The Role of Neural Tension in Hamstring Injury, Part 2: Treatment and Rehabilitation

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A thorough evaluation is critical for a prompt resolution of any athletic injury. This is certainly true for posterior thigh pain, and clinicians should be mindful that hamstring-strain injury does not necessarily occur in isolation. Complaints of hamstring-related pain can be related to lumbar-spine pathology, sacroiliac-joint dysfunction, or hip pathology.1–3 Neural tension can also contribute to posterior thigh pain. Part 1 of this two-part column addressed the concomitant condition of neural tension (NT) and presented evaluation techniques that might help identify NT in athletes with complaints of hamstring pain. The purpose of Part 2 is to present specific treatment strategies that might enhance recovery from recurrent muscle-strain injuries in which NT has been identified.

Traditional Treatment Strategies

An aggressive and comprehensive rehabilitation program is generally recommended for repetitive hamstring-strain injuries.4 Minor injuries might be inadequately treated and, consequently, become recurrent injuries. Conventional treatment of acute muscle-strain injury includes cryotherapy, compression with an elastic wrap or neoprene sleeve, and relative rest for the initial 24–72 hr in an effort to minimize tissue damage. Careful evaluation of athletes with hamstring injuries can ensure appropriate mobilization interventions, which could accelerate the formation of granulation tissue and influence the orientation of scar tissue.5 Athletes with minor acute strains might benefit from working within a pain-free range of motion and refraining from aggressive stretching exercises for 24–48 hr after injury.5

Traditional treatment programs have also included therapeutic modalities such as electrotherapy and ultrasound. Nonsteroidal anti-inflammatory drugs (NSAIDs) are often used in early treatment of sports-related musculoskeletal injuries, but there is no convincing evidence that their pharmacologic effect accelerates recovery from hamstring injury.2,6 The use of NSAIDs in the treatment of soft-tissue injury is controversial. It might have adverse affects on long-term healing when administered during the acute phase of injury.7,8

Generally, traditional hamstring-injury treatment strategies fail to address NT injury, which is the abnormal physiological or mechanical response of neural tissue that occurs when the normal range of movement and stretch capabilities are exceeded.9 If NT injury is suspected, or confirmed during evaluation, it must be specifically addressed during the rehabilitation process through neural-mobilization techniques that reestablish normal neurodynamics.10 The clinician must use these techniques with care, because overly aggressive mobilization might further damage the traumatized nerve.

Neural Mobilization

Including neural mobilization in a traditional hamstring-injury rehabilitation regime might allow athletes to return to play more quickly.1,11 Two techniques are commonly employed for neural mobilization. “Sliding,” or “flossing,” which is premised on the contiguous nature of the nervous system, encourages neural-tissue mobility within the neural canal and surrounding tissues as the athlete alternately elongates the proximal and distal portions of the neural-tissue chain.10 The primary goal of this technique is to restore mobility
of the neural tissue in relation to its surroundings. A second technique, known as “tensioning,” requires intermittent tensioning of the neural tissue that likely alters intraneural pressure, which might be independently therapeutic. To achieve appropriate pressure, the athlete positions him- or herself to create a mild intermittent tension on the neural structures. Tensioning is also believed to have a neurogenic effect on the involved area, which might optimize healing of injured tissue.

Neural-mobilization techniques are specific to neural tissue. Mobilization techniques used in the treatment of hamstring injury include seated sliders and tensioners. To perform seated sliders, the athlete is instructed to sit in a “slump” position with the ankle in dorsiflexion (Figure 1). As tension is applied to the proximal segment (cervical flexion), tension is relieved in the distal segment (knee flexion). Alternately, as tension is relieved in the proximal segment (cervical extension), it is applied in the distal segment (knee extension). This encourages the neural tissue to slide through the neural canal and surrounding tissues. The athlete should be instructed to generate and relieve tension in a slow, rhythmic fashion and to avoid stretching the neural tissue excessively, which could produce pain and burning. The sliding mobilization technique is recommended for the acute phase of injury, as well as the subacute phase.

Another mobilization technique involves stretching in either the slump or the long-sitting position, thereby tensioning the nerve (Figure 2). Kornberg and McCarthy cite a reversal of tonic vasoconstriction and excessive sympathetic outflow as a result of 5- to 10-s “slump stretching” that might facilitate healing. Athletes might experience a pronounced warming sensation in the posterior thigh after several seconds of neural tensioning. Familiar therapeutic techniques also associated with sympatholytic effects include transcutaneous electrical neuromuscular stimulation and acupuncture. Tensioning the nerve might be most helpful in the subacute injury phase as the initial sympathetic response subsides. Furthermore, when tensioning techniques are employed, the patient must avoid painful ranges of motion, produce only mild tension, and avoid overly aggressive stretching of neural tissue.

Neural-mobilization treatment for an athlete with a hamstring-strain injury might consist of a dynamic warm-up (stationary biking or backward walking), 20–30 s of neural sliding, three to four repetitions of neural tensioning, hamstring stretches, and 20–30 s of neural sliding. Neural mobilization can be progressed

Figure 1 Sliders. Alternately tensioning one aspect of the neural-tissue chain (proximal or distal). As a general rule, (a) cervical flexion occurs with knee flexion and (b) cervical extension occurs with knee extension. It is important that the athlete avoid reproducing symptoms with this technique. Movements should be slow and rhythmic to encourage mobility and avoid tension.
by increasing the range over which the motion takes place. Increasing hip flexion during slump-position mobilizations will increase the amount of tension that can be produced and will allow mobilization of the nerve through a greater range.

Regaining Strength

Athletes with acute minor hamstring strains, by definition, have minimal muscle damage. Therefore, strength loss should be minimal. Rehabilitation exercises should focus on regaining normal neuromuscular function. On the other hand, athletes with chronic or recurrent injury might have strength loss or strength imbalances. These athletes require both focused strengthening exercises and neuromuscular-coordination training. Selection of exercises must be made with hamstring function in mind. This two-joint muscle functions in hip extension, knee flexion, and hip and knee stabilization. Hip strength must not be overlooked, because the hamstring unit functions as a hip extender more than a knee flexor during running.

Rehabilitation of minor hamstring strains includes exercises that isolate the hamstring-muscle group, such as traditional hamstring curls and multijoint functional exercises. Bridging techniques that are included in lumbopelvic-stabilization training are an excellent choice for an athlete with a hamstring strain (Figure 3). The athlete can begin these exercises on a stable platform and progress to a more dynamic platform such as an exercise ball. Resistive cords can also be used to develop hamstring strength both concentrically and eccentrically (Figure 4). These exercises can also be used to develop overall hip strength.

Return to Activity

Many athletes with minor hamstring-strain injury can perform at submaximal levels. Thus, a primary concern for these athletes is avoiding reinjury when maximal effort is required for athletic activity. An athlete who is recovering from a minor strain should participate in a return-to-running program that gradually increases physical stress and mimics specific sport requirements to alleviate fear of reinjury. The program should progress through an intensity spectrum in such a manner that the athlete’s cardiovascular-conditioning level is maintained or improved. Athletes who complain of recurrent symptoms as they return to high-velocity motions should be reexamined, with attention given to surrounding structures that might be interfering with neural-tissue mobility.
Many athletes might benefit from a compression wrap, or neoprene sleeve, when resuming physical activity. Some athletes prefer to wear compression shorts to maintain tissue warmth and to stabilize the injured soft tissue in the thigh. Either method is acceptable; the decision can be left to the athlete. Nothing in the literature suggests that these compression devices are detrimental to athletic performance, and there is evidence to suggest that compression garments might reduce hamstring-strain injuries.\(^2,13\)

Athletes are encouraged to use cryotherapy after exercise sessions to minimize the inflammatory response to exercise. Performing neural sliders postactivity might be beneficial in maintaining normal mobility of the nerve through surrounding tissue.\(^10\)

**Summary**

Chronic hamstring-strain injury has often been attributed to insufficient rehabilitation or a premature return to athletic activity. Recent research suggests that traditional treatment supplemented with prompt evaluation and treatment of adverse neural tension will result in a faster return to activity and reduce the incidence of recurrent injury.\(^11\) Athletes with complaints of posterior thigh pain need a thorough examination and an individualized rehabilitation program designed to address strength loss, range-of-motion restriction, neuromuscular-control impairments, and abnormal neurodynamics.\(^1\)

**References**


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