesis.

Heckman MM, Whitesides TE Jr, Grewe SR, et al: Histologic determination of the ischemic threshold of muscle in the canine compartment syndrome model. J Orthop Trauma 1993;7:199-210.

Matsen III FA, Winquist RA, Krugmire II RB. Diagnosis and management of compartmental syndromes. J Bone Joint Surg Am, 62:286-291, 1980.

Epidemiology



J Bone Joint Surg [Br] 2000;82-B:200-3.

- 69% associated with fracture
- 20% from sport
- 90% Male, 10% Female
- Mean age M 30y, F 44y

More Common Causes

- Trauma: Primary Cause
  - Fracture
    - Long Bone
    - Tibial Tubercle
    - Tibial Plateau
  - Soft Tissue Injury
  - Burns
    - Eschar
  - Vascular Injury
  - Penetrating Trauma
  - Crush
  - Exertion

Less Common Causes

- External Compression
  - Casts
  - Wraps
- Reperfusion Injury
- Other
  - Extravsation
  - Venous Obstruction
  - Snake bite

Presentation

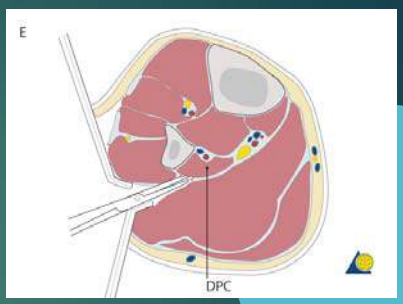
- 5 (6) P's are unreliable
  - Pain
  - Pallor
  - Paralysis
  - Pulselessness
  - Paresthesia
  - (Poikilothermia)
- Unreliable as are signs of an established compartment syndrome. Can also be present in other conditions.
- Pain with passive motion out of proportion to what is expected
  - Be cautious as nerve injury can inhibit exam
- Tense compartments

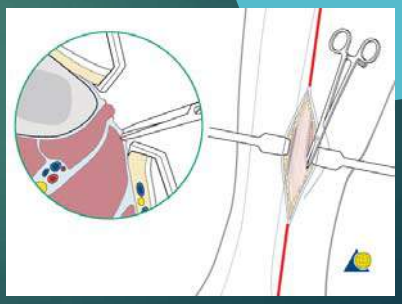
Diagnosis

- CLINICAL DIAGNOSIS!
- Intracompartmental Pressure Testing
- ΔP= Diastolic Pressure- Intracompartmental Pressure
  - ΔP <30 concerning for compartment syndrome
  - ΔP <20 indication for surgery

Treatment

- Remove restrictive dressings/casts/splints
- EMERGENT 4 compartment fasciotomy
  - 2 incision
    - Better access to all compartments
    - More scarring
  - 1 incision
    - More difficult to fully release posterior tib
    - Only 1 scar





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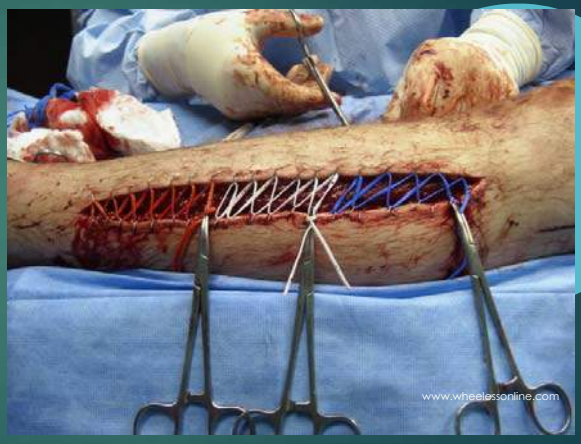
Treatment

https://www.researchgate.net/figure/Lateral-fasciotomy-of-left-lower-leg_fig3_273384887

Complications

- Volkmann's Contracture
- Stiffness
- Scarring
  - Often requires skin graft
- Numbness/Paralysis
- Infection
- Amputation
- Medical issues
- Pain/Disability



Thank you