

Quadriceps Contusions in Athletes

Background

1. Definition
 - Direct external blow to thigh resulting in pain, swelling, loss of knee ROM
 - Typically to a single quadricep muscle¹
2. General info
 - Increase swelling
 - Loss of knee flexion
 - Occurs morning after injury

Pathophysiology

1. Pathology of disease
 - Compressive force on muscle causes
 - Partial rupture of muscle
 - Capillary rupture
 - Infiltrative bleeding
 - Leads to hematoma, edema, and inflammation²
2. Incidence, prevalence
 - Common in contact sports
 - Football
 - Rugby
 - Martial arts
 - Soccer
 - 90% of all sports-related injuries
 - Contusion and strain²
 - Many unreported
3. Risk factors
 - Contact sports
 - Bleeding disorders predispose to severe injuries
4. Morbidity/mortality
 - Myositis ossificans
 - Calcium deposition into hematoma by osteoblasts
 - Calcification process stabilizes and shrinks 3-6 months after injury
 - Incidence 7-20%³
 - Symptoms
 - Increase pain
 - Palpable mass
 - Initial improvement in ROM w/subsequent deterioration
 - Occurs frequent w/severe injury and recurrent injury
 - Treatment: conservative
 - Gentle active ROM
 - D/c heat, U/S
 - Surgery (rarely indicated)
 - Compartment syndrome
 - Increase swelling
 - Pain out of proportion to injury
 - Sensory changes

- DVT, thrombophlebitis may occur after injury

Diagnostics

1. History

- Direct blow to antr or lat thigh
 - Ssubsequent pain
 - Swelling
 - Limited knee ROM

2. Physical examination

- Tense, swollen, tender thigh
- +/- visible ecchymosis
- Pain upon active straight leg raise
- Passive knee flexion limited
- +/- knee effusion
- May ambulate w/ limp

3. Diagnostic testing

- Not necessary for Dx
- Lab evaluation
- Diagnostic imaging
 - X-ray
 - R/o acute Fx
 - If suspect, evaluate for myositis ossificans
 - 1-2 mo after injury
 - 6 mo after injury
 - MRI
 - Useful
 - Localize and evaluate extent of injury
 - When definitive Hx is lacking
 - Allows sequential f/u if needed
 - Functional recovery occurs before MRI resolution
 - Ultrasound
 - Distinguishes
 - Diffuse swelling and edema vs localized, circumscribed hematoma²
 - Other studies
 - Compartment syndrome
 - Compartment pressure testing

4. Diagnostic Criteria

- Classification based upon ROM 12-24 hrs after injury²
 - Mild (Grade 1)
 - Knee flexion > 90°
 - Moderate (Grade 2)
 - Knee flexion between 45°-90°
 - Severe (Grade 3)
 - Knee flexion < 45°

Differential Diagnosis

1. Key DDx

- Quadriceps strain
 - Quadriceps tendon rupture
 - Femur fx
 - Referred pain from hip or back
2. Extensive DDX
- Neoplasm
 - Morel-Lavallee lesion
 - Shear injury -subQ tissue torn away from underlying fascia
 - Resultant cavity fills w/ large hematoma
 - Commonly in region of greater trochanter

Therapeutics

1. No evidence of a universally accepted Tx regimen
2. Acute Tx (first 24 hrs)
 - D/c activity
 - RICE (Rest, Ice, Compression, Elevation)
 - Immobilize and ice in pain-free flexion position⁴
 - Results in:
 - Tamponade hemorrhage
 - Rapid ROM improvement vs immobilization in extension⁴
 - Decrease risk of myositis ossificans
 - +/- crutches to assist w/ wt bearing
 - Avoid NSAIDs in first 24-48 hrs
 - Avoid heat and massage in acute phase
3. Further management (> 24 hrs)
 - Refer to physical therapy
 - Early mobilization important to restore function
 - Begin assisted ROM ASAP pain permitting
 - Do not force ROM
 - Caution: s/s of compartment syndrome
 - Surgical Tx
 - Not indicated per studies
 - Consider evacuation of hematoma or percutaneous drainage
 - No evidence to recommend Tx
 - Recommended Tx:
 - Monitor elevated compartment pressures
 - Nonoperative Tx for compartment pressures ≤ 88 mmHg⁵
4. Long-term care
 - Cont phys therapy
 - ROM until pain-free
 - When ROM pain-free:
 - Advance strengthening and functional rehabilitation
 - Return to sports after³
 - Full ROM restored
 - Quadriceps strength 90-95% of unaffected side
 - Sports activities performed w/o pain
 - Myositis ossificans
 - NSAID (indomethacin)

- After 48-72 hrs
- No definitive evidence for prevention
- Use controversial
- Short-term benefit
 - Avoid corticosteroids- inhibit long-term healing⁶
- Repeat x-rays in 1-2 months and at 6 months to evaluate progress

Follow-Up

1. Return to office
 - If rehabilitation not progressing
 - 1 month - x-rays to evaluate myositis ossificans
2. Refer to specialist
 - Concerns about compartment syndrome
 - Athletes' recovery not progressing
 - Diagnostic uncertainty
3. Admit to hospital
 - For pain management (rarely)

Prognosis

1. Not well documented
2. Most recover fully w/o complications
3. Recovery time depends on injury severity and time to initial Tx

Prevention

1. 1° prevention
 - Thigh padding
2. To prevent exacerbation d/c play at time of injury
3. To decrease severity contract quadriceps muscle at time of injury

References

1. Diaz JA, Fischer DA, Rettig AC, Davis TJ, Shelbourne KD. Severe quadriceps muscle contusions in athletes. A report of three cases. *Am J Sports Med.* 2003;31(2):289-93.
2. Beiner JM, Jokl P. Muscle contusion injuries: Current treatment options. *J Am Acad Orthop Surg.* 2001; 9(4):227-237.
3. McKeag DB, Moeller JL, eds. *ACSM's Primary Care Sports Medicine.* 2nd ed. Philadelphia: Lippincott Williams & Wilkins, 2007:456-57.
4. Aronen JG, Garrick JG, Chronister RD, McDevitt ER. Quadriceps contusions: clinical results of immediate immobilization in 120 degrees of knee flexion. *Clin J Sports Med.* 2006;16(5):383-87.
5. Mithofer K, Lhowe DW, Altman GT. Delayed presentation of acute compartment syndrome after contusion of the thigh. *J Orthop Trauma.* 2002;16(6):436-38.
6. Jarvinen TA, Jarvinen TL, Kaariainen M, et al. Muscle injuries: optimising recovery. *Best Pract Res Clin Rheumatol.* 2007;21(2):317-31.

Author: Shelley Ringo, MD, FMR of Idaho

Editor: Carol Scott, MD, University of Nevada Reno FPRP