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REHABILITATION PROTOCOL: Hamstring Injury (Nonop)

This protocol is intended to guide clinicians and patients through the non-operative course for hamstring injury. This protocol is time based (dependent on tissue healing) as well as criterion based, and may vary greatly depending on severity of injury, grade of strain and location of injury (muscle, myotendinous junction, tendon). Specific intervention should be based on the needs of the individual and should consider exam findings and clinical decision making. If you have questions, contact the referring physician.

Considerations for the non-operative Hamstring injury

Many different factors influence the injured hamstring rehabilitation outcomes, including chronicity of injury, area affected (proximal, mid belly, distal), number of tendons/muscles involved, pre-injury gluteal motor control/strength and presence of any concomitant sciatic neural tension. It is recommended that clinicians collaborate closely with the referring physician regarding the above.

PHASE I: EARLY (0-2 WEEKS AFTER INJURY)

Rehab Goals	▪ Allow healing of repaired tendon ▪ Initiate early protected ROM ▪ Prevent muscular atrophy ▪ Decrease pain and inflammation
Weight Bearing	▪ As tolerated
Precautions	▪ **Limit stretching hamstring (trunk flexion, knee extension)**
Range of Motion	▪ Active assisted and passive hip and knee flexion ▪ Limit stretching and hip/knee ROM to avoid a “stretch/strain” sensation to injured area
Interventions	**Manual Therapy** ▪ STM along hamstring muscle group as needed ▪ Myofascial (no lotion) release to posterolateral glute and lateral hamstring fascia/muscle (proximal 1/3 of lateral thigh) ▪ Attain and maintain neutral iliac position ipsilateral and contralateral to injured side with manual posterior rotations to ilium **Stretching** ▪ Do not stretch the hamstring, but nerve gliding (sciatic neural flossing) may be needed if neural tension exists ▪ Hip flexors in Thomas test position (maintain neutral pelvis/spine throughout stretch) ▪ Gastrocnemius/Soleus stretching

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	Therapeutic Exercises ▪ Quad sets ▪ Glute sets *must be mastered before progressing any gluteal or hamstring muscle strengthening* ▪ AA and PROM hip flexion (60deg limit) and knee flexion ▪ Upper body and core circuit training (avoiding positions which lengthen hamstring) ▪ Upper body ergometer (UBE)
Criteria to Progress	▪ 1-2 weeks post-injury depending on severity of injury

PHASE II: INTERMEDIATE (2-4 WEEKS AFTER INJURY)

Rehab Goals	▪ Reduce/resolve pain and edema ▪ Good motor control and pain-free functional movements
Weight Bearing	▪ As tolerated
Precautions	▪ **Carefully begin gentle, pain-free hip flexion with knee extension**
Range of Motion	▪ Active and passive hip and knee flexion
Additional Interventions *Continue with Phase I interventions	**Manual Therapy** ▪ Gentle cross friction massage to proximal tendon including proximal to attachment on ischial tuberosity ▪ Manual trigger point release as needed (common area is within distal 1/3 of biceps femoris) ▪ Manual trigger point release as needed with ART (active release therapy) to piriformis, quadratus femoris ▪ Anterior hip glides with and without external rotation at the hip (hip in neutral to slightly extended) ▪ Posterior/inferior belted hip mobilizations as needed for full flexion (belted quadruped position with active movement into child's pose) **Stretching** ▪ Hip external rotation in flexion ▪ Gentle, slow, pain-free non weighted hamstring stretching (supine with strap) **Therapeutic Exercises** ▪ Low Double Leg (DL) Bridge ▪ Side-lying hip abduction ▪ Standing calf raises ▪ Strengthening of uninvolved limb ok

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	Cardiovascular Exercise: ▪ Stationary bike ▪ Progressive speed walking on level surfaces ▪ Elliptical at week 4 if pain-free
Criteria to Progress	▪ 4-6 weeks post-injury depending on severity of injury

PHASE III: TRANSITIONAL (4-8 WEEKS AFTER INJURY)

Rehab Goals	▪ Normalized gait ▪ Gradually progress to full ROM ▪ Improve neuromuscular control ▪ Increase strength ▪ Enhance proprioception and kinesthesia
Weight Bearing	▪ Full weight bering, no assistive device
Precautions	▪ Per tolerance
Range of Motion	▪ Progressive active hip and knee flexion ▪ Active stretching all uninvolved muscle groups
Additional Interventions *Continue with Phase I-II interventions	**Manual Therapy** ▪ Per above as needed **Therapeutic Exercises** ▪ DL Bridge with band around thighs ▪ DL Bridge with ball squeeze ▪ DL Bridge with Upper back on the bench ▪ Plank with alternating leg lifts ▪ Side plank with leg lift (on left knee until stronger) or oblique twists ▪ Straight Leg Raise (SLR) ▪ Hamstring (HS) curls antigravity ▪ Hip extension antigravity At 6 weeks add: ▪ Single Leg (SL) bridge, back on floor, foot on bench ▪ Progress to ankle weight for all leg lifts PRE ▪ Wall slides ▪ Clam shells ▪ Partial squats ▪ Step ups ▪ Step downs **Cardiovascular Exercise**

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	▪ Stationary bike ▪ Swimming arms and legs ▪ Progressive speed walking on level surfaces ▪ Jog/walk may be initiated at week 6 if full, symmetrical ROM and strength
Criteria to Progress	▪ Good control with functional movements without antalgic movement patterns ▪ Hamstring strength 5/5 in prone with knee at 90deg flexion ▪ Good neuromuscular control in all planes without pain ▪ HHD testing: o To initiate plyos: ▪ LSI hamstring >70/80% ▪ LSI glute med >80% ▪ LSI quad >80% o To run: ▪ LSI hamstring >80/90% ▪ LSI glute med >90% ▪ LSI quad >90% ▪ Single leg hop cluster (distance, triple, cross over, 6 meter timed) >85%

PHASE IV: EARLY RETURN TO SPORT (8-12 WEEKS AFTER INJURY)

Rehab Goals	▪ Full ROM ▪ Improve neuromuscular control ▪ Improve strength/power/endurance ▪ Enhance dynamic stability
Precautions/ Guidelines	▪ No pain during strength training or cardiovascular activity
Additional Interventions *Continue with Phase I-III interventions	**Therapeutic Exercises** ▪ Dynamic and static hamstring stretching ▪ Weight training machines: Leg Press, Standing Hip Abduction, Hamstring Curl, Leg Extension ▪ Single leg closed chain exercises ▪ Resisted step ups using sports cord around waist from behind ▪ Double Leg Hamstring ball roll out (eccentric portion only) → DL eccentric and concentric → SL eccentric portion only → SL eccentric and concentric ▪ Double Leg deadlift, short range → progressing to Single Leg no rotation ▪ Double Leg deadlift – wide abducted leg stance with band around forefeet – pushing into abduction during eccentric phase of deadlift ▪ Progress to single leg with spine rotation deadlift to work hamstrings three- ▪ dimensionally ▪ Bridge on ball – eccentric portion only double leg → progressing to single leg **Cardiovascular Exercise**

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	▪ Continue to increase speed and distance for walking, incorporate uneven surfaces ▪ Continuous jogging ▪ Initiate interval jogging and running
Criteria to Progress	▪ Full ROM ▪ No pain/tenderness ▪ Satisfactory clinical exam including isokinetic testing

PHASE V: UNRESTRICTED RETURN TO SPORT (12+ WEEKS AFTER INJURY)

Rehab Goals	▪ Emphasis on gradual return to recreational activities ▪ Progressively increase activities to prepare for unrestricted functional return
Precautions/ Guidelines	▪ Neoprene support as needed
Additional Interventions *Continue with Phase II-IV interventions	**Therapeutic Exercises** ▪ Progressive strengthening avoiding overload to HS ▪ Progress speed of resisted steps and add forward lean ▪ SL dead lift with band under stance leg: hold for resistance ▪ Reverse Lunge on Slider: Progress load bearing and add concentric/eccentric phase: o Part 1: Eccentric hamstring with core strength exercise: injured leg is weight bearing leg, from standing, lunge backward (weightless leg slides back on slide board) into full lunge, bend forward and then push through weightbearing leg/heel as raise back up o Part 2: in full lunge position: leg slides back as weight bearing knee bends, back leg slides forward as weight bearing leg straightens) ▪ Short range Nordic HS to physio ball height → progress range to ground depth ▪ Kettle bell swing ▪ Retro lunge slide (working leg in front, slide board slider for back leg) ▪ Jump training **Cardiovascular Exercise** ▪ Continue above, progressing speed, distance ▪ Progress step ups to resisted jump onto steps ▪ Plyometric progression o Double leg up/down o Double leg forward/back o Alternating lateral bounding o Single leg jump o Progress plyometrics to resisted plyometrics using sports cord around waist ▪ Ladder drills

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	▪ Falling start runs- see below for details ▪ Mini hurdle runs ▪ Sprint progressions (5 times each) ○ 10 yard → 20 yd → assisted deceleration with band around waist deceleration lean ▪ 40 yard sprints at 90%
Criteria to Progress	▪ To Return to Play: ○ LSI Hamstring strength > 95% ○ LSI Glute strength >95% ○ LSI quad strength >95% ○ Single leg hop cluster (distance, triple, cross over, 6 meter timed) >95% ○ Good acceleration, deceleration, change of direction control ○ 60 second timed step-down test 80 bpm, with excellent control ○ 60 second timed Lateral leap 60 bpm, with excellent control ▪ Last stage, no additional criteria ▪ Proceed with caution

**Acknowledgement: This rehab protocol was largely adopted from the protocols at MGH Sports Medicine Physical Therapy, which can be found at https://www.massgeneral.org/orthopaedics/sports-medicine/physical-therapy/sports-rehab-protocols*

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Return to Running Program

This program is designed as a guide for clinicians and patients through a progressive return-to-run program. Patients should demonstrate > 80% on the Functional Assessment prior to initiating this program (after a knee ligament or meniscus repair). Specific recommendations should be based on the needs of the individual and should consider clinical decision making. If you have questions, contact the referring physician.

PHASE I: WARM UP WALK 15 MINUTES, COOL DOWN WALK 10 MINUTES Day 1 2 3 4 5 6

Day	1	2	3	4	5	6	7
Week 1	Walk 5 min, Jog 1 min x 5 reps		Walk 5 min, Jog 1 min x 5 reps		Walk 4 min, Jog 2 min x 5 reps		Walk 4 min, Jog 2 min x 5 reps
Week 2		Walk 3 min, Jog 3 min x 5 reps		Walk 3 min, Jog 3 min x 5 reps		Walk 2 min, Jog 4 min x 5 reps	
Week 3	Walk 2 min, Jog 4 min x 5 reps		Walk 1 min, Jog 5 min x 5 reps		Walk 1 min, Jog 5 min x 5 reps		Return to Run

**Only progress if there is no pain or swelling during or after the run

PHASE II: WARM UP WALK 15 MINUTES, COOL DOWN WALK 10 MINUTES

Day	1	2	3	4	5	6	7
Week 1	20 min		20 min		20 min		25 min
Week 2		25 min		25 min		30 min	

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Week 3	30 min		30 min		35 min		35 min
Week 4		35 min		40 min		40 min	
Week 5	40 min		45 min		45 min		45 min
Week 6		50 min		50 min		50 min	
Week 7	55 min		55 min		55 min		60 min
Week 8		60 min		60 min			

Recommendations

- Runs should occur on softer surfaces during Phase I
- Non-impact activity on off days
- Goal is to increase mileage and then increase pace; avoid increasing two variables at once
- 10% rule: no more than 10% increase in mileage per week

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Agility and Plyometric Program

This program is designed as a guide for clinicians and patients through a progressive series of agility and plyometric exercises to promote successful return to sport and reduce injury risk. Patients should demonstrate > 80% on the Functional Assessment prior to initiating this program. Specific intervention should be based on the needs of the individual and should consider clinical decision making. If you have questions, contact the referring physician.

PHASE I: ANTERIOR PROGRESSION

Rehab Goals	▪ Safely recondition the knee ▪ Provide a logical sequence of progressive drills for pre-sports conditioning
Agility	▪ Forward run ▪ Backward run ▪ Forward lean in to a run ▪ Forward run with 3-step deceleration ▪ Figure 8 run ▪ Circle run ▪ Ladder
Plyometrics	▪ Shuttle press: Double leg alternating leg single leg jumps ▪ Double leg: ○ Jumps on to a box jump off of a box jumps on/off box ○ Forward jumps, forward jump to broad jump ○ Tuck jumps ○ Backward/forward hops over line/cone ▪ Single leg (these exercises are challenging and should be considered for more advanced athletes): ○ Progressive single leg jump tasks ○ Bounding run ○ Scissor jumps ○ Backward/forward hops over line/cone
Criteria to Progress	▪ No increase in pain or swelling ▪ Pain-free during loading activities ▪ Demonstrates proper movement patterns

PHASE II: LATERAL PROGRESSION

Rehab Goals	▪ Safely recondition the knee ▪ Provide a logical sequence of progressive drills for the Level 1 sport athlete
Agility *Continue with Phase I interventions	▪ Side shuffle ▪ Carioca ▪ Crossover steps ▪ Shuttle run

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	▪ Zig-zag run ▪ Ladder
Plyometrics *Continue with Phase I interventions	▪ Double leg: o Lateral jumps over line/cone o o Lateral tuck jumps over cone ▪ Single leg (these exercises are challenging and should be considered for more advanced athletes): o Lateral jumps over line/cone o Lateral jumps with sport cord
Criteria to Progress	▪ No increase in pain or swelling ▪ Pain-free during loading activities ▪ Demonstrates proper movement patterns

PHASE III: MULTIPLANAR PROGRESSION

Rehab Goals	▪ Challenge the Level 1 sport athlete in preparation for final clearance for return to sport
Agility *Continue with Phase I-II interventions	▪ Box drill ▪ Star drill ▪ Side shuffle with hurdles
Plyometrics *Continue with Phase I-II interventions	▪ Box jumps with quick change of direction ▪ 90 and 180 degree jumps
Criteria to Progress	▪ Clearance from MD ▪ Functional Assessment o Quad/HS/glut index ≥90% contra lateral side (isokinetic testing if available) o Hamstring/Quad ratio ≥70% o Hop Testing ≥90% contralateral side ▪ KOOS-sports questionnaire >90% ▪ International Knee Committee Subjective Knee Evaluation >93 ▪ Psych Readiness to Return to Sport (PRRS)

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Psychological Readiness to Return to Sport

Patient Name: MRN:
Injury: Date of Injury:
Surgeon:

Please rate your confidence to return to your sport on a scale from 0 – 100
Example: 0 = No confidence at all
50 = Moderate confidence
100 = Complete confidence

1. My overall confidence to play is _____
2. My confidence to play without pain is _____
3. My confidence to give 100% effort is _____
4. My confidence to not concentrate on the injury is _____
5. My confidence in the injured body part to handle demands of the situation is _____
6. My confidence in my skill level/ability is _____

Total: _____
Score:_____

Examiner: _____