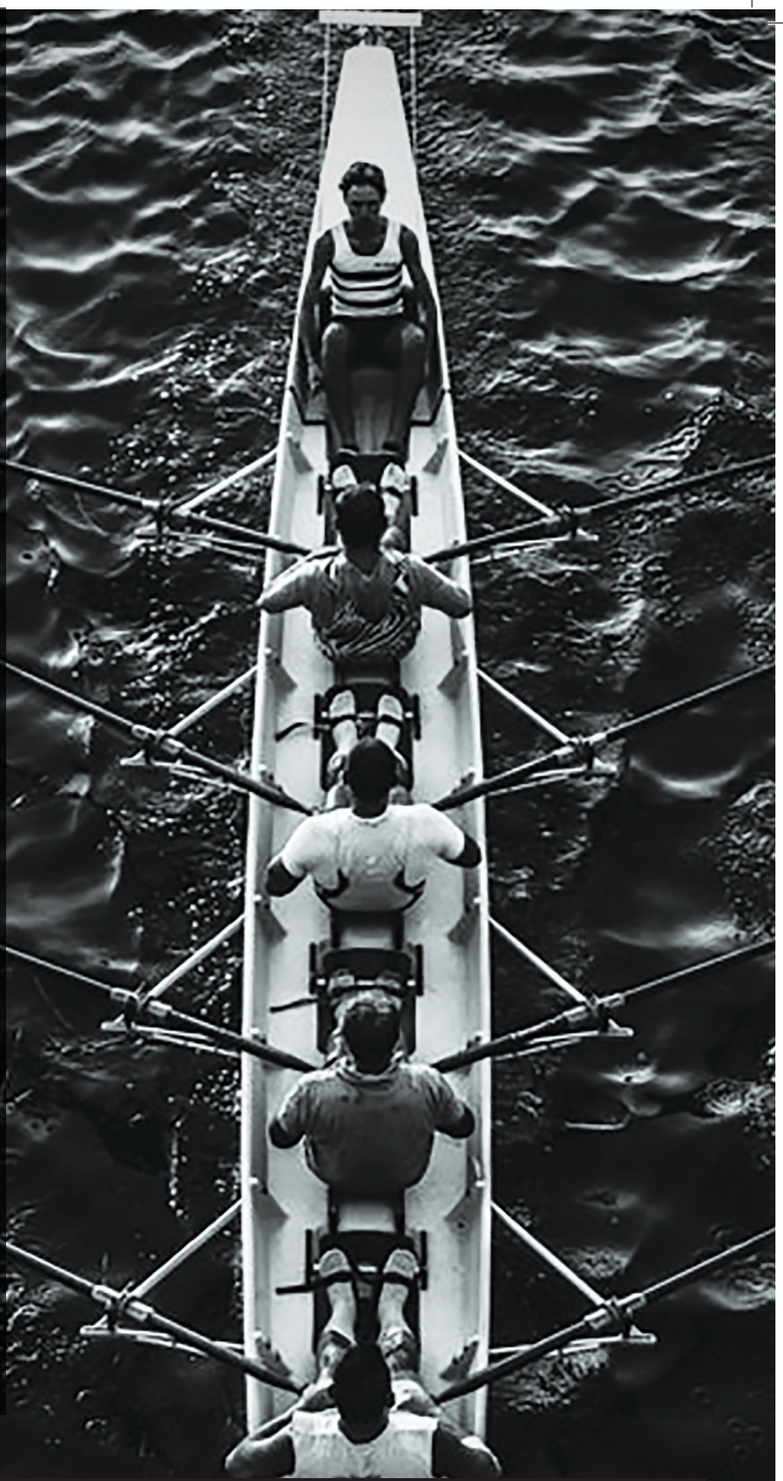
Managing Musculoskeletal Pain in Endurance Athletes



Primary care physicians can play a crucial role in the correction and rehabilitation of sports-related abnormalities and improper training before acute/subacute pain becomes a chronic condition.

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The popularity of endurance sports has grown steadily over the past several decades. From running and rowing to Ironman and century cycling events, the options for endurance training and competitive events are many. With the months of intense training required to compete in these events comes an increased risk of overuse sports injuries and resultant musculoskeletal pain. While prevention is the best treatment, equally important is early diagnosis of acute and chronic pain conditions and referral to sports medicine/musculoskeletal pain specialists and rehabilitation specialists.

Endurance athletes frequently first present to their primary care provider with acute/subacute, and sometimes chronic, injuries, such as musculoskeletal tendonitis or lower back pain, making a greater awareness of treatment options for common musculoskeletal pain conditions essential to care in this setting. In addition, it is important for primary care physicians to convince their patients of the importance of rehabilitation to correct musculoskeletal abnormalities and avoid improper training before acute/subacute conditions become chronic.

In endurance athletes, musculoskeletal injury occurs when

repetitive, cumulative forces exceed the tissue's ability to withstand such forces either due to isolated macrotrauma—such as a rotational injury to a joint, blunt trauma, or sudden overload causing a tear—or repetitive microtrauma—such as tendonitis, nerve compression, or stress fractures. Often, specific biomechanical or physiological factors predispose an athlete to injury.

This review provides treatment options for three isolated, but common sports-related musculoskeletal injuries in endurance athletes: plantar fasciitis, rotator-cuff tendonitis, and spine-related pain conditions. The authors discuss management from the perspective of a musculoskeletal pain physician and a physical therapist to provide a wide spectrum of approaches.

Case: Plantar Fasciitis

Patient

A 33-year-old woman training for her first half Ironman event presented with pain in the medial part of her distal heel that increased in severity when running and upon taking her first steps in the morning. She reported the pain as "stabbing" and "excruciating" in the heel segment. She was one-year postpartum, and 15 pounds over her prepregnancy weight.

The pain increased in severity over six weeks prior to presentation when she increased her running distance from 15 miles to more than 30 miles per week. She had no history of foot or ankle fracture, but reportedly "had twisted her ankle" in high school and college. At home, she walked barefoot on hardwood floors and purchased new running shoes at a chain sports store two months prior.

Her primary care provider prescribed oral nonsteroidal inflammatory drugs (NSAIDs) and suggested using a topical anesthetic, with little improvement found at two-week follow-up. The provider referred her to a physical medicine and rehabilitation (PM&R) specialist, who observed tight heel cords with mobility, and point tenderness with palpation, as well as positive Tinel's sign at the right medial aspect of distal heel on the calcaneous.

The patient was diagnosed with subacute plantar fasciitis after the specialist noted thickening of the right plantar fascia (one-third to one-half larger in diameter compared to the left foot) on diagnostic ultrasound, with no abnormalities found on x-ray or motorsensory testing.

The PM&R physician administered a localized injection of anesthetic with a corticosteroid into the plantar fascia using ultrasound guidance, which lowered her pain score from 7 to 4 (out of 10), and advised her to stop running and switch to biking or swimming for two to four weeks. She was referred to a physical therapist who fitted her with orthotics and recommended wearing cushioned footwear (eg, sneakers) at home. She also was advised to purchase new sneakers with improved rear heel stability and motion control from a running store.

The physical therapist assisted her with active and passive stretching, recommended home stretching exercises and icing, and fitted her with low-dye taping at each visit to allow her to resume running, starting with short distances. Her symptoms resolved after four to six weeks and she was able to gradually increase her distance to her preinjury level over a period of two months, and eventually competed in a half Ironman event with no further symptoms.

History/Pathogenesis

Inflammatory stress syndrome typically presents as pain at the medial calcaneal origin of the plantar fascia (plantar aponeurosis). This syndrome, as exhibited in the case, is believed to be related to stress on plantar fascia from the weight of an activity combined with weight transfer up onto the toes, leading to metatarsal phalangeal joint extension with a windlass effect on the plantar fascia.[1] It is a common cause of heel pain in runners, particularly in those with biomechanical abnormalities, such as excessive pronation or supination.[2,3]

Management Approaches

Relative Rest

Patients may be advised to decrease speed work and running hills or stairs, as well as the overall intensity, duration, and/or frequency of their exercise to permit

healing. Biking or swimming may offer good options for cardiovascular exercise in patients determined to keep training.

Stretching & Strengthening

Calf and plantar fascia stretches should be gentle at first and more aggressive as inflammation decreases (see Figure 1A). Roller devices may be used in the office or at home to assist in stretching the plantar fascia, gastrocnemius, and soleus.

Once inflammation has subsided, patients may begin calf raises starting in a seated position and progressing to a standing position and eventually off an incline (eg, a step or platform) with weights added. Therabands also may be used to strengthen the calf, foot, and peroneal muscles.

Kinesio Taping & Low-Dye Strapping

Kinesio taping may be used to support the plantar fascia and arch. Rigid strapping may be used to hold and support the arch, allowing the patient to continue training (see Figure 1B).

Orthotics

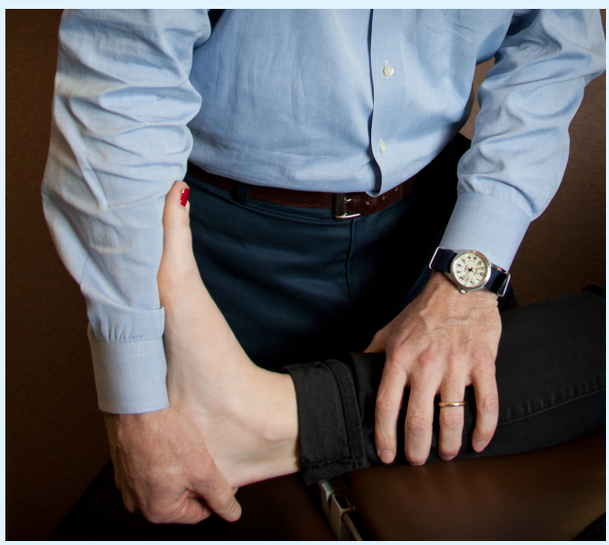
Custom made or over-the-counter orthotics should be use to correct biomechanical abnormalities, such as excessive pronation or supination. Heel lifts and soft-gel heel cup inserts to reduce stress on the plantar fascia, as well as shoewear with rear heel motion control/stabilization, may be recommended.

Regenerative Medicine

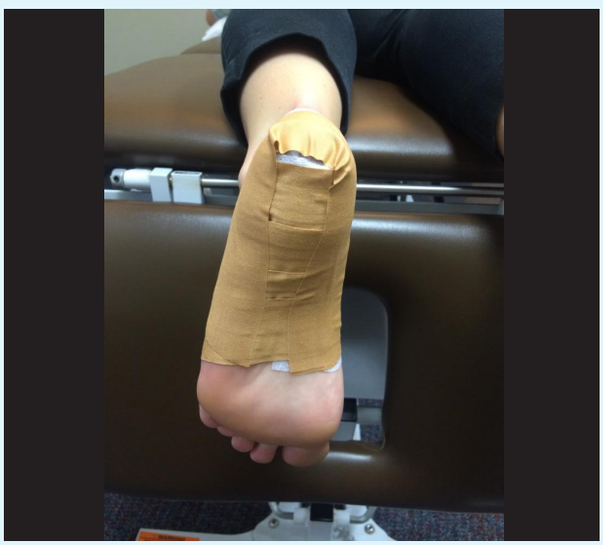
In severe recalcitrant cases, platelet-rich plasma (PRP) or stem cell injections may be used to regenerate torn or pathological tendon/ligament tissue.

Other

Icing, NSAIDs (oral or topical), cross-fiber/deep tissue massage, therapeutic ultrasound, transcutaneous electrical nerve stimulation (TENS–for modifying pain receptors, releasing endorphins, or stimulating muscle relaxation), gait analysis, and night splints or walking boots (if severe) may be helpful at the discretion of the clinician.



1A



1B

Figure 1. Passive stretching of the plantar fascia (A) and low-dye strapping (B) for plantar fasciitis. Images courtesy J. Chandler.

Case: Rotator-Cuff Tendonitis

Patient

A 43-year-old former college tennis player with a history of shoulder injuries in his 20s and 30s began cross training for events between age-group categories and joined a master's swim program three months prior to presentation.

The patient had developed increasingly greater shoulder pain (6 out of 10) with longer lap distances, particularly after performing freestyle and butterfly strokes. In addition, he noticed inflammation in his shoulder after workouts, which he treated with ice and oral NSAIDs at the advice of his coach. The pain persisted, and his coach recommended seeing a sports-specific physical therapist for evaluation.

The physical therapist started the patient on an in-office and home exercise program that involved strengthening the rotator-cuff muscles and accessory muscles. After two weeks, the patient did not improve and was referred for evaluation by a PM&R specialist who noticed mild atrophy of the supraspinatus muscle with abduction/internal rotation and crepitus in the shoulder joint with rotation and range of motion. Point tenderness was found in the superior lateral region of the shoulder. Sensory exam and reflexes were intact.

The patient underwent x-rays and magnetic resonance imaging (MRI), the latter of which showed chronic supraspinatus/infraspinatus tendinopathy with rotator-cuff impingement and a partial tear of the supraspinatus. The PM&R physician treated the patient with an ultrasound-guided intra-articular injection with steroid and anesthetic along with a continued stretching/strengthening program and Kinesio taping to facilitate supraspinatus and infraspinatus action. Initially, the injection significantly reduced the patient's pain level (3 out of 10), but symptoms returned within two weeks.

After further consultation, the physician and patient decided on a platelet-rich plasma (PRP) injection with ultrasound guidance as the next treatment course. The patient was instructed to limit movement at the shoulder for two weeks to allow for input of the medication into the supraspinatus/infraspinatus tendon attachments.

Physical therapy resumed at three weeks post-injection and the patient reported an 80% improvement in pain and functioning. The patient was given a sports-specific rehabilitation program for use in his local pool, and after one month was able to increase his lap distance. At six months, he competed in an open-water, two-mile swimming event, placing third in his age group.

History/Pathogenesis

Repetitive shoulder activity (especially overhead) creates degradation of the rotator-cuff musculature (especially the supraspinatus) from tensile overload, insufficient blood circulation, aging, and subacromial impingement, and tends to result in tendonitis.[4,5] Weakness in the rotator-cuff muscles results in altered glenohumeral movement and creates impingement of the cuff muscles under the acromion thereby enhancing pain and inflammation.[6]

Management Approaches

Relative Rest

Limit overhead work (eg, freestyle swimming, and butterfly or backstroke) to allow healing/decreased inflammation.

Stretching & Strengthening

Flexibility exercises may help regain full range of motion (ROM) at the shoulder. Progressive resistance training using Therabands or weights (see Figure 2A-2D) is needed for the four rotator-cuff muscles and should focus on full ROM with gradual return to overhead activity.

Equally important is strengthening the surrounding accessory muscles (deltoid, biceps, triceps, pectoral muscles, and scapular stabilizers) through full ROM to help compensate for the deficits in the injured muscle and allow it to heal. Retraining of the scapula-humeral rhythm and periscapular muscles should be sport-specific.

Kinesio Tape

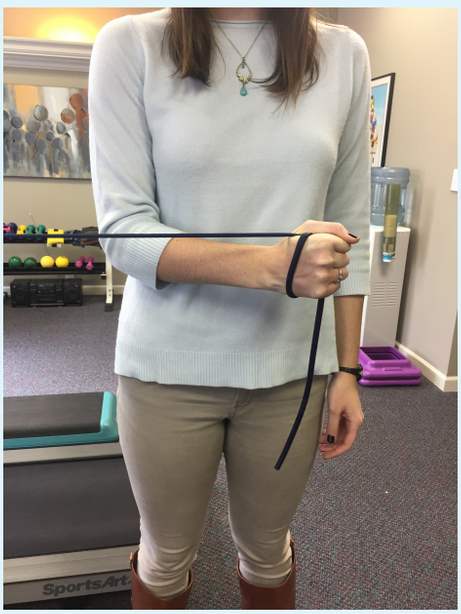
Kinesio taping may be used to facilitate (ie, elevate and rotate) the affected rotator-cuff muscles during rehabilitation and training (see Figure 3) as well as to increase circulation and lymphatic drainage to the injured area.

Injections and Regenerative Medicine

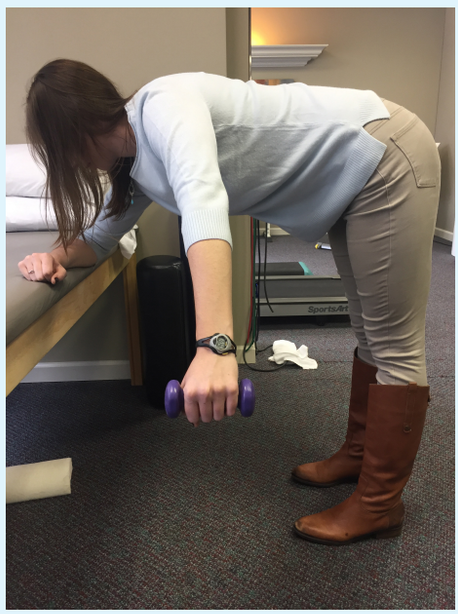
Intra-articular injection with a steroid (short-term) may reduce inflammation to allow the patient to better engage in physical therapy. Hyaluronic acid and regenerative medicine techniques (eg, PRP and stem-cell injections) may be effective. Injections are given at the pathology site, based upon clinical evaluation or diagnostic confirmation at multiple sights (eg, anterior/posterior/lateral/superior) with ultrasound guidance.

Other

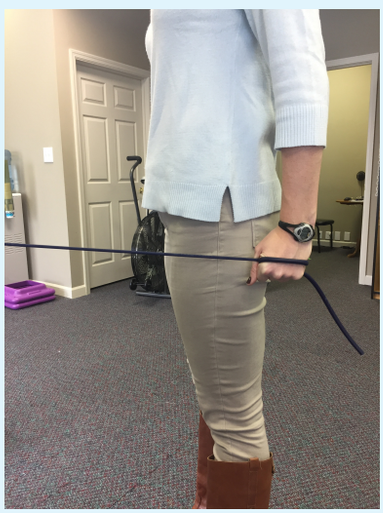
Ice, NSAIDs (oral or topical), therapeutic ultrasound, topical anesthetic or skin refrigerant, and TENS may be useful on an individual basis.



2A



2C



2B

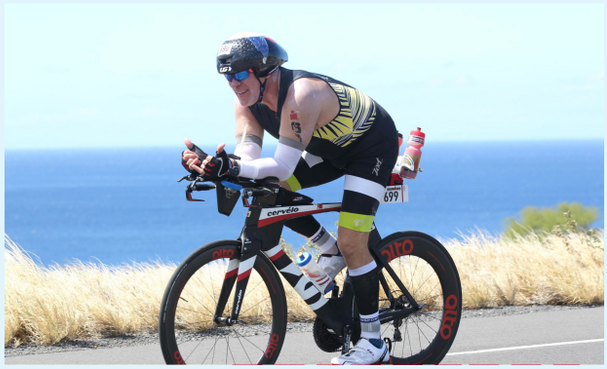
2D

3

Figure 2. Rotator-cuff strengthening using Therabands (A, B) and free weights (C,D). Images courtesy J. Chandler.

Figure 3. Kinesio taping for muscle facilitation in rotator-cuff tendonitis. Images courtesy J. Chandler.

Case: Spine-Related Pain Conditions



Patient

A 55-year-old male physician was training for his fifth Ironman event and had been cross training with running, cycling, and swimming. Upon increasing his cycling to 100 miles, he experienced severe pain in his neck (8 out of 10) and back (6 out of 10) that radiated into his right leg. He consulted with an orthopedic spine surgeon to evaluate his condition. MRI showed facet arthropathy in both the cervical and lumbar spine, and posterolateral disc herniation on the right side of his lumbar spine, with possible L5 nerve impingement. The surgeon suggested consultation with a PM&R physician, who recommended facet joint and medial branch blocks for the cervical spine and select transforaminal epidural injection and facet joint injection for the lumbar spine. The patient underwent three sets of these injections.

The patient reported significant improvement in lumbar spine pain, but continued to have cervical pain. The patient was referred to a sports-specific physical therapist who treated the patient with core stabilizing exercises and an at-home TENS unit and lumbar support brace. The combination of treatments resulted in continued improvement in lumbar spine symptoms (pain level, 1 out of 10), but only slight improvement in cervical spine pain.

The patient followed-up with the PM&R physician, who suggested radiofrequency ablation for the cervical spine. This treatment resulted in almost complete resolution of neck pain (2 out of 10) over the next four to eight weeks and allowed the patient to resume training. The patient increased his training regimen over the next six months, and qualified in his age group for the Ironman World Championship.

History/Pathogenesis

Acute/subacute pain is felt in the lower lumbar, lumbosacral, or sacroiliac/pelvic regions, or cervical neck area and often is accompanied by sciatica or radiculopathy with pain radiating distally down to the sciatic nerve or radicular nerve distribution or into the arms with cervical spine conditions.

Management Approaches

Relative rest

Limit excessive lifting/contact activity to allow healing/decreased inflammation.

Stretching & Strengthening

Range of motion in spinal flexion and extension as well as gluteal and lower extremity stretching may be helpful to regain flexibility (see Figure 4A-4C).

For the lumbar spine, improve the overall strength and conditioning of the core stabilizers (eg, transversus abdominus, internal obliques, erector spinae, multifidi, semispinalis' and lumbar transversospinalis; see Figure 4).

For the cervical spine, strengthening of the cervical, periscapular, shoulder stabilizer muscles as well as the upper thoracic/upper lumbar core stabilizers may relieve pain. Strength training should be sport-specific.

Postural/Manual Physical Therapy Techniques

The McKenzie Method and joint mobilizations, as well as body mechanic and postural retraining, may relieve pain and improve outcomes.

Bracing, Injections, and Procedures

Temporary lumbar supports and cervical neck bracing may be necessary. Depending upon the source of spine pain condition, diagnostic or therapeutic medial branch blocks, intra-articular facet joint injections, sacroiliac joint, selective transforaminal epidural injection, radiofrequency nerve ablation, and percutaneous epidural

adhesiolysis have the potential to reduce axial and radicular pain and may allow patients to better engage in physical therapy and continue training.

Other

Ice, TENS, topical anesthetics, therapeutic ultrasound with dexamethasone, cupping, and home cervical traction or inversion table may be recommended.

4A

4B

4C

Figure 4. Lumbar stabilization (A), flexibility (B), and range of movement (C) exercises. Images courtesy J. Chandler.

Recent Advances in Sports Medicine

Several advances made in the past decade have improved the management of musculoskeletal pain conditions in endurance athletes. First, in addition to commonly used topical analgesics or over-the-counter lidocaine ointments, compounded topical analgesic medications such as baclofen, bupivacaine, capsaicin, diclofenac, gabapentin, ketamine, ketoprofen, and tramadol have become more frequently used for acute and chronic pain conditions.[6-8] These compounded medications may be customized to include targeted and synergistic treatments such as topic analgesics, anti-inflammatory agents, muscle relaxants, neuroleptic agents, and mild opiates.

Second, regenerative medicine has made great strides in pain medicine and sports medicine. Injections of autologous platelet-rich plasma or mesenchymal stem cells may help heal ligaments, tendons, cartilage, and musculoskeletal regions that are damaged by overuse sports injuries.[9-12] Future high-quality studies are needed to determine the most appropriate and effective use of these agents.[11] In addition, ultrasound guidance has markedly improved the accuracy of delivering these regenerative medicines as well as delivery of steroid, hyaluronic, and anesthetic injections.[11]

Finally, diagnostic ultrasound is being used more often in sports medicine and physical therapy offices to determine whether a patient has pathology in a tendon, ligament, or muscle, particularly if a patient presents with a joint or myofascial effusion. Earlier diagnosis may facilitate interventions, as opposed to waiting for MRI results to identify injury or trauma.

Conclusion

Conservative treatments such as exercise therapy, stretching/strengthening, manual therapies, Kinesio tape, and injections should be exhausted before an athlete is referred for surgery. These nonsurgical approaches may allow for the same success rates with fewer complications compared to surgical approaches. Early intervention for these common musculoskeleletal pain conditions may be essential to preventing progression to chronic pain, and primary care physicians may play a key role in diagnosing these conditions and referring patients for rehabilitation.

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