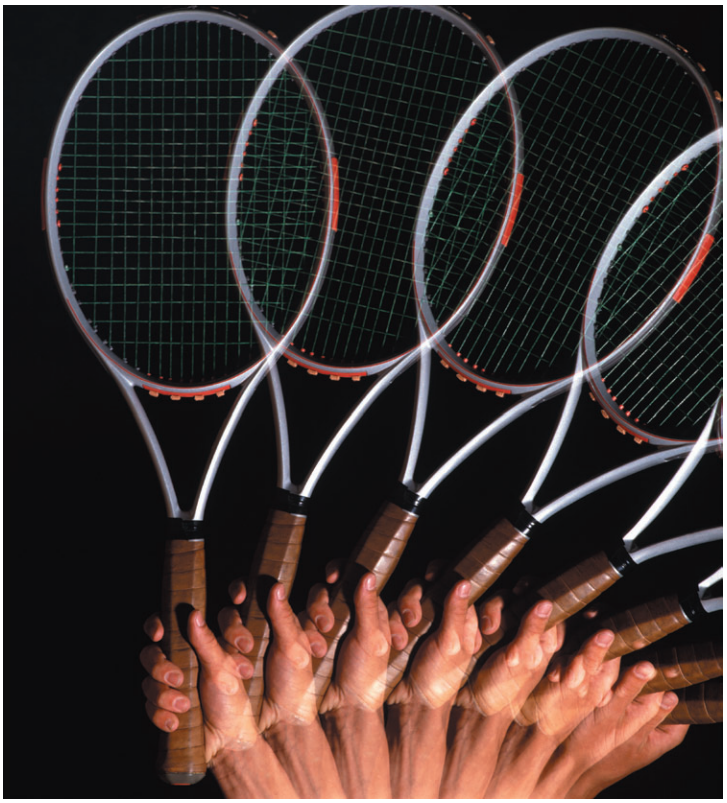
Chronic Overuse Sports Injuries



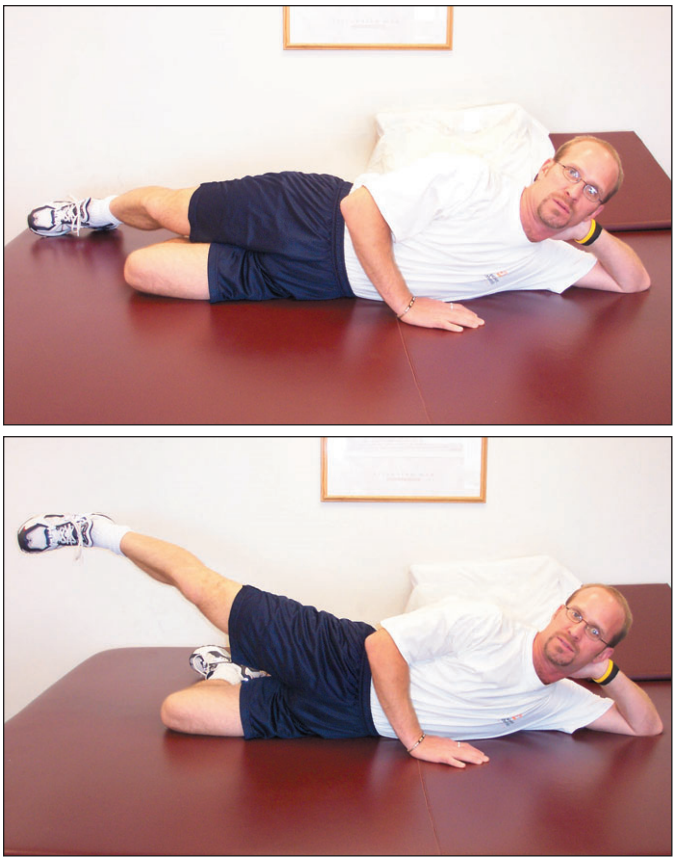
By Elmer "Al" Pinzon, MD, MPH, FABPMR, FABPM; and Mick Larrabee, PT, MS, SCS, EMT, CSCS

Practical evaluation and treatment modalities.

The evaluation and management of chronic overuse sports/athletic injuries is one of the most pervasive concerns in sports medicine today. Overuse sports injuries outnumber acute, instantaneous injuries in almost every athletic activity. Because overuse sports injuries are not instantly disabling they attract less medical attention than those that cause an acute and obvious loss of function. Therefore, their frequency of occurrence is almost always underestimated in surveys of athletic injuries. The treatment of overuse sports injuries is made difficult by various factors, including an insidious onset which means that the problem is usually ignored at the start. When athletes actually present for treatment, the injuries are well established and more difficult to manage successfully. Additionally, these injuries seem less serious to the athletes and makes it difficult to convince them of the importance of intensive treatment for correction.

Physicians' attitudes toward athletes with chronic overuse sports injuries are often inappropriate and frequently result in the athlete seeking inappropriate treatment options. All too often the athlete-patient is told: "If you only abstain from performing your sport, the injury will resolve." The athlete-patient has sought treatment not because of the injury, but rather because they are unable to continue the athletic participation. Therefore, the ability to return the athlete to functional activity is as much part of the treatment as alleviation of the symptoms.

Overuse injuries are almost always a result of change in three general areas: the athlete, the environment, or the activities. Identifying these changes requires patience, precision in history-taking, and a great understanding of the demands of the specific sporting activity. The most common cause of overuse athletic injuries is continued athletic participation despite the presence of symptoms associated with another injury (eg. pitcher who continues to throw despite persistent elbow tendonitis). Continued participation with an existing injury also occurs as the result of inadequate rehabilitation. Some overuse dysfunctions are the result of normal physiological changes such as rapid growth spurts in which musculotendinous flexibility often decreases and indirectly causes tendonitis (eg. Osgood-Schlatter



FIGURES 1-2. *Side-lying hip abduction.*

knee syndrome). Environmental alterations occur in the athlete's personal environment (eg. equipment and clothing) or the more global sports environment (eg. running hills in a training regiment previously limited to running flat surfaces). Advancing to a higher level of athletic proficiency involves both quality and quantity of workouts. Even increasing workout time in an abrupt manner can result in overuse athletic injuries, especially when an athlete attempts to perfect a single, isolated skill. It should be obvious that discovering the changes that cause overuse problems requires an emphasis on history taking, more so than the diagnosis and management of acute injuries.

The prevention of recurrences of overuse injuries is the most important aspect of managing overuse injuries thus, the physician's role becomes one of reinforcing and reminding the athlete to identify the appropriate changes to be made in their regimen. While overuse injuries may involve bone, ligaments, or musculotendinous structures, the majority of overuse injuries involve the latter. Muscle fatigue may occur due to relative lack of either strength or endurance. As a result, the muscle unit tightens and may undergo physiological structural damage (iehemorrhage or localized edema) followed by muscle spasms and shortening. This indirectly leads to muscle weakness so that reinjury occurs with less provocation. The resulting "overuse-tightness-pain-disuse-weakness-easier overuse cycle" continues until broken by active treatment interventions.[1-5]

As society's emphasis on continued physical activity and athletics throughout one's lifespan has increased, so have the knowledge and skill required by the community of health care providers involved in managing the related injuries. It is essential for all sports medicine providers to realize that a team approach (physicians, physical therapists, athletic trainers, coaches, etc.)—and taking advantage of the collective knowledge, talent, and expertise of all these specialists in a collaborative effort—affords the athlete the optimal conditions for successful return to sport.

This article highlights a few of the most common injuries seen in athletics with a focus on the overuse/repetitive strain injury. It is important to note that, for most athletes, up to 60% of the "overuse" type injuries are related to training errors. Interaction with the coach/trainer is critical in solving this problem. Pain will get the athlete into the clinic, but the tricky part may be figuring out exactly what is causing the pain. The old acronym RICE (Rest, Ice, Compression, and Elevation) along with NSAIDs can do a very nice job of decreasing/eliminating the chemical pain associated with the inflammatory response. However, the real challenge is to identify the underlying dysfunction.

A thorough physical exam, biomechanical assessment, and functional movement analysis can provide great insight into how the body moves and reveal any joint dysfunction and/or muscle imbalances. The muscle imbalance leads to changes in the length-tension relationships of involved muscles. This change in force coupling decreases neuromuscular efficiency and leads to more rapid fatigue. As the muscles fatigue, there is often a biomechanical compensation which may overload tissues not used to the elevated level of stress. Eventually, breakdown must occur and the athlete enters the cumulative injury cycle of pain.

Clinical Assessment, Diagnostic Evaluation, and Treatment Options

With the heightened interest in personal fitness and athletic participation, the physician is expected to see a variety of sports-related injuries and must be able to recognize these conditions in order to institute prompt and proper management. A thorough history, physical examination, radiographic studies, laboratory studies and, occasionally, further imaging studies are essential to establish and confirm the appropriate diagnosis and institute correct and adequate treatment for the injured athlete. The mechanism of injury must be established in order to proceed on the correct path. Symptoms must be evaluated in detail and categorized as to initial stimulus, location, intensity, and characterization of the pain pattern (the major symptom in overuse injuries). The primary purpose of the physical examination is to precisely define the anatomical structures involved in the overuse injury. With musculoskeletal injuries, the easiest way to localize the maximally painful area is to have the athlete assume the position of maximal discomfort and point out the most painful location. This usually involves stretching the involved muscle. While radiographic and other diagnostic testing are occasionally used to evaluate and often exclude other sources of more serious pathology, they should never be used initially to make a diagnosis, but instead used as a supplement to the thorough history and physical examination.[1-6]

Although there exists an indefinite and varied number of chronic overuse sports injuries, the authors have chosen a select few deemed the most popular and most often treated syndromes to address.

Iliotibial Band Friction Syndrome (ITBFS)

History/Pathogenesis: ITBFS is an inflammatory, nontraumatic overuse injury of the knee affecting predominantly long-distance runners, especially with excessive downhill running, or bicyclists who are not conditioned for longer rides. Tendonitis or bursitis occurs when the posterior edge of the ITB impinges against the lateral femoral epicondyle. This repeated trauma to the soft tissues in that area creates swelling and pain that is aggravated by further knee motion. Pain occurs after foot strike in the gait cycle, usually at about 30 degrees of knee flexion. As the knee flexes, the ITB moves posteriorly and rubs over the lateral femoral epicondyle causing inflammation and pain after prolonged activity. ITBFS is the second most common running-related injury and accounts for 12% of all overuse injuries in the running population. It can be exacerbated in a runner with a varus knee deformity, worn-out running shoes, or increased foot supination which, in turn, increases lateral knee force. In the cyclist, the foot position on the pedals and raising the height of the seat to decrease the degree of knee flexion should be evaluated.[1-3,6-8]

Signs/Symptoms: lateral knee pain made worse by running, pain when ascending and descending stairs, stiff-legged walking in advanced cases.

Physical Exam: tenderness to lateral femoral condyle and distal ITB. Possible leg length discrepancy, increased subtalar joint pronation, SIJ dysfunction, increased Q angle, positive Ober's test, hip weakness (particularly gluteus medius), and poor neuro-muscular control during single leg activities (squat and/or step down). Check footwear and appropriateness for foot type.

Diagnostic tests: if indicated, evaluate with baseline x-rays, MRI, bonescan, or ultrasound.

Differential Diagnoses: lateral meniscal/collateral ligament injury, patellofemoral syndrome, occult lesion, or stress fracture.

Acute Treatment: relative rest; analgesia through appropriate doses of NSAIDs and with physical modalities such as ice, ultrasound, iontophoresis, phonophoresis, topical anesthetic skin refrigerant (eg. "Gebauer's Spray and Stretch") and electrical stimulation (eg. "RS Medical Sequential Stimulator").

Long-term Treatment/Rehab: Thorough lower quarter examination to identify the cause and help formulate the treatment plan. For runners it's a good idea to alternate running on different sides of the road or changing direction on the track. Corrective exercise for the hip musculature (emphasis on gluteus medius), manual therapy (to break up fibrotic adhesions, scar tissue, and trigger points), stretching (hip flexors, hamstrings, calves, and ITB), self myofascial release techniques, and orthotic intervention (if deemed appropriate).[9-16] See Figures 1 and 2: side-lying hip abduction.

Elbow Pain—Lateral Epicondylitis

History/Pathogenesis: Injury of the forearm and wrist extensor muscles which causes pain at the lateral epicondyle and extensor forearm at the elbow (ie- ECRB). Usually occurs in the 4th decade of life, indicating a degenerative process in the tendon, aggravated by repetitive stress and muscular microtears. Commonly referred to as "tennis elbow", but present in non-tennis players as well.[1-3,6,7]

Signs/Symptoms: pain at lateral elbow, pain with wrist and forearm motions, pain with gripping objects (eg. screwdriver, making fist, shaking hands). Pain radiates from dorsum of the forearm to the fingers.

FIGURE 3. *Forearm extensor strengthening.*

Physical Exam: localized tenderness just anterior and distal to the lateral epicondyle, pain/weakness to resisted wrist extension (especially with extended elbow) and/or middle finger extension. Pathoanatomic changes occur primarily in the ECRB and secondarily at the EDC. Important to rule out C-6/7 radiculopathy, especially with paresthesias.

Diagnostic tests: if indicated, evaluate with baseline x-rays, MRI, ultrasound, or EMG.

Differential Diagnoses: medial epicondylitis, intraarticular pathology or stress fracture, gout, cervical spine disease, posterior interosseous nerve entrapment.

Acute Treatment: relative rest; equipment modifications (decrease racquet string tension for tennis player or improve ergonomics of work station); analgesia through appropriate doses of NSAIDs, physical modalities such as ice, ultrasound, iontophoresis, phonophoresis; counterforce bracing, and/or wrist splinting (especially at night); along with forearm stretching, and topical anesthetic skin refrigerant and electrical stimulation.

Long-term Treatment/Rehab: activity modification (improve technique through local tennis pro or modify workstation), stretch tight musculature, and strengthen weak musculature.[9-16] See Figure 3: forearm extensor strengthening.

Elbow Pain—Medial Epicondylitis

History/Pathogenesis: Injury of the forearm and wrist flexor/forearm pronator muscles causing pain to the medial elbow. Valgus stress lesion of the medial epicondylar physis with a possible avulsion fracture. A catch-all phrase for "little-leaguer's elbow" or "golfer's elbow." Can mimic Panner's disease (osteochondritis and/or osteochondrosis of the capitellum).[1-3,6,7]

Signs/Symptoms: pain in medial elbow accentuated during early and late cocking of throwing motion, pain with resisted wrist flexion, pronation, and forearm motions. Mild weakness is often noted for grasping activities. For pitchers, may notice a decrease in control of pitches.

Physical Exam: look for increased carrying angle (greater than 10 degrees in males and 15 degrees in females), pain with point tenderness over the tip of the medial epicondyle extending distally 1-2 inches along the common flexor origin (usually PT and FCR), pain/weakness of wrist flexors and pronators with elbow extended, possible loss of full extension of elbow (flexion

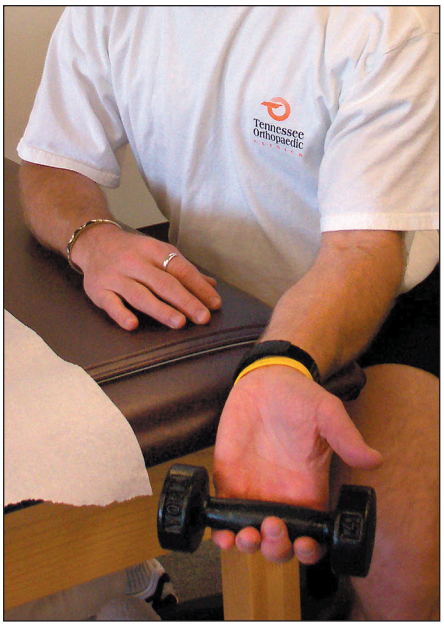


FIGURE 4. *Forearm flexor strengthening*

contracture consistent with avulsion fracture), assess for ulnar collateral ligament stability, pain/weakness with resisted wrist flexion.

Diagnostic tests: if indicated, evaluate with baseline x-rays, MRI, ultrasound, or EMG.

Differential Diagnoses: lateral epicondylitis, chronic valgus instability or tears of the medial collateral ligament, intraarticular pathology or stress fracture, gout, cervical spine disease, ulnar nerve entrapment.

Acute Treatment: relative rest; analgesia through appropriate doses of NSAIDs and physical modalities such as ice, ultrasound, iontophoresis, phonophoresis, topical anesthetic skin refrigerant and electrical stimulation. If avulsion fracture with minimal displacement, apply posterior splint for 2-3 weeks then gradually progress range of motion (ROM) and strengthening. If displacement greater than 5mm, open reduction, and internal fixation.

Long-term Treatment/Rehab: activity modification, stretch tight musculature, and strengthen weak musculature. With young baseball players, it is critical to promote good throwing mechanics, limit the types of pitches thrown (especially breaking pitches such as the screwball), and keep a cap on the number of innings pitched per week (less than 10 is a safe recommendation based on the data).[9-16] See Figure 4: forearm flexor strengthening.

Achilles Tendinitis

History/Pathogenesis: Painful inflammation of the Achilles tendon as a result of repetitive stresses. Injury of the lower leg muscles (gastrocnemius/soleus) that leads to a degenerative tendon condition characterized by chronic pain and inflammation on the posterior aspect of the ankle. Predisposing factors include tightness of the Achilles tendon, cavus foot, functional talipes equines, or pronated foot secondary to forefoot or hindfoot varus or tibia varus. Most frequently occurs in sports requiring jumping or running, especially in uneven terrain and hill-running.[1-3,6,7]

Signs/Symptoms: pain/tenderness 2-6cm above the Achilles' tendon insertion on the calcaneus, but also along the length of the tendon. Occasionally with warmth/swelling with crepitus and tendon nodule present. Pain with running (especially sprinting), and standing heel raise. Preactivity and morning stiffness.

Physical Exam: tenderness to palpation 2-6cm above the Achilles' tendon insertion (thickening of the tendon is often noted). Pain/weakness with resisted plantarflexion and walking on toes. Decreased ankle dorsiflexion. Often, patient will present with increased subtalar pronation. If chronic, may see atrophy of calf muscles.

Diagnostic tests: if indicated, evaluate with baseline x-rays, MRI, or bone scan.

Differential Diagnoses: posterior tibialis ligament injury or Achilles tendon avulsion, inflammatory arthritides, plantar fasciitis syndrome, occult lesion, or stress fracture of calcaneous, or sural neuritis.

Acute Treatment: relative rest (decrease speedwork, running hills or stairs…general decrease in overall intensity, duration, and/or frequency); new shoes to control excessive motion if present; heel lift; analgesia through appropriate doses of NSAIDs together with physical modalities such as ice, ultrasound, iontophoresis, phonophoresis, topical anesthetic skin refrigerant, and electrical stimulation; gentle calf stretching; orthotics or arch supports if significant hyperpronator; night splints or walking boot (if severe).

Long-term Treatment/Rehab: proper shoe wear for foot type — orthotic intervention, if necessary; gait analysis of running athlete to identify biomechanical faults; gastrocnemius/soleus stretching;

FIGURES 5-6. *Multiplanar calf stretch with use of "Tristretch"*

gastrocnemius/soleus strengthening with emphasis on eccentric loading of musculature in a sport-specific manner; surgical debridement if conservative treatment fails.[9-16] See Figures 5 and 6: multiplanar calf stretch with use of "Tristretch."

Patellar Tendinitis

History/Pathogenesis: Symptomatic degeneration of the patellar tendon with vascular disruption and an inflammatory repair response. Often triggered by overuse and repetitive overload of the quadriceps tendon at its insertion on the upper

FIGURE 7. *Single-leg wall squat with "Theraband ball."*

FIGURE 8. *Eccentric strengthening with "Theraband cords."*

pole of the patella, or the infrapatellar tendon at its origin from the inferior pole of the patella, or its insertion at the tibial tubercle…exacerbated by poor lower quarter biomechanics. Younger patients are typically engaged in jumping sports ("jumper's knee), whereas older patients most likely involve a lifting strain or weight gain.[1-3,6,7]

Sign/Symptoms: Anterior knee pain/tenderness at the inferior pole of the patella, patellar tendon, and distally toward the tibial tuberosity. Patients often point to a tender spot of concentration. Reported nocturnal pain, as well as during sitting, squatting, kneeling, or climbing stairs. Pain is worse with "loading" activities such as landing from a jump, running up/down hill, and/or resisted leg extensions.

Physical Exam: tender point on inferior pole of patella or patellar tendon. Frequent tightness to the quadriceps, hamstrings, and tensor fascia lata muscle groups. Check patellar alignment and tracking through long arc extension—normal movement makes a reverse "C" shape as the knee moves from flexion to extension. Pain occurs with a three-quarters to full squat.

Diagnostic tests: if indicated, evaluate with baseline x-rays, MRI, or ultrasound.

Differential Diagnoses: ACL or PCL ligament injury, inflammatory or infectious condition, patellofemoral syndrome, occult lesion, or stress fracture.

Acute Treatment: relative rest (decrease speedwork, running hills or stairs); new shoes to control excessive motion if present; analgesia through appropriate doses of NSAIDs with physical modalities such as ice, ultrasound, iontophoresis, phonophoresis, and topical anesthetic skin refrigerant, and electrical stimulation; gentle quadriceps and hamstring stretching; counter-force bracing and/or patellar taping can be used short-term to allow athlete to perform corrective exercises in a relatively pain free manner.

Long-term Treatment/Rehab: Strength training should emphasize closed kinetic chain work with eccentric loading.[9-16] See Figure 7: single-leg wall squat with "Theraband ball."

Shin Splints

History/Pathogenesis: Most commonly, this term represents medial tibial stress syndrome which is a periostitis. Pain occurs along the medial distal two-thirds of the tibial shaft border at the periosteal/fascial junction. It is an overuse syndrome of either the posterior or anterior tibial muscle-tendinous units. Predisposing factors involve poor conditioning, running on hard surfaces, and abnormal foot alignment, especially with hyperpronation.[1-3,6,7]

Signs/Symptoms: often insidious and progressive in nature. Usually related to sudden increase in intensity/duration of activity (primarily running), or a change in playing/running surface (to a harder, less forgiving surface). Early in the course, pain with onset of exertion and usually relieved with rest. Later in the progression, pain after cessation of activity, possibly worse than the pain during activity.

Physical Exam: pain/tenderness along the middle to distal thirds of the tibia, along the postermedial border. Diffuse tenderness often along the tendon of the tibialis posterior and/or soleus. Foot/ankle examination often reveals excessive pronation. In chronic cases, may find induration, soft tissue swelling, or nodularity.

Diagnostic tests: if indicated, evaluate with baseline x-rays, MRI, or bone scan.

Differential Diagnoses: posterior tibialis or peroneal ligament injury, peroneal muscle strain or chronic compartment syndrome, occult lesion, or stress fracture.

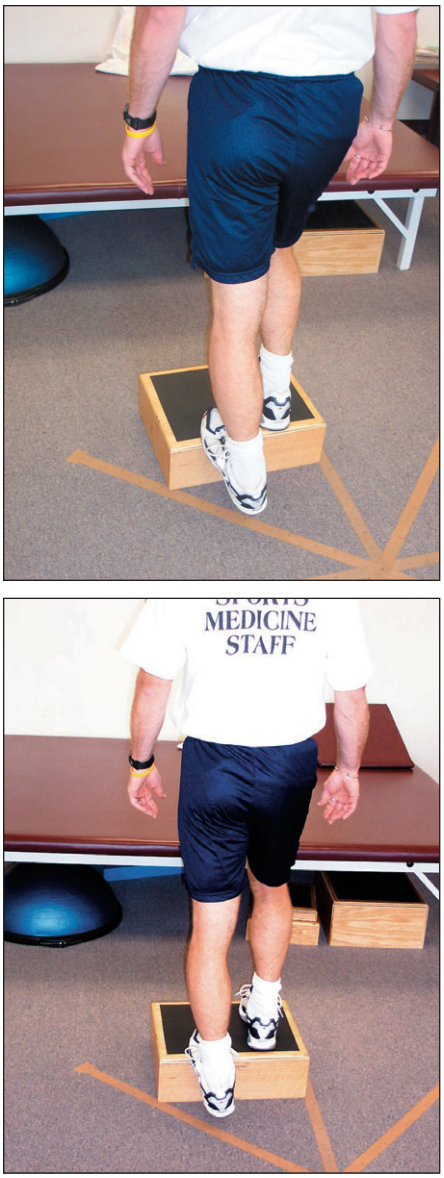
Acute Treatment: NSAIDs and cryotherapy are most beneficial early on (in the acute stage); topical anesthetic skin refrigerant and electrical stimulation. Complete rest, if possible, otherwise 20-50% reduction in mileage/intensity with gradual progressive return to normal activity. Cross training with non-impact activities such as cycling, swimming, aqua jogging, and elliptical trainers.

Long-term Treatment/Rehab: Slow, steady, progressive return to run. Eccentric strengthening with bands/cords to the foot/ankle invertors. Proper shoe wear (for foot type and activity) along with orthotic intervention, if necessary.[9-16] See Figure 8: Eccentric strengthening with "Theraband cords."

Plantar Fasciitis

History/Pathogenesis: Inflammatory stress syndrome of the plantar fascia or plantar aponeurosis, usually at its medial calcaneal origin. It is believed that this syndrome is related to the stress on the plantar fascia from the weight of an activity combined with weight transfer up onto the toes and leading to MTP joint extension with a "windlass" effect on the plantar fascia. Accounts for approximately 10% of all running-related injuries, and the most common cause of heel pain in runners.[1-3,6,7]

Signs/Symptoms: tenderness noted at the anteromedial calcaneal margin and tightness of the Achilles tendon, with burning pain at the anteromedial aspect of the heel. Worsens with activity (walking or running), but tends to be worst with the



FIGURES 9-10. *Plantar fascial stretch.*

first few steps in the morning (immediately after getting out of bed). Pain intensity increases with prolonged weight bearing, especially if walking barefoot or in dress shoes.

Physical Exam: pain localized to the anteromedial aspect of the calcaneus. Tightness to the gastrocnemius/soleus complex. PROM displays hypermobility to the subtalar joint, the midfoot complex, and the 1st ray. Gait evaluation reveals overpronation at the midfoot with excessive calcaneal eversion at heel lift. Pain on passive toe extension with the foot in dorsiflexion.

Diagnostic tests: if indicated, evaluate with baseline x-rays (calcaneal spur is not diagnostic) , MRI, or ultrasound.

Differential Diagnoses: posterior tibial ligament injury, tarsal tunnel syndrome, occult lesion, or stress fracture.

Acute Treatment: relative rest; new shoes to control excessive motion if present; analgesia through appropriate doses of NSAIDs with physical modalities such as ice, ultrasound, iontophoresis, phonophoresis, topical anesthetic skin refrigerant, and electrical stimulation; calf stretching (early morning and throughout the day); manual therapy techniques/deep soft tissue work to the gastrocnemius and soleus along with deep transverse friction massage to the arch and insertion point; soft gel heel cups; arch taping during athletic activities.

Long-term Treatment/Rehab: Conservative therapy may last 4-12 months. Custom orthotic intervention may be necessary. Night splinting may be helpful.[9-16] See Figures 9 and 10: plantar fascial stretch.

Rotator Cuff Tendinitis

History/Pathogenesis: The rotator cuff is composed of four muscles: supraspinatus, infraspinatus, teres minor, and subscapularis. These muscles form a cover around the head of the humerus and whose function is to rotate the arm and stabilize the humeral head against the glenoid. Repetitive shoulder activity (especially overhead) causes breakdown in the cuff musculature (especially the supraspinatus) from tensile overload, poor blood supply, aging, subacromial impingement, and results in tendonitis. Weakness in the rotator cuff muscles results in altered glenohumeral movement and causes impingement of the cuff muscles under the acromion and thereby enhancing the pain and inflammation.[1-3,6,7]

Signs/Symptoms: shoulder pain with overhead activity; weakness in the shoulder musculature; numbness/paresthesias (usually between the lateral neck to the elbow); and night pain. In young patients, impingement is usually related to laxity caused by an instability, in those 25-40 years of age there is generally an overuse of the rotator cuff, and for those over 40, the impingement is generally caused by overloading the cuff muscles beyond their threshold.

Physical Exam: first, must rule out cervical spine dysfunction by checking cervical ROM and any radicular findings. Painful active range of motion (AROM), especially above 90° of forward elevation.

FIGURE 11. *Shoulder rotator muscle strengthening.*

Pain/weakness to shoulder flexors, abductors, internal rotators, and/or external rotators. Frequently, one sees positive findings with impingement testing (Hawkins-Kennedy or Neer's). May see scapular dyskinesis.

Diagnostic tests: if indicated, evaluate with baseline x-rays, MRI, or arthrogram.

Differential Diagnoses: bursitis-tendinitis with impingement, adhesive capsulitis, DJD of the AC or GH joint, thoracic outlet syndrome, cervical spondylosis, Pancoast tumor, or stress fracture.

Acute Treatment: NSAIDs; short course of prednisone; subacromial injection; physical modalities such as ice, ultrasound, iontophoresis, phonophoresis, topical anesthetic skin refrigerant and electrical stimulation; relative rest (limit overhead work); and flexibility exercises to regain full ROM.

Long-term Treatment/Rehab: strength and conditioning of the entire shoulder girdle (deltoid, rotator cuff, biceps, triceps, and scapular stabilizers) throughout full ROM. Progressive return to overhead activity. Sport-specific retraining for overhead athletes (especially throwers and swimmers). Retraining of the scapulahumeral rhythm and peri-scapular muscles.[9-16] See Figure 11: shoulder rotator muscle strengthening.

Low Back Pain

History/Pathogenesis: Acute pain is felt in the low lumbar, lumbosacral, or sacroiliac/pelvic region. Often accompanied by sciatica or radiculopathy with pain radi-

FIGURE 12. *Prone-lying press up with "McKenzie method."*

ating distally down the distribution of the sciatic nerve or specific radicular nerve. 90% of people experience low back pain in their lifetime, and 5-10% will experience chronic pain. Spondylolysis involves a defect in the pars interarticularis of the vertebral complex. The defect ranges from a stress reaction to a traumatic fracture. Spondylolysthesis results from anterior displacement of a vertebral body on the subjacent vertebra. Back pain from spondylolysis and/or spondylolysthesis occurs most frequently in the young athletic population (10-18 years of age) and is most common in sports emphasizing extension activities, e.g., gymnastics, ballet, volleyball, weight lifting, football, and wrestling.[1-3,6,7,17]

Signs/Symptoms: pain in the low back exacerbated by movement and often accompanied by focal muscle spasm in the lumbar extensors. Patients tend to prefer to stand in a semi-flexed position and move slowly rather than sit still. Discogenic pain tends to be sharp or burning and often shoots into the lower leg. Spondylolysis and spondylolysthesis patients tend to have pain into the buttocks which is worse with extension and lateral side-bending.

Physical Exam: pain, tightness, and often spasm to the lumbar paraspinals. Repeated movement testing (flexion and extension) can be very useful to identify disogenic pain. Quadrant testing to identify instabilities. Straight leg raise and slump test to assess dural inflammation. Assess strength/endurance of core trunk musculature. Myotomal and dermatomal scan to differentiate level of nerve root involvement. Special questions regarding bowel/bladder changes, "saddle" anaesthesias, or visceral disease.

Diagnostic tests: if indicated, evaluate with baseline x-rays, MRI or CT, or EMG.

Differential Diagnoses: facet osteoarthritis, musculoskeletal-ligamentous strain, occult lesion, infection, stress/compression fracture or pars interarticularis defect.

Acute Treatment: relative rest; analgesia through appropriate doses of NSAIDs and with physical modalities such as ice, ultrasound, topical anesthetic skin refrigerant and electrical stimulation. "Back School" or "McKenzie Method" emphasizing self-correction, proper posture, body mechanics, and self-management techniques. Encourage active approach to problem with movement-based therapy.

Long-term Treatment/Rehab: improve overall strength and conditioning (special emphasis to the core stabilizers: transversus abdominus, internal obliques, multifidus, and lumbar transversospinalis). Improve strength to the gluteus maximus/hamstrings for hip extension. Nutritional counseling and weight management can help "unload" the spine during normal activities of daily living (ADL's).[9-17] See Figure 12: prone-lying press up with "McKenzie method."

Conclusion and Summary

The unprecedented level in popularity over the last few decades of increased participation in athletic sporting events has led directly to an increase in chronic overuse sports injuries. Sports provide many benefits including improvement in health status and physical fitness, relaxation, entertainment and, for a select few, some prestige and a good source of income. Indirectly, the burgeoning population of elite athletes and the "weekend warriors" will see an exponential increase in the number of sports overuse injuries. Injury occurs when cumulative forces exceed the tissue's ability to withstand such forces—either due to isolated macrotraumatic events or repetitive microtraumatic events. Often, specific biomechanical or physiological factors predispose an athlete to injury. It remains in the medical/health personnel's domain to properly identify and assist the athlete in correcting these conditions to treat, prevent, and possibly reverse the detrimental effects. As always, prevention is always the best treatment but, failing that, the next best thing is proper and successful rehabilitation. ■

Elmer "Al" Pinzon, MD, MPH; FABPMR, FABPM is fellowship-trained in non-surgical spinal procedures and musculoskeletal/electrodiagnostic medicine. Dr. Pinzon practices at SpineKnoxville and Tennessee Orthopaedic Clinics in Knoxville, Tenn. Email pinzoneg@tocdocs.com.

Mick Larrabee, PT, MS, SCS, EMT, CSCS is a board-certified clinical sports physical therapist and USA Triathlon Coach-Level I at the Tennessee Orthopaedic Clinics in Knoxville, Tenn. Email larrabeemp@tocdocs.com.

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