



Hamstring Strain Rehabilitation Guideline

This rehabilitation program is designed to return the individual to their activities as quickly and safely as possible. It is designed for rehabilitation following proximal/mid-hamstring injuries. Modifications to this guideline may be necessary depending on physician-specific instruction, specific tissue healing timelines, chronicity of injury and other contributing impairments that need to be addressed. This evidence-based rehabilitation guideline is criterion-based. Time frames and visits in each phase will vary depending on many factors including patient demographics, goals and individual progress. This guideline is designed to progress the individual through rehabilitation to full sport and activity participation. The therapist may modify the program appropriately depending on the individual's goals for activity following a proximal/mid-hamstring injury.

This guideline is intended to provide the treating clinician with a frame of reference for rehabilitation. It is not intended to substitute clinical judgment regarding the patient's post-injury care, based on exam or treatment findings, individual progress and/or the presence of concomitant injuries or complications. If the clinician should have questions regarding progressions, they should contact the referring physician.

General Guidelines/Expectations

- Progression through the protocol should be individualized to the patient's presentation with typical return to activity in 4-9 weeks.
- Blood flow restriction (BFR) can be used to supplement. Please refer to BFR guideline for further details.
- Criterion-based exercise and loading progressions:
 - o Isometric (phase I)
 - o Isotonic in reduced hip flexion (phase II)
 - o Isotonic in increasing hip flexion motion (phase II)
 - o Energy storage loading (phases III & IV)
- Types of Hamstring Strains
 - a. Type I Mid-Substance - Typically acute strains of the hamstring, involving the long head of the biceps.
 - i. Sprinting type injury - high-speed running at or near maximal speed - mean return to sport is around 4-5 weeks (32 days).
 - b. Type II Proximal - Can be acute or chronic strains resulting from a combination of hip flexion and knee extension.
 - i. Stretching type injury - sudden deceleration at end range hip flexion (dancers, gymnasts, split motions) - mean return to sport is around 8-9 weeks (59 days).
 - ii. Can be chronic and degenerative due to repetitive or excessive stretching and mechanical overload from training errors (increasing volume/intensity too quickly, sudden introduction of sprinting/lunging/deep squatting/hurdles/hills).
 - iii. Even sudden increase in sitting volume (compression load) may be the provoking factor.
- 1. Patient may not recall specific injury, but rather a slow progressive increase in pain or cramping/tightness in the posterior thigh.
- 2. Pain may initially be present with the start of exercise, but resolve after warming up, and then slowly progress to failing to resolve with warming up and becoming present with daily activities and at rest, especially sitting and driving, especially on firm surfaces.
 - iv. Commonly involve the proximal semimembranosus, close to the ischial tuberosity.
 - v. Sciatic nerve irritation may concomitantly present, particularly in chronic conditions.

Proximal/Mid Hamstring Strain Rehabilitation Guideline

PHASE	SUGGESTED INTERVENTIONS	GOALS/MILESTONES FOR PROGRESSION
<p>Phase I <i>Acute Phase</i> <i>Isometric Phase</i></p>	<p>Specific instructions:</p> <ul style="list-style-type: none"> Avoid end-range active and passive hamstring lengthening Avoid isolated resistance training of the injured hamstring muscle For proximal hamstring, suggestion of hip to be near neutral flexion/extension position or and minimal flexion 20° to 30° <p>Suggested Treatments: Modalities as Indicated: Edema-controlling treatments ROM: Passive and AAROM within ROM tolerance Manual Therapy: If positive active slump test during the examination, neural flossing techniques are recommended as part of the rehab program</p> <p>Exercise Examples:</p> <ul style="list-style-type: none"> Multi-angle isometric hamstring (prone/supine to tolerance) Isometric lumbopelvic musculature-front plank, side plank Trunk extension Single limb balance exercises Frontal plane stepping drills-marching, grapevine Double leg bridge holds with hip in neutral for proximal hamstring progressing to single leg bridge holds Longer lever bridge was progressing from 2 legs to one leg 20°-30° hip flexion, SLR pull-downs <p>Other Activities: <i>bike as appropriate</i></p>	<p>Goals of Phase:</p> <ol style="list-style-type: none"> Minimize pain, inflammation and edema Minimize scar development Minimize atrophy <p>Criteria to Advance to Next Phase:</p> <ol style="list-style-type: none"> Normal pain-free walking symmetry Pain-free isometric contraction against submaximal (50-70%) resistance Pain-free low-speed jog Tolerate single leg bent knee bridge and long lever bridge Subjective pain scale 0-3/10 during exercise loading Tolerate bent knee stretch test – patient supine with hip and knee maximally flexed, examiner slowly straightens patient’s knee
<p>Phase II <i>Intermediate Phase</i> <i>Isotonic in Reduced Hip Flexion Phase</i></p>	<p>Specific instructions:</p> <ul style="list-style-type: none"> Avoid end-range stretching/flexibility of hamstring if hamstring weakness persists <p>Suggested Treatments: Modalities as Indicated: Edema controlling treatments, ice after rehab exercises to help decrease possible associated pain and inflammation ROM: Gradual increase in hamstring lengthening Manual Therapy: Continue if still positive slump test, neural mobilization, dry needling</p> <p>Exercise Examples:</p> <ul style="list-style-type: none"> Rotating body bridge Boxer shuffle Supine bent knee bridge walkouts Single limb windmill touches Prone/seated leg curl to tolerance Bridging from double to single leg Hip thrust Supine leg curl with bridge progressing double to single leg Step up progressions <p>Other Activities: May start to use elliptical as tolerated, continue bike</p>	<p>Goals of Phase:</p> <ol style="list-style-type: none"> Regain pain-free hamstring flexibility Progress to full active and passive ROM Movements primarily in the transverse and frontal planes to avoid overstretching. Begin to restore hamstring strength and functional range of motion Develop neuromuscular control of trunk and pelvis with progressive increase in speed of movement <p>Criteria to Advance to Next Phase:</p> <ol style="list-style-type: none"> Pain-free prone knee flexion test Pain-free moderate forward/backward jog Tolerate arabesque movement 3/10 or less Tolerate modified bent-knee stretch (patient is supine with legs fully extended, examiner maximally flexes patient’s hip and knee and rapidly straightens knee)

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<p>Phase III Advanced Strengthening</p> <p><i>Isotonic in Increasing Hip Flexion Phase</i></p>	<p>Specific instructions: For proximal hamstring progressive hip flexion 70-90°</p> <p>Suggested Treatments:</p> <p>Manual Therapy: Soft tissue techniques and/or dry needling as needed</p> <p>Exercise Examples: All performed at 0-3/10 subjective pain or less, with speed and stride</p> <ul style="list-style-type: none"> • Weight training (RDL, hex bar deadlift, squat progressions) • Single leg chair bridge-slow to fast speeds • Rotating body bridge with weight • Lunge progressions with variations • Windmill touches single limb with weight • Nordic hamstring starting with assistance with the upper body • Side shuffle, moderate to high intensity (i.e., 30 yards, 3x1 min) • Boxer shuffle, moderate to high intensity (i.e., 10 yards, 3x1 min) • Carioca, moderate to high intensity (i.e., 30 yards, 3x1 min) • A skip progressing to B skip-start with low knee height and progressive increments that are pain-free • Forward/backward accelerations progressing distance, start at 5 yards->10 yards->30 yards 	<p>Goals of Phase:</p> <ol style="list-style-type: none"> 1. Symptom-free during all activities 2. Normal concentric and eccentric strengthening through full range of motion and speeds 3. Integrate sport-specific movements 4. For proximal hamstring injury, progression into greater hip flexion <p>Criteria to Advance to Next Phase:</p> <ol style="list-style-type: none"> 1. Minimal pain 0-3/10 with loading tests, arabesque 2. Within 85% strength with single leg exercises 3. For proximal hamstring, loading of hamstring origin in sport-specific ranges should be comfortable with minimal provocation after activity
<p>Phase IV Return to Performance Phase</p> <p><i>Energy Storage Loading Phase</i></p>	<p>Specific instructions:</p> <ul style="list-style-type: none"> • 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. • Should be returned to prior level of function with strength training • Exercises chosen per individual functional and sport demands • Gradual exposure to provocative activity in training, prior to return to full competition • Caution to avoid excessive fatigue (with intensity and volume) in early progressions • Conservative progressive plyometric and agility activities until the demands of sport are met <p>Suggested Treatments:</p> <p>Modalities/Manual: At this stage any increase in irritability use of modalities to diminish (ice, instrument-assisted soft tissue work, dry needling)</p> <p>Exercise Examples:</p> <ul style="list-style-type: none"> • Sprinter leg curl with theraband • Sprinter follow through with high knee with theraband • Fast sled push and pull • Kettlebell swings • Exercise ball tantrums • Alternate leg split squat jumps • Bounding lateral and forward • Stair or hill bounding • Cutting 	<p>Goals of Phase:</p> <ol style="list-style-type: none"> 1. Graded return to sport with subjective symptoms 0-3/10 or less <p>Criteria to Advance to Next Phase:</p> <ol style="list-style-type: none"> 1. Full strength without pain <ol style="list-style-type: none"> a. 4-5 reps of maximum effort manual strength test in prone knee flexed position b. <5-10% deficit bilateral eccentric hamstrings, concentric quadriceps ratios c. <5-10% deficit in knee flexion isokinetic concentric peak torque 4. Full range of motion without pain 5. Ability to replicate sport-specific movements near maximal speed without pain

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	<p>Passive Stretch Tests Assessment: Moderate to high validity and high sensitivity and specificity</p> <ol style="list-style-type: none"> 1. Bent Knee Stretch <ul style="list-style-type: none"> • Patient supine with hip and knee maximally flex, examiner slowly straightens their knee 2. Modified Bent Knee Stretch <ul style="list-style-type: none"> • Patient is supine with legs fully extended, examiner maximally flexes their hip and knee and rapidly straightens the knee 3. Puranen-Orava Test <ul style="list-style-type: none"> • Stretch hamstring in a standing position with hip flexed to 90°, knee fully extended and foot is resting hop on another chair or bench 	
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