





















- 1  **A Dynamic Approach to Management of Hamstring Strains**  
Randy Craig, MS, PT, ATC
- 2  **Hamstring Strains**
  - Extremely common in athletics
    - 2<sup>nd</sup> most common injury (n=85) in 10 year span of NFL team Feeley et al 2008
    - 3<sup>rd</sup> most common injury in Memphis St. football over 4 year period (most common soft tissue injury) Canale et al 1981
- 3  **Challenges**
  - Lengthy rehabilitation
    - Days lost 8-25 depending on severity and location Brooks et al 2006
  - Recurrence
    - Australian FB
      - 12.6% during first week
      - 8.1% during second week
      - Cumulative (22 week season) 30.6%
    - Sprinters
      - 15 out of 30 injured sprinters had previous strain of same hamstring
- 4  **Anatomy**
- 5  **Injury Location**
  - Most occur in biceps femoris with hi-speed running Askling et al AJSM 2007
- 6  **Injury Location: Prognosis**
  - Proximal free tendon vs. intra-muscular
  - Greater convalescent period associated with:
    - Involvement in proximal tendon Askling AJSM 2006
    - Proximity to ischial tuberosity Askling AJSM 2007
    - Increased length and cross-sectional area of injury (MR imaging) Connell et al AJR 2004
- 7  **Injury Location: Prognosis**
  - Intra-muscular injury
    - Shorter recovery time Askling et al AJSM 2007
    - Able to reasonably estimate recovery time based on physical exam Schneider-Kolsky et al AJSM 2006
- 8  **Injury Location: Prognosis**
  - MR imaging may or may not be effective in predicting recovery
- 9  **Causative Factors**
  - Extrinsic – most occur with sprinting
  - Intrinsic
    - Age
    - Fatigue
    - Insufficient warm-up
    - Lack of strength and/or flexibility
    - Strength imbalance (ecc HS: conc quads)
    - Other LE injury
    - Strength/coord deficits in pelvis & trunk
    - \*\*\*Previous Injury – incomplete rehab
- 10  **Hamstring Re-injury**

- High recurrence rate Orchard CJSM 2002
- 2<sup>nd</sup> injury
  - More severe than initial injury
  - Double recovery time Brooks et al ASJM 2006
- Contributing factors:
  - Persistent weakness
  - extensibility due to scar tissue
  - Adaptive changes in biomechanical and motor patterns
- 11  **Hamstring Re-injury**
  - Other contributing factors
    - Incomplete rehab
    - Pelvic & trunk stability
    - Proprioception
    - Quad & psoas flexibility → ant pelvic tilt → HS tension
    - Faulty movement patterns
    - Muscle imbalance – esp eccentric HS
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- 12  **Why eccentrics for Hamstrings?**
  - Biomechanical model Askling AJSM 2007
    - Eccentric load on HS during late swing phase of gait
  - Physiological model Brockett Med Sci Sports Exerc 2004
    - Shorter optimum MT length for active tension in prev injured muscle
    - Exacerbated by concentric trng in rehab
    - Also affected by scar tissue
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- 13  **Evidence?**
  - Extremely limited for evidence-based rehabilitation programs
    - PubMed:
      - 19 articles on hamstring strain from 2006 to 2010
      - NONE on effectiveness of rehabilitation programs
  - Most treatment based on clinical experience, anecdotal evidence, and tissue repair models
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- 14  **Evidence**
  - 1 → Group 1
    - Static stretching, isolated PRE's, ice
  - Group 2
    - Progressive agility, trunk stabilization, ice
  - 2 → Outcomes
    - Similar return to sport time
    - >50% in group 1 sustained re-injury at 2 weeks
    - 1 year
      - 7/10 reinjury (Grp 1)
      - 1/13 reinjury (Grp 2)
      - Sherry JOSPT 2004
- 15  **Evidence**
  - Sport-specific training reduces incidence of HS strains in Aus FB players. Verrall et al 2005

- - Effect of stretching on 50m sprints Fletcher et al 2007
    - Improved performance with dynamic stretching and combination of static/dynamic
    - Decreased performance with static stretching alone
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  - Effect of stretching on soccer performance Little et al 2006
    - Dynamic stretching improved performance
    - Static stretching not detrimental
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- 16  **Evidence**
  - Pre-season eccentric training for elite soccer players Askling 2005
    - Lower incidence of injury
    - Increased strength and speed
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  - Role of lumbo-pelvic muscles in prevention and rehabilitation of hamstring strains Thelen et al 2006
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  - *Clinical Commentary* - Hamstring Strain Injuries: Recommendations for Diagnosis, Rehabilitation, and Injury Prevention Heiderscheit et al JOSPT 2010
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- 17  **Hamstring Rehabilitation Program**
  - 4 phase program (Worrell 1994)
    - Acute phase (< 1 week)
    - Sub-acute phase
    - Remodeling phase
    - Functional phase
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- 18  **Acute Phase (< 1 week)**
  - Inflammation control
    - Modalities prn: heat, ultrasound, electrical stimulation, ice
    - Soft tissue massage (gentle)
      - Mobilize edema and ecchymosis
      - Minimize scarring
  - Early functional ROM
    - Normalize gait
    - Lateral movement (frontal plane)
    - Non-hamstring isometrics as tolerated
- 19  **Sub-acute phase**
  - Modalities prn – HP, US, ES, CP
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  - Massage – manual prn, self-massage (The Stick), foam roll (later)
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- 20  **Sub-acute phase**
  - Initiate HS mobilization
    - Active knee ext in 90/90 posn – pain free
    - Gentle manual stretch
  - Stationary bike or treadmill
  - Stretching
    - Quads
    - Hip flexors
    - ITB

21  **Sub-acute phase**

- Strengthening
  - Prone knee flexion (no resistance, progressing to manual resistance or ankle weight)
  - Initiate low intensity dynamic stretching
  - Lumbo-pelvic strengthening
    - Planks – front and side
    - Gluteus medius strengthening – clams
  - Closed chain HS exercise
    - Bridge progression
- Proprioceptive training
  - Single leg balance progression
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22  **Remodeling Phase**

- Modalities PRN – HP, CP
- Bike, treadmill – progression of fwd/bwd jog to 50% intensity
- Stretching
  - Static (limited)
  - Dynamic (video)

23  **Remodeling Phase**

- Strengthening
  - PRE's
    - Leg press
    - Prone leg curls (eccentrics)
  - Functional & Eccentric
    - Swiss ball bridges → ham curls
    - Supine hip extension with knee extended (Keiser or theraband)
    - Multi-plane lunges (cone complex)
    - Ladder agility program
    - Low grade bilateral plyos (hurdles)

24  **Remodeling Phase**

25  **Remodeling Phase**

26  **Functional Phase**

- Limited modalities
- Stretching
  - Static
  - Dynamic (more demanding)

27  **Functional Phase**


- Sprint progression (build up to 100%)
- Strengthening
  - Continue PRE's
  - Functional & Eccentric
    - Swiss Ball/BOSU

- Supine hip extension (slow/med/fast)
- Ladder
- Resisted running (theraband, Keiser)


28  **Functional Phase**

- Strengthening
  - Functional & Eccentric (cont)
    - Skipping – fwd, bwd, lateral
    - Hurdles (forward and lateral)
    - High lateral step ups
    - Plyometrics (box jumps, blast offs)
- Sport-specific drills
  - Emphasis on technique and game speed

29  **Functional Phase**

30  **Release to Play Criteria**

- No evidence-based model
- Combination of Objective and Functional Criteria

31  **Release to Play Criteria**

- Pain-free – smoldering FIRE analogy
- Symmetrical ROM (exc. gymnasts)
- Pain-free 5/5 MMT: multi-position

32  **Release to Play Criteria (cont)**

- Symptom-free with high speed and sport-specific maneuvers (NO pain, tightness or twinges)
- Emphasis on prevention and dynamic warm-up before competition

33  **THANK YOU !!!**