**Travis Frantz, MD, FAAOS**
Orthopedic Surgeon
Shoulder, Knee, & Sports Medicine
Indiana University Health Medical Group
Assistant Professor of Orthopedic Surgery,
Indiana University
(317) 944-9400
*sportsmedindiana.com*

Orthopedics & Sports Medicine

# *Hamstring Injury Non-Op Rehabilitation Protocol*

Hamstring injuries are difficult, and rehabilitation with return to sport always proceeds more slowly than desired. However, moving too quickly through the process increases the risk of re-injury, which results in even longer time away from activity and sport. Rehabilitation should be specific to the athlete and return to sport is criterion rather than time-based. However, research suggests a full return to sport without restriction ranges from 2-10 weeks, with an average time of 32 days, depending on injury and athlete characteristics. Generally speaking, if an athlete feels his or her hamstring "tighten" anticipate a recovery time of 10+ days. If the athlete feels the hamstring "pull" anticipate 21+ days. And if the athlete feels a "pop" then 28+ days until return to sport. Again, this time frame can vary dramatically based upon how the athlete progresses through the rehab protocol outlined below. Pain and inflammation should be aggressively treated in a multi-modality approach early after injury.

| PHASE | SUGGESTED INTERVENTIONS | GOALS/MILESTONES FOR PROGRESSION |
|---|---|---|
| **Phase I**<br>*Acute Phase*<br><br>*Isometric Phase* | ***Specific instructions:***<br>• Avoid end-range active and passive hamstring lengthening<br>• Avoid isolated resistance training of the injured hamstring muscle<br>• For proximal hamstring, suggestion of hip to be near neutral flexion/extension position or and minimal flexion 20° to 30°<br><br>***Suggested Treatments:***<br>**Modalities as Indicated:** Edema-controlling treatments<br>**ROM:** Passive and AAROM within ROM tolerance<br>**Manual Therapy:** If positive active slump test during the examination, neural flossing techniques are recommended as part of the rehab program<br><br>***Exercise Examples:***<br>• Multi-angle isometric hamstring (prone/supine to tolerance)<br>• Isometric lumbopelvic musculature–front plank, side plank<br>• Trunk extension<br>• Single limb balance exercises<br>• Frontal plane stepping drills-marching, grapevine<br>• Double leg bridge holds with hip in neutral for proximal hamstring progressing to single leg bridge holds<br>• Longer lever bridge was progressing from 2 legs to one leg<br>• 20°–30° hip flexion, SLR pull-downs<br><br>***Other Activities: bike as appropriate*** | ***Goals of Phase:***<br>1. Minimize pain, inflammation and edema<br>2. Minimize scar development<br>3. Minimize atrophy<br><br>***Criteria to Advance to Next Phase:***<br>1. Normal pain-free walking symmetry<br>2. Pain-free isometric contraction against submaximal (50-70%) resistance<br>3. Pain-free low-speed jog<br>4. Tolerate single leg bent knee bridge and long lever bridge<br>5. Subjective pain scale 0–3/10 during exercise loading<br>6. Tolerate bent knee stretch test – patient supine with hip and knee maximally flexed, examiner slowly straightens patient's knee |

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| **Phase II**<br>*Intermediate Phase*<br><br>*Isotonic in Reduced Hip Flexion Phase* | ***Specific Instructions:***<br>• Avoid end-range stretching/flexibility of hamstring if hamstring weakness persists<br><br>***Suggested Treatments:***<br>**Modalities as Indicated:** Edema controlling treatments, ice after rehab exercises to help decrease possible associated pain and inflammation<br>**ROM:** Gradual increase in hamstring lengthening<br>**Manual Therapy:** Continue if still positive slump test, neural mobilization, dry needling<br><br>***Exercise Examples:***<br>• Rotating body bridge<br>• Boxer shuffle<br>• Supine bent knee bridge walkouts<br>• Single limb windmill touches<br>• Prone/seated leg curl to tolerance<br>• Bridging from double to single leg<br>• Hip thrust<br>• Supine leg curl with bridge progressing double to single leg<br>• Step up progressions<br><br>***Other Activities:*** May start to use elliptical as tolerated, continue bike | ***Goals of Phase:***<br>1. Regain pain-free hamstring flexibility<br>2. Progress to full active and passive ROM<br>3. Movements primarily in the transverse and frontal planes to avoid overstretching.<br>4. Begin to restore hamstring strength and functional range of motion<br>5. Develop neuromuscular control of trunk and pelvis with progressive increase in speed of movement<br><br>***Criteria to Advance to Next Phase:***<br>1. Pain-free prone knee flexion test<br>2. Pain-free moderate forward/backward jog<br>3. Tolerate arabesque movement 3/10 or less<br>4. Tolerate modified bent-knee stretch (patient is supine with legs fully extended, examiner maximally flexes patient's hip and knee and rapidly straightens knee) |
| **Phase III**<br>*Advanced Strengthening*<br><br>*Isotonic in Increasing Hip Flexion Phase* | ***Specific Instructions:*** For proximal hamstring progressive hip flexion 70-90°<br><br>***Suggested Treatments:***<br>**Manual Therapy:** Soft tissue techniques and/or dry needling as needed<br><br>***Exercise Examples: All performed at 0-3/10 subjective pain or less, with speed and stride***<br>• Weight training (RDL, hex bar deadlift, squat progressions)<br>• Single leg chair bridge-slow to fast speeds<br>• Rotating body bridge with weight<br>• Lunge progressions with variations<br>• Windmill touches single limb with weight<br>• Nordic hamstring starting with assistance with the upper body<br>• Side shuffle, moderate to high intensity (i.e., 30 yards, 3x1 min)<br>• Boxer shuffle, moderate to high intensity (i.e., 10 yards, 3x1 min)<br>• Carioca, moderate to high intensity (i.e., 30 yards, 3x1 min)<br>• A skip progressing to B skip-start with low knee height and progressive increments that are pain-free<br>• Forward/backward accelerations progressing distance, start at 5 yards->10 yards->30 yards | ***Goals of Phase:***<br>1. Symptom-free during all activities<br>2. Normal concentric and eccentric strengthening through full range of motion and speeds<br>3. Integrate sport-specific movements<br>4. For proximal hamstring injury, progression into greater hip flexion<br><br>***Criteria to Advance to Next Phase:***<br>1. Minimal pain 0-3/10 with loading tests, arabesque<br>2. Within 85% strength with single leg exercises<br>3. For proximal hamstring, loading of hamstring origin in sport-specific ranges should be comfortable with minimal provocation after activity |

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| **Phase IV**<br>*Return to Performance Phase*<br><br>*Energy Storage Loading Phase* | ***Specific instructions:***<br>• Required for athletes returning to sports involving energy storage and/or impact loading. Pain again should not go above 0-3/10 with activities during loading.<br>• Should be returned to prior level of function with strength training<br>• Exercises chosen per individual functional and sport demands<br>• Gradual exposure to provocative activity in training, prior to return to full competition<br>• Caution to avoid excessive fatigue (with intensity and volume) in early progressions<br>• Conservative progressive plyometric and agility activities until the demands of sport are met<br>***Suggested Treatments:***<br>**Modalities/Manual:** At this stage any increase in irritability use of modalities to diminish (ice, instrument-assisted soft tissue work, dry needling)<br>***Exercise Examples:***<br>• Sprinter leg curl with theraband<br>• Sprinter follow through with high knee with theraband<br>• Fast sled push and pull<br>• Kettlebell swings<br>• Exercise ball tantrums<br>• Alternate leg split squat jumps<br>• Bounding lateral and forward<br>• Stair or hill bounding<br>• Cutting | ***Goals of Phase:***<br>1. Graded return to sport with subjective symptoms 0–3/10 or less<br><br>***Criteria to Advance to Next Phase:***<br>1. Full strength without pain<br>a. 4-5 reps of maximum effort manual strength test in prone knee flexed position<br>b. <5-10% deficit bilateral eccentric hamstrings, concentric quadriceps ratios<br>c. <5-10% deficit in knee flexion isokinetic concentric peak torque<br>4. Full range of motion without pain<br>5. Ability to replicate sport-specific movements near maximal speed without pain |

- Protocol adapted from Sanford Orthopedics Sports Medicine (https://www.sanfordhealth.org/-/media/org/files/medical-professionals/resources-and-education/proximal_mid-hamstring-strains-rehab-guideline.pdf)

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