

Hip Muscle Power Deficits

ICD-9-CM codes: 843.8 Specified sites of hip and thigh strains

ICF codes: Activities and Participation Domain codes:

d4105 Bending (Tilting the back downward or to the side, at the torso, such as in bowling or reaching down for an object)

d4350 Pushing with lower extremities (Using the legs and feet to exert a force on an object to move it away, such as pushing a chair away with a foot)

d4351 Kicking (Using the legs and feet to propel something away, such as kicking a ball)

d4552 Running (Moving with quick steps to that both feet may be simultaneously off the ground)

Body Structure code: **s75002** Muscles of thigh

Body Functions code: **b7300** Power of isolated muscles and muscle groups

Common Historical Findings

"Pulled" muscle during a quick, eccentric demand of muscle - or - blunt trauma to hip myofascia

Daily activities which stretch or contract the involved muscle are painful

Common Impairment Findings - Related to the Reported Activity Limitation or Participation Restrictions:

Pain with stretch to the involved muscle

Pain with contraction of the involved muscle

Pain with palpation of the injury site

Physical Examination Procedures:



Lateral Hamstring Stretch



Medial Hamstring Stretch

Performance Cues:

Flexion/adduction movement stretches the posterior lateral part of thigh
Flexion/abduction movement stretches the posterior medial part of thigh



Rectus Femoris Stretch and Resistive Test

Performance Cues:

The amount of contralateral hip flexion/posterior pelvic rotation determines the intensity of the stretch

Flex the knee (slowly) to stretch rectus femoris and vasti muscles

Monitor symptom response and strength of contraction during the resistive test

Prone knee bending also provokes symptoms in the presence of femoral nerve or anterior innominate abnormalities - muscle palpation provocation provides the differential diagnosis



Lateral Hamstring
Resistive Test



Medial Hamstring
Resistive Test

Performance Cues:

For lateral hamstring (biceps femoris) - externally rotate tibia, contact lateral heel, and apply force in a medial direction

For medial hamstrings (semimembranosus and semitendinosus) - internally rotate tibia, contact medial heel, and apply force in a lateral direction

A gentle force will elicit symptoms with moderate tears

Stronger force will be required to elicit symptoms in mild tears and in subacute conditions

Do not expect to be able to totally isolate the medial vs. lateral hamstring contraction – however, symptom responses vary - thus, focusing the palpation examination



Hip Adductor Stretch and Resistive Test

Performance Cues:

Stabilize opposite thigh during application of stretch and resistance

Monitor symptom response and strength during muscle contraction

Adductor tests also provokes symptoms in the presence of pubic symphysis abnormalities -
muscle palpation provocation provides the differential diagnosis

Hip Muscle Power Deficits: Description, Etiology, Stages, and Intervention Strategies

The below description is consistent with descriptions of clinical patterns associated with the vernacular terms
"Hamstring, Hip Adductor, or Hip Flexor Muscle Strain"

Description: Generalized weakness secondary to the damaged muscle's inability to develop tension. Damage presents itself as tears that can occur at any point along the muscle. There are three grades of muscle; Grade 1 - microtearing of the muscle fibers due to excessive tearing, Grade 2 - incomplete tear of the muscle fibers, Grade 3 - complete tear of muscle

Etiology: Sudden passive stretch or an activation of the muscle during a stretch (i.e., a forced eccentric contraction) persistent repetitive stress, improper warm-up, fatigue, previous injury and lack of flexibility have been factors correlated with hamstring injury. A slow controlled stretch that continues to an abnormally extreme position can also strain the muscle. Hamstring strains are the most common strain injury in athletes.

Differential Diagnosis for Hamstring Strains: Other conditions with similar presentations as hamstring strains are sciatic nerve mobility limitations, lumbar spine disorders (L4-S1), strained popliteus muscle, osteochondroma with bursa formation (one case reported), tendonitis at either origin of the gastrocnemius, apophysitis-pain in ischial tuberosity, sprained posterior cruciate ligament, and lesions of the upper tibio-fibular joint. Resisted external or internal rotation can distinguish between a distal biceps lesion or a lesion in the medial hamstrings.

Differential Diagnosis for *Rectus Femoris Strains*: Other conditions with similar presentations as rectus femoris strains are femoral nerve or lateral femoral cutaneous nerve mobility limitations, lumbar spine disorders (L1-L4), sacroiliac joint disorders, hip disorders, and psoas trigger points.

Differential Diagnosis for *Adductor Strains*: Other conditions with similar presentations as adductor strains are pubic symphysis disorders, sacroiliac joint disorders, obturator nerve mobility limitations, lumbar spine disorders (L1-L4), hip disorders, and psoas trigger points.

Prognosis: Complete recover from pain is sometimes difficult. Untreated condition may lead to scarring, fibrosis and shortening of the related myofascia. If effusion occurs close to the adjacent nerve, residual symptoms of nerve tension may be present. A hematoma that is contained within a thigh compartment may lead to a compartment syndrome. The sites affected, in order of incidence, are: injuries muscle belly (most on the musculotendinous junction MTJ), proximal tendon-bone injuries (avulsions) and distal tendon injuries. Ultrasonography may be able to detect only half of injuries compared to MRI.

Risk/Predisposing factors: Persistent repetitive stress, improper warm-up, fatigue, lack of muscle strength, previous injury, lack of flexibility, enthesopathy, involvement in high acceleration /deceleration sport activities such as water skating, soccer, rugby or dance.

Prevention: Warm up stretching exercises are frequently recommended. Strengthening exercises tends to alter viscoelasticity and gains in muscle strength may mean losses in flexibility. However progressive eccentric loading exercises are preventive (Askling).

Acute Stage / Severe Condition: Physical Examinations Findings (Key Impairments)

ICF Body Functions codes: b7300.3 SEVERE impairments of muscle power

- Pain with weight bearing on the involved limb
- Bleeding/eczymosis (i.e., black and blue appearance) if grade 2
- Balled up muscle if grade 3 (which is rare)
- Pain with stretch of the involved muscle (i.e., during a SLR or prone knee bend)
- Pain and weakness with active contraction of the involved hamstring(s)
- Palpable tenderness (i.e., hematoma) at the injury site

Sub Acute / Moderate Condition: Physical Examinations Findings (Key Impairments)

ICF Body Functions codes: b7300.2 MODERATE impairments of muscle power

- Painful, but strong contraction of the involved muscle(s)
- Palpable soft tissue restrictions at the injury site

Settled Stage / Mild Condition: Physical Examinations Findings (Key Impairments)
ICF Body Functions codes: b7300.1 MILD impairments of muscle power

- Strong and painfree contraction of the involved muscle(s)
- Potential muscle flexibility deficits of the involved muscle(s)
- Less palpable soft tissue restrictions at the injury site

Intervention Approaches / Strategies

Acute Stage / Severe Condition

Goals: Prevent further injury - protect muscle integrity
Reduce pain

- Immediate Measures: First 24 hours
 - Compression taping used with an elastic bandage for 10 minutes followed by mild compression to reduce blood flow
 - Ice bandage
 - Immobilization
 - Crutch use

After the first 24 hours

- Physical Agents
 - Non-thermal ultrasound
- Therapeutic Exercises
 - Painfree active mobility exercises of the affected muscle (and hip and knee) – consider the use of aqua therapy (i.e., pain free mobility exercises and walking in a pool)
- Re-injury Prevention Instruction
 - Perform no movements that cause pain (e.g., stretching producing pain should be avoided)
 - Crutch training if walking is painful.
 - Paresthesias and numbness while exercising should be avoided as well as any numbness produced by the compressive taping or shorts
- External Devices (Taping/Splinting/Orthotics)
 - Compression taping using with an elastic bandage – or – wearing compressor shorts

Sub Acute Stage / Moderate Condition

Goals: As above

Optimize tissue regeneration

Restore flexibility, strength, and endurance the involved hamstring

- **Manual Therapy**
Soft tissue mobilization to area of soft tissue restrictions (that may have resulted from excessive scar formation during the fibroplasia phase of tissue healing)
Very early intense massage in completely diagnosed cases may contribute to problems such as heterotropic bone formation
- **Therapeutic Exercises**
Utilize stationary bike, walking on treadmill, and active knee flexion in standing for mobility exercises
Gentle passive stretching if tolerated without pain and does not worsen the symptoms
Painfree submaximal isometric contractions
Painfree strengthening exercises, such as low resistance, low load against gravity, prone hip extension, heel slides, scooting with rolling chair
- **Re-injury Prevention Instruction**
Be extremely cautious to proceed exercises and stretching slowly and without pain

Settled Stage / Mild Condition

Goals: Painfree, unlimited walking or long distance running

- **Physical Agents**
Consider applying heat before exercise, and cold after exercise
- **Therapeutic Exercises**
End-range passive stretching if tolerated without pain and does not worsen the symptoms
Sciatic or femoral nerve mobility exercises
Dural (i.e., slump) mobility exercises
Progress strengthening exercises, such as partial curl ups, dead bug progression, wall slides, single knee to chest, double knee to chest, increase resistance, increase speed as able, eccentric exercises, seated theraband, modified standing theraband knee extensions
- **Re-injury Prevention Instruction**
Muscles need to be stretched before and after exercise.

Intervention for High Performance / High Demand Functioning in Workers or Athletes

Goal: Return to desired sport or occupation demands

- Approaches / Strategies listed above
- Re-injury Prevention Instruction
 - Before returning to sports the patient should be entirely painfree and all additional contributory factors eliminated.
 - Grade 2 strains take longer recovery time – 3-4 weeks
 - Grade 3 strains may require surgical intervention

Selected References

Askling C, Karlsson J, Thorstensson A. Hamstring injury occurrence in elite soccer players after preseason strength training with eccentric overload. *Scand J Med Sci Sports*. 2003; 13: 244-250

Baker K, Robertson V, Duck F. A review of therapeutic ultrasound biophysical effects. *Phys Ther*. 2001;81:1354

Brubaker CE, James SL. Injuries to runners. *J Sports Med*. 1974;2:189-198.

Hurme T, Rantanen J, Kalimo H.. Effects of early cryotherapy in experimental skeletal muscle injury. *Scand J Med Sci Sports* 1993;3:46-51.

Jackson, DW, Feagin JA,. Quadriceps contusion in young athletes. *J Bone Joint Surg*. 1973;55-A:95-105

Jarvinen, M. The Effect of early mobilization and immobilization on the healing process following muscle injuries. *Sports Med* 1993;15:78-89

Korberg C, Lew P, The effect of stretching neural structures on grade one hamstring injuries. *J Orthop Sports Phys Ther*. 1989;10:481-487

Koulouris G, Connell D, Evaluation of the hamstring muscle complex following acute injury, *Journal of the International Skeletal Society A Journal of Radiology, Pathology and Orthopedics, Skeletal Radiology*, August 2003

Kujala U, Orava S, Järvinen, Hamstring Injuries – Current Trends in Treatment and Prevention, *Sports Med* 1997;23:401

MacAuley DC. Ice therapy: how good is the evidence? *Int J Sport Med*. 2001;22:379-384

Magnusson SP, Passive properties of human skeletal muscle during stretch maneuvers. *Scand J Med Sci Sports*. 1998;8:73

Sawyer PC, Uhl TL, Mattacola CG, Jognson DL, Yates JW. Effects of moist heat on hamstring flexibility and muscle temperature, *J Strength Cond Res.* 2003;17:285-290

Thornson O, Hemdal B, Liliya B et al. The effect of external pressure on intramuscular blood flow at rest and after running. *Med Sci Sport Exerc* 1987;19:469-473

Turl SE, George KP. Adverse neural tension: a factor in repetitive hamstring strain? *J Orthop Sports Phys Ther.* 1998;27:16-21.

Verrall GM, Slavotinek JP, Barnes PG, Fon GT, Spriggins AJ. Clinical risk factors for hamstring muscle strain injury: a prospective study with correlation of injury by magnetic resonance imaging. *Br J Sports Med.* 2001;35:435-9. Discussion 440

Webright WG, Randolph BJ, Perrin DH. Comparison of nonballistic active knee extension in neural slump position and static stretch techniques on hamstring flexibility. *J Orthop Sports Phys Ther.* 1997;26:7-13