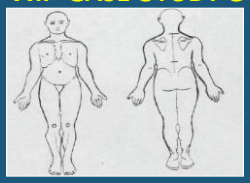
HIP CASE STUDY 3

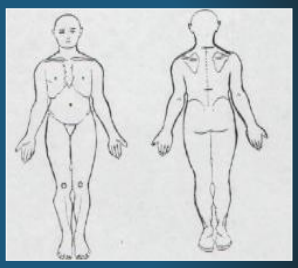


Orthopaedic Manual Physical Therapy Series
Charlottesville 2017-2018

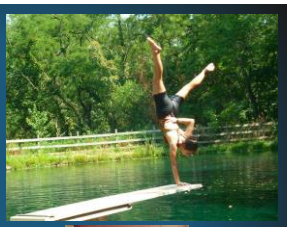
Eric Magrum DPT OCS FAAOMPT

Body Chart-Initial Hypothesis:

- Hamstring Strain
- HS Tendinopathy
- Lumbar Radiculopathy
- Lumbar Referred (Facet)
- Piriformis Syndrome

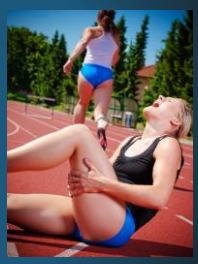


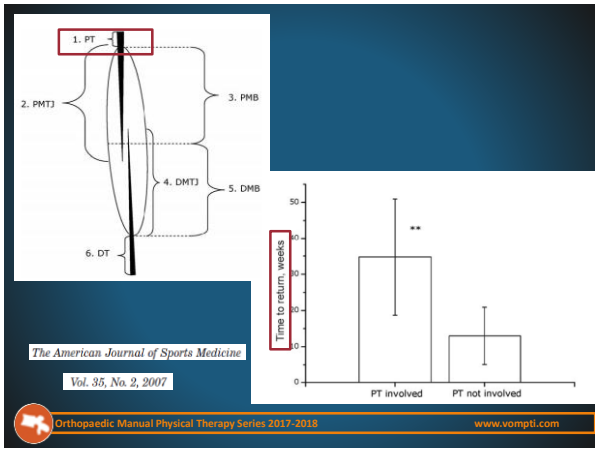
- 42 yo female
- 3 weeks
- Cartwheel off diving board
- Audible "pop"
- Sharp local pain proximal HS lateral ischium
- Unable to bear weight initially
- Significant Ecchymosis/Swelling
- Pain with sitting proximal aspect HS laterally
- Intermittent NT
- Goals: Train for 10K

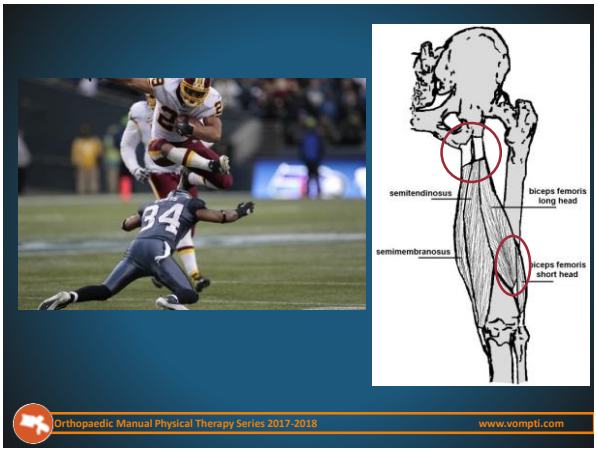


**** Subjective Asterisks Signs/Symptoms ****
(Aggravating/Easing Factors, Description/Location of symptoms, Behavior, Mechanism of injury)

- Mechanism
- Immediate proximal pain
- Inability to bear wt, extend knee with gait (short stride)
- Ecchymosis
- Pain with sitting
- Intermittent Distal NT







Physical Exam "Asterisks" Signs/Symptoms **
(Special Tests, Movement/Joint Dysfunction, Posture, Palpation, etc.)

- Pain with palpation – Proximal aspect, lateral HS (biceps femoris) distal 3 cm
- Improving ecchymosis
- (-) Lumbar clearing
- (+) Slump
- (+) Knee EXT test (40) > SLR (60)
- (+) Thomas Test
- (+) Pain with resisted knee flexion in prone at 15 > 90 degrees; Tibial ER>IR
  - No palpable defect
- Poor LP stability (Ant tilt/Trendelenberg) with Single leg Stance/Squat
- Swing Test: Decreased Hip EXT – increased Ant tilt, pain at end ROM hip flexion/knee EXT; Poor stance stability

Diagnostic Accuracy of Clinical Tests for Assessment of Hamstring Injury: A Systematic Review

- Diagnostic Accuracy Variable
- Puranen-Orava Test
- Bent-Knee Stretch Test
  - Small- Moderate: Alter post test probability
- Taking-Off-The-Shoe Test
  - Conclusive
  - Study biased
- Clustering Tests – minimally improved accuracy
- Caution: Comprehensive Exam recommended

APRIL 2013 | VOLUME 43 | NUMBER 4 | JOURNAL OF ORTHOPAEDIC & SPORTS PHYSICAL THERAPY

Puranen-Orava test	• This test entails actively stretching the hamstring muscles in the standing position with the hip flexed at about 90°, the knee fully extended, and the foot on a solid support surface.	

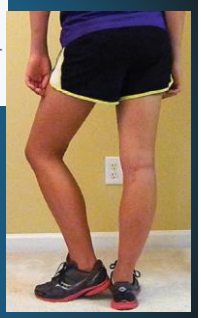
(+)

Bent-knee stretch test	• The patient is supine. The hip and knee of the symptomatic limb are maximally flexed, and the clinician slowly straightens the knee while keeping the hip flexed.	Exacerbation of the patient's symptoms.

(+)

Taking-off-the-shoe test	• In standing, the patient is asked to take off the shoe on the affected side with the help of his/her other shoe. While performing this maneuver, the affected leg hindfoot must press the longitudinal arch of the noninvolved foot. The affected leg during the maneuver is in approximately 90° of external rotation at the hip and 20° to 25° of flexion at the knee.

(+)



[CLINICAL COMMENTARY]

THOMAS S.H. GOOM, BSc (Hons), MCSP[1] • PETER MALLIARAS, BPhysio (Hons), PhD[2,3]
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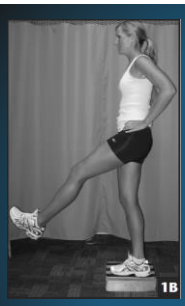
Proximal Hamstring Tendinopathy: Clinical Aspects of Assessment and Management

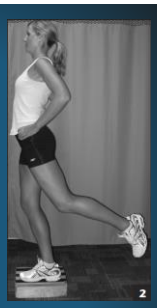
JOURNAL OF ORTHOPAEDIC & SPORTS PHYSICAL THERAPY | VOLUME 46 | NUMBER 6 | JUNE 2016

FIGURE 1. (A) Single-leg bent-knee bridge, an example of a low-load clinical test. (B) Long-lever bridge, an example of a moderate-load clinical test. (C) Arabesque, an example of a high-load clinical test.

JOURNAL OF ORTHOPAEDIC & SPORTS PHYSICAL THERAPY | VOLUME 46 | NUMBER 6 | JUNE 2016

Swing Test





Swing Leg (involved):
Pain at Terminal Swing
Early Knee Flexion

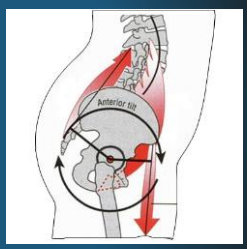
Bilaterally:
Limited Hip Extension
Excessive Lumbar EXT
Pelvic Ant tilt

Thomas Test

(+)

HS Injury Risk Factors

- Age
- Previous HS injury
- HS weakness, poor endurance, decr strength
- Muscle imbalance HS (ecc) : Quads (conc)
- Poor LP control/stability



Factors Associated with Recovery

- Kicking versus sprinting
- Proximal tendon
- Semimembranosus
- Distal from Ischial tuberosity
- Length of injury
- High Recurrence
  - >30% 1st 2 weeks

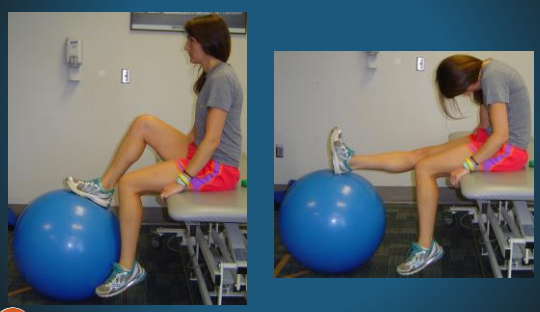
Adverse Neural Tension: A Factor in Repetitive Hamstring Strain?

Volume 27 • Number 1 • January 1998 • JOSPT

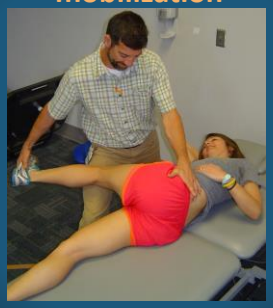
- 14 male Rugby Union players with a history of grade 1 repetitive hamstring strain.
- Results indicated that 57% of the test group had positive slump tests, suggesting the presence of adverse neural tension.
- None of the control group had a positive slump test.
- Results suggest that adverse neural tension may result from or be a contributing factor in the etiology of repetitive hamstring strain.

Neurodynamic Slider

Neurodynamic Tensioner

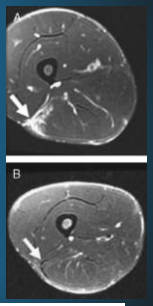


Side lying: Lumbar opening Neural mobilization



Hamstring Strength and Morphology Progression after Return to Sport from Injury

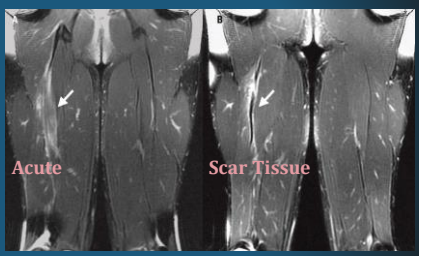
- Residual Edema at return to sport (average 26 days post injury)
- Resolved at 6 months
- 10% strength deficit
- Persistent Scar formation
- Protective muscular inhibition
- Shift in peak torque to shorter HS length – change length/tension
- 5% atrophy at 6 months (worst BF)



Med. Sci. Sports Exerc., Vol. 45, No. 3, pp. 448–454, 2013

Scar Tissue

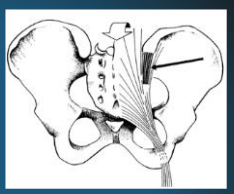
- Changes relative amounts of connective tissue @ 6 weeks & 23 month (MRI)
- High tissue strain at injury site
- Increased overall stiffness of MT unit



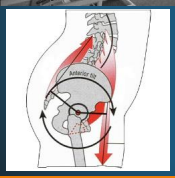
Med. Sci. Sports Exerc., Vol. 45, No. 3, pp. 448–454, 2013

Manual Therapy

- Soft Tissue Mobilization
- ? Instrument Assisted
- Insertional at ischium
- Sacrotuberous ligt
- ? Sacro illial dysfunction (torsion)



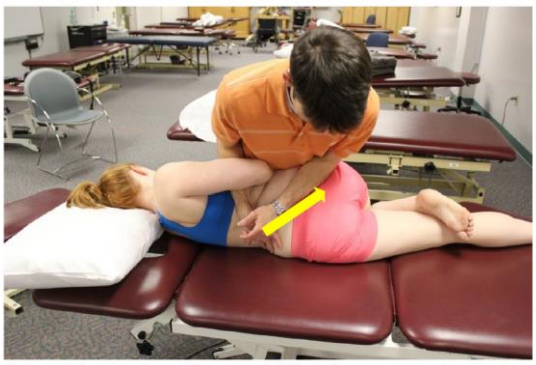
LP/SIJ Regional Manipulation



- Mobilization/Manipulation to Ant Rotation Innominate
- Address associated Lumbar dysfunction
- ? Sacral Torsion

LP/SIJ Regional Manipulation

Patient is SB to same side and rotated opposite to take up slack/lock up lumbar spine. Posterior directed thrust applied to (L) innominate.



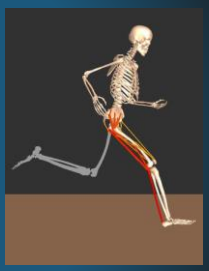
Right Side Flexion/Gap Mobilization or Manipulation

Posterior Rotation Innominate – Mobilization/MET

Anterior Rotation Innominate – Mobilization/MET

Eccentrics

- Stretch-Shortening Cycle
  - "Springs" to utilize elastic energy
- Highest forces with reduced energy expenditure
- Overloads muscle compared to Concentric
  - Increased mass, power, strength
- Structural and Neural influences



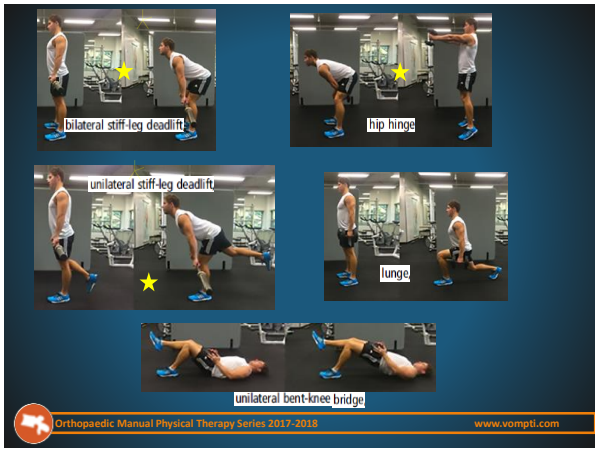
Eccentric Training

- Shift in peak torque to longer HS length – change length/tension
- Active spring adaptation – "stiffer" muscle
- Increased force to resist stretch
- Protect lengthening muscle from stretch overload – injury
  - Increased force threshold for tissue failure
- Enhance amount of elastic recoil
  - Enhanced load attenuation

Impact of exercise selection on hamstring muscle activation

Br J Sports Med 2016

- 80% HS injuries involve BF long head
- Inhibited, atrophy = re injury
- 10 common HS exercises
- EMG ratios of specific HS muscles
- Concentric/Eccentric
- fMRI
- HS activation patterns differed during each exercise
- Hip extension more selectively activated BF
- Nordic HS preferentially activates Semitendinosis; also large activation of BF
- Eccentric phase of hip oriented exercises > BF/Med HS ratio
  - Straight leg bridge, deadlifts, hip hinge



A Comparison of 2 Rehabilitation Programs in the Treatment of Acute Hamstring Strains

- Progressive Agility and Trunk Stability (PATS)
- Static Stretching, Progressive Hamstring Resistance Exercise (STST)
- Re injury rate:
  - PATS: 0% @ 2weeks; 7.7% @ 1 year
  - STST: 54% @ 2 weeks; 70% @ 1 year
- Return to sport:
  - Avg. 37.4 days (STST)
  - Avg. 22.2 days (PATS)

J Orthop Sports Phys Ther 2004;34:116-125.

Orthopaedic Manual Physical Therapy Series 2017-2018 www.vompti.com

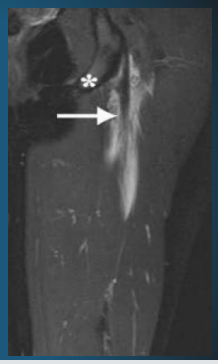
Clinical and Morphological Changes Following 2 Rehabilitation Programs for Acute Hamstring Strain Injuries: A Randomized Clinical Trial

- Progressive Agility and Trunk Stabilization Rehabilitation Program
- Progressive Running and Eccentric Strengthening Rehabilitation Program
- No significant differences in clinical or morphological outcome measures between rehabilitation groups across time
- Re injury rates were low for both rehabilitation groups after return to sport

J Orthop Sports Phys Ther 2013;43(5):284-299.

Orthopaedic Manual Physical Therapy Series 2017-2018 www.vompti.com

- MRI findings: Predictive return to activity (at time of injury)
  - Amount of edema
  - Cranial – Caudal injury length
  - Cross Sectional Area of injury
  - Distance maximal signal intensity from Ischial tuberosity
- 80% cleared for return to sport
  - Pain free
  - Normal strength
- MRI (+) tissue injury



J Orthop Sports Phys Ther 2013;43(5):284-299

Hamstring Strain Injuries: Recommendations for Diagnosis, Rehabilitation, and Injury Prevention

BRYAN C. HEIDERSCHEIT, PT, PhD[1] • MARC A. SHERRY, PT, DPT, LAT, CSCS[2] • AMY SILDER, PhD[3]
ELIZABETH S. CHUMANOV, PhD[4] • DARRYL G. THELEN, PhD[5]

JOURNAL OF ORTHOPAEDIC & SPORTS PHYSICAL THERAPY | VOLUME 40 | NUMBER 2 | FEBRUARY 2010

Rehab

- LP Stability
- Progressive Agility
- Neural Mobility
- Improve extensibility of tissue
- Improve local tolerance for stretch
- Strengthen (eccentrics)

Phase 1

Goals

1. Protect scar development
2. Minimize atrophy

Protection

Avoid excessive active or passive lengthening of the hamstrings

Ice

2-3 times/d

Therapeutic exercise (performed daily)

1. Stationary bike × 10 min
2. Side-step × 10 m, 3 × 1 min, low to moderate intensity, pain-free speed and stride
3. Grapevine × 10 m, 3 × 1 min, low to moderate intensity, pain-free speed and stride (**ONLINE VIDEO**)
4. Fast feet stepping in place, 2 × 1 min
5. Prone body bridge, 5 × 10 s
6. Side body bridge, 5 × 10 s
7. Supine bent knee bridge, 10 × 5 s
8. Single-limb balance progressing from eyes open to closed, 4 × 20 s

Criteria for progression to next phase

1. Normal walking stride without pain
2. Very low-speed jog without pain
3. Pain-free isometric contraction against submaximal (50%-70%) resistance during prone knee flexion (90°) manual strength test

Phase 2

Goals

1. Regain pain-free hamstring strength, beginning in mid-range and progressing to a longer hamstring length
2. Develop neuromuscular control of trunk and pelvis with progressive increase in movement speed

Protection

Avoid end-range lengthening of hamstrings while hamstring weakness is present

Ice

Postexercise, 10-15 min

Therapeutic exercise (performed 5-7 d/wk)

1. Stationary bike × 10 min
2. Side-shuffle × 10 m, 3 × 1 min, moderate to high intensity, pain-free speed and stride
3. Grapevine jog × 10 m, 3 × 1 min, moderate to high intensity, pain-free speed and stride
4. Boxer shuffle × 10 m, 2 × 1 min, low to moderate intensity, pain-free speed and stride (**ONLINE VIDEO**)
5. Rotating body bridge, 5-s hold each side, 2 × 10 reps (**ONLINE VIDEO**)
6. Supine bent knee bridge with walk-outs, 3 × 10 reps (**FIGURE 3**)
7. Single-limb balance windmill touches without weight, 4 × 8 reps per arm each limb (**ONLINE VIDEO**)
8. Lunge walk with trunk rotation, opposite hand-toe touch and T-lift, 2 × 10 steps per limb (**ONLINE VIDEO**)
9. Single-limb balance with forward trunk lean and opposite hip extension, 5 × 10 s per limb (**ONLINE VIDEO**)

Criteria for progression to next phase

1. Full strength (5/5) without pain during prone knee flexion (90°) manual strength test
2. Pain-free forward and backward jog, moderate intensity

Therapeutic exercise (performed 4-5 d/wk)

1. Stationary bike × 10 min
2. Side-shuffle × 30 m, 3 × 1 min, moderate to high intensity, pain-free speed and stride
3. Grapevine jog × 30 m, 3 × 1 min, moderate to high intensity, pain-free speed and stride
4. Boxer shuffle × 10 m, 2 × 1 min, moderate to high intensity, pain-free speed and stride
5. A and B skips, starting at low knee height and progressively increasing, pain-free
   a. A skip is a hop-step forward movement that alternates from leg to leg and couples with arm opposition (similar to running). During the hop, the opposite knee is lifted in a flexed position and then the knee and hip extend together to make the next step (**ONLINE VIDEO**)
   b. B skip is a progression of the A skip; however, the opposite knee extends prior to the hip extending recreating the terminal swing phase of running. The leg is then pulled backward in a pawing type action. The other components remain the same as the A skip (**ONLINE VIDEO**)
6. Forward-backward accelerations, 3 × 1 min; start at 5 m, progress to 10 m, then 20 m (**ONLINE VIDEO**)
7. Rotating body bridge with dumbbells, 5-s hold each side, 2 × 10 reps
8. Supine single-limb chair-bridge, 3 × 15 reps, slow to fast speed (**FIGURE 4**)
9. Single-limb balance windmill touches with dumbbells, 4 × 8 reps per arm each leg (**FIGURE 5**)
10. Lunge walk with trunk rotation, opposite hand dumbbell toe touch and T-lift, 2 × 10 steps per limb
11. Sport-specific drills that incorporate postural control and progressive speed

Phase 3

Goals

1. Symptom-free (eg, pain and tightness) during all activities
2. Normal concentric and eccentric hamstring strength through full range of motion and speeds
3. Improve neuromuscular control of trunk and pelvis
4. Integrate postural control into sport-specific movements

Protection

Avoid full intensity if pain/tightness/stiffness is present

Ice

Postexercise, 10-15 min, as needed

Criteria for return to sport

1. Full strength without pain
   a. 4 consecutive repetitions of maximum effort manual strength test in each prone knee flexion position (90° and 15°)
   b. Less than 5% bilateral deficit in eccentric hamstrings (30°/s): concentric quadriceps (240°/s) ratio during isokinetic testing
   c. Bilateral symmetry in knee flexion angle of peak isokinetic concentric knee flexion torque at 60°/s
2. Full range of motion without pain
3. Replication of sport specific movements near maximal speed without pain (eg, incremental sprint test for running athletes)

[CLINICAL COMMENTARY]

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JOURNAL OF ORTHOPAEDIC & SPORTS PHYSICAL THERAPY | VOLUME 46 | NUMBER 6 | JUNE 2016 |

Proximal Hamstring Tendinopathy: Clinical Aspects of Assessment and Management

Progressive Tendon Loading

- **Stage I: Isometric HS load**
- **Stage II: Isotonic HS load with minimal hip flexion**
- **Stage III: Isotonic HS load with 70-90 degrees hip flexion**
- **Stage IV: Energy Storage and Loading**

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MARCH 2014 | VOLUME 44 | NUMBER 3 | JOURNAL OF ORTHOPAEDIC & SPORTS PHYSICAL THERAPY

Rehabilitation of Proximal Hamstring Tendinopathy Utilizing Eccentric Training, Lumbopelvic Stabilization, and Trigger Point Dry Needling: 2 Case Reports