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A Practical Approach for the Differential Diagnosis of Chronic Leg Pain in the Athlete

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Chronic lower leg pain results from various conditions, most commonly, medial tibial stress syndrome, stress fracture, chronic exertional compartment syndrome, nerve entrapment, and popliteal artery entrapment syndrome. Symptoms associated with these conditions often overlap, making a definitive diagnosis difficult. As a result, an algorithmic approach was created to aid in the evaluation of patients with complaints of lower leg pain and to assist in defining a diagnosis by providing recommended diagnostic studies for each condition. A comprehensive physical examination is imperative to confirm a diagnosis and should begin with an inquiry regarding the location and onset of the patient’s pain and tenderness. Confirmation of the diagnosis requires performing the appropriate diagnostic studies, including radiographs, bone scans, magnetic resonance imaging, magnetic resonance angiography, compartmental pressure measurements, and arteriograms. Although most conditions causing lower leg pain are treated successfully with nonsurgical management, some syndromes, such as popliteal artery entrapment syndrome, may require surgical intervention. Regardless of the form of treatment, return to activity must be gradual and individualized for each patient to prevent future athletic injury.

Keywords: chronic leg pain; medial tibial stress syndrome; tibial stress fracture; chronic exertional compartment syndrome; nerve entrapment; popliteal artery entrapment syndrome

Chronic leg pain in weightbearing athletes is a common clinical presentation that may be difficult to diagnose because pain in the foot, ankle, calf, or shin typically hinders activity and is nonspecific in nature.11,45 Because symptoms may be ambiguous, evaluation of chronic leg pain requires a thorough knowledge of anatomy and biomechanics, as well as an understanding of the specific injuries. A thorough history and physical examination, in addition to accurate interpretation of appropriate diagnostic tests, are crucial in establishing a definitive diagnosis.11,57 Details regarding training regimens, surface conditions, and shoe wear also must be ascertained because these factors play a significant role in the diagnosis.

Because of the possible presence of several causes and the overlapping of symptoms, patients must be evaluated for multiple conditions.11,57 Table 1 summarizes the differential diagnosis of chronic leg pain in the athlete. Despite the wide range of potential diagnoses, medial tibial stress syndrome (MTSS), chronic exertional compartment syndrome (ECS), stress fractures, nerve entrapment, and popliteal artery entrapment syndrome (PAES) are the most common forms of exercise-induced leg pain.11,55 In a retrospective review of 150 athletes with chronic leg pain, chronic ECS was the most prevalent condition, with an incidence of 33%, followed by stress fractures and MTSS, with incidences of 25% and 13%, respectively.11 Another study involving 98 patients with recurrent anterior leg pain, induced either by sports or trauma, demonstrated a similar diagnostic distribution, with a 42% incidence of MTSS, a 27% incidence of chronic ECS, and a 13% incidence of superficial peroneal nerve entrapment.55 Based on the authors’ clinical practice, MTSS is the most common source of lower leg pain, followed by stress fractures and chronic ECS.

The authors developed an algorithmic approach to aid in the evaluation of athletes with complaints of lower leg pain. The first algorithm characterizes the clinical features of the common conditions causing lower leg pain based on history and physical examination (Figure 1). The second algorithm aids in confirming a diagnosis by providing recommended diagnostic tests for each condition (Figure 2). The 5 most frequent causes of chronic pain involving the lower extremity will be reviewed and will be followed with a discussion of the recommended diagnostic tools and treatment options for each condition in the context of the aforementioned algorithm. The goal of this algorithmic approach is to assist the orthopaedic surgeon in establishing a definitive diagnosis of chronic leg pain,
which will lead to more effective treatment decisions, thereby producing more successful outcomes.

MEDIAL TIBIAL STRESS SYNDROME

Although the highest incidence of MTSS occurs in runners, MTSS also may develop in athletes involved in jumping sports, such as basketball, tennis, and volleyball. In the authors' experience, MTSS typically occurs late in a sport season after prolonged activity; however, onset also may occur during the initial rigors of pre-season training after a relatively sedentary off-season. A typical clinical presentation of this condition involves pain, palpable tenderness, and, in rare cases, swelling. Pain associated with MTSS frequently presents as a recurring dull ache over the distal one-third postero medial cortex of the tibia. During the early development of this condition, patients may experience pain at the beginning of a workout or run, which may be relieved with continued activity, only to recur at the conclusion of the activity. Pain caused by MTSS usually is alleviated with rest and typically does not occur at night. However, as this syndrome progresses, pain often may ensue throughout training or during low activity and also may continue at rest.

The physical examination should confirm the presence of pain along the medial border of the distal tibia. Palpable tenderness along the posteromedial edge of the distal one third of the tibia is the most common physical finding in MTSS. In rare cases, erythema or swelling over the medial tibia also may be observed. Range of motion of the ankle and foot should not elicit pain. Furthermore, vascular and neurological examinations produce normal results in patients with MTSS. With distal medial leg pain, medial malleolus stress fractures also should be considered, the discussion of which is beyond the scope of this review.

Radiographs and 3-phase bone scans are recommended to differentiate between MTSS and other causes of chronic leg pain, such as stress fractures.
The preferred management of MTSS is multimodal, consisting of rest, nonsteroidal anti-inflammatory drugs (NSAIDS), and ice, and often is successful. A suggested 2- to 3-week period of rest or decrease in training may be curative without additional evaluation. Cardiovascular conditioning with low-impact activities, including stationary biking, swimming, upper-body weight lifting, and deep-water running, may be maintained during this period. However, these activities, particularly stationary biking, should be performed in a manner that diminishes muscular load transmission to the leg. To relieve pain and decrease possible inflammation, NSAIDS are frequently prescribed. Ice also may be incorporated to further reduce swelling and inflammation. Biomechanical abnormalities associated with repetitive loading, such as excessive pronation, should be addressed and often may be corrected with the use of custom or commercial orthotics. Physical therapy modalities, including bracing, massage, electrical stimulation, iontophoresis, and ultrasound, may be utilized. Range of motion boots or walkers or both should be incorporated if pain is present with walking or at rest. Gradual return to training may be initiated if pain has subsided during nonoperative treatment. To prevent the recurrence of symptoms, stretching during warm-up and cooldown
periods is advised with each workout. Training may progress in increments of 10% to 25% during a 3- to 6-week time interval for patients who remain asymptomatic.11 If symptoms return, activity should cease for at least 2 weeks before resuming training at a lower intensity and duration.

Surgical treatment should be reserved for patients with intractable MTSS and for whom nonoperative modalities have failed.11,26,30,61 In these rare instances, a posteromedial fasciectomy, involving release of the medial soleus fascial bridge and the deep compartment fascia, should be performed.11,26,30,61 In addition to the fasciectomy, some authors advocate the removal of a strip of periosteum along the medial tibial border.14,64

**STRESS FRACTURES**

Another type of overuse injury affecting athletes is the stress fracture, which is caused by bony microtrauma produced by repetitive loading.4,7,10,15,45,54 Stress fractures of the lower extremity account for 80% to 95% of all stress fractures, with the majority of such fractures involving the tibia.7,30,54,57,59 Although most fractures of the tibia occur in the proximal metaphyseal or upper diaphyseal regions, such fractures also may occur in the midanterior region or may be longitudinal in nature.7,30,31,45 The site of a stress fracture may vary, depending on the type of sport or activity.9,25,59,60 For example, runners often fracture the midshaft or distal one third of the tibia, whereas volleyball and basketball players are prone to proximal tibial stress fractures.60

The recognition of a stress fracture is contingent on a detailed clinical history. Certain types of patients, including those with eating disorders, 3,8,56 those participating in sports in which leanness is emphasized,3,7,58,60 females with menstrual abnormalities,3,7,8,25,58,66 those with a history of stress fractures,5,8,62 and military recruits,4,15 are at higher risk for stress fracture. Although stress fractures may develop in the absence of training errors, training and activity should be evaluated to determine the type and frequency of lower extremity loading and to assess the risk of stress fracture.7,8,59 The goal of this process is to identify correctable factors, such as recent changes in the duration, intensity, frequency, and technique of activity, as well as the condition of footwear, use of orthotics, and modifications in the training surface.5,8,15 For patients with previous stress fractures, the location of and circumstances resulting in the fracture, in addition to subsequent treatment, should be determined.8

Special attention should be paid to the female athlete, who should be screened for the “female athlete triad,” which comprises disordered eating, amenorrhea, and osteoporosis.31,58,60 Although most athletes do not meet the classic definition of patients with eating disorders, the possibility must be ruled out during the clinical history.8 Obtaining the height and weight, with calculation of the percentage of body fat, also may be helpful in assessing a potential eating disorder. Patients participating in sports or other activities in which leanness is important are at higher risk for developing eating disorders and stress fractures.7,31,59,60 For the athlete with a true eating disorder, such as anorexia or bulimia, appropriate referrals to a dietician, nutritionist, and/or sports psychologist, are necessary.8 A nutritional assessment also is important for athletes without eating disorders because the ingested number of calories often is below that required, given the athlete’s activity level, and the type of calories ingested may be insufficient in protein.8 Such a nutritional evaluation is not exclusive to female athletes; it also should be conducted in male athletes.

Because female athletes with abnormal menstrual cycles are at particular risk for stress fractures,3,7,8,25,58,60 a menstrual history, including the age of menarche, cycle duration, frequency, date of last menstrual cycle, and previous episodes of amenorrhea or oligomenorrhea, should be documented.8,58 Evaluation by a gynecologist is recommended to rule out non–eating-related causes of menstrual irregularity,3,8 as many young athletes have never had a gynecologic evaluation. In addition, pregnancy should be ruled out as a possible cause for amenorrhea in female athletes of childbearing years. Criteria exist for use of hormonal replacement therapy and serial bone density scans in this patient population; however, this discussion is outside the scope of this article.

After an inquiry regarding the possible risk factors associated with stress fractures, a physical examination should be performed. An insidious onset of pain with a concurrent reported change in activity is a typical presentation.8,11,25,45,59 Pain associated with tibial stress fractures typically is localized to the fracture site and is more proximal than that caused by MTSS.60 Pain initially occurs as a mild ache after a specific amount of exercise and then subsides.25,45,59 As the condition progresses, pain may become severe and occur during earlier stages of exercise, as well as after cessation of activity.8,59 Night pain is
possible in rare cases. Conversely, fever and fatigue may indicate a possible tumor or infectious process.

On gross examination, the leg will appear normal. Palpation will elicit tenderness localized at the fracture site; however, the posteromedial aspect of the middle to distal one third of the tibia should not be tender. Erythema or localized swelling also may be present. In the absence of any associated abnormalities, neurovascular examination findings will be normal. Joint range of motion typically is normal, but gait analysis may reveal biomechanical risk factors. Although not definitive, a tuning fork may assist in diagnosing stress fractures. Vibratory pain at the stress fracture site produced by a tuning fork or ultrasound confirms the diagnosis. A negative vibratory stress test finding, however, may not be conclusive and should be followed up with further diagnostic studies, as sensitivity and specificity of the vibratory stress test have been reported as 75% and 67%, respectively.

Although stress fractures may be diagnosed solely on history and physical examination, diagnostic imaging, particularly radiography or scintigraphy, will assist in identifying questionable cases. Plain radiographs should be performed as the first imaging step, but the radiographs typically produce negative results because radiographic abnormalities often are not observed until 2 to 3 weeks after the onset of symptoms. Radiographic abnormalities associated with stress fractures may appear as a faint periosteal reaction, a fluffy area of callus, or a cortical lucency. Particular attention should be paid to the midanterior cortex because a small lucency, commonly referred to as the “dreaded black line,” may be indicative of a midanterior cortex tibial stress fracture. If radiographic examination demonstrates evidence of a stress fracture, no further imaging is necessary. However, a 3-phase bone scan is suggested when radiograph findings appear normal and suspicion of a stress fracture remains. The scintigraphic pattern indicative of a stress fracture is a focal uptake in the area of fracture. To differentiate between longitudinal stress fractures and MTSS, an MRI is recommended because bone scans of these conditions demonstrate identical diffuse uptake in the distal one third of the tibia.

Although there are many subtleties involved in the management of stress fractures, the primary treatment focuses on pain relief and protection from further injury. Improvement in muscular strength and endurance, continuation of cardiovascular fitness, and modification of risk factors also are important. Rest with weightbearing restriction initially is recommended for a minimum of 2 to 4 weeks. Mild analgesics or NSAIDS may be prescribed in conjunction with physical therapy modalities, such as ice application or cross training. Cardiovascular fitness is encouraged and may be maintained with cycling, swimming, deep-water running, or other nonweightbearing activities. In addition, upper-body strength training does not jeopardize fracture healing and is recommended to preserve muscle mass. If pain is not relieved after the initial 2- to 4-week rest period, or for patients with severe fractures, bracing or casting may be warranted for 3 to 12 weeks to immobilize the fracture. Finally, bone stimulators (electrical, pulsating electromagnetic field, ultrasound) also may be considered as part of the treatment armamentarium. In the authors’ experience, electrical stimulation has been effective in the healing of nonunion of traumatic fractures, and we recommend it in the management of stress fractures for elite athletes. It should be noted, however, that additional research of this treatment is warranted because only one prospective randomized trial evaluating a bone stimulator for the treatment of tibial stress fractures has been performed. This study did not demonstrate a difference in the time to healing between the study and control groups.

Factors contributing to stress fractures, including training errors, improper shoe wear, and muscle imbalance, identified in the history and physical examination, must be addressed to prevent fracture recurrence. Training schedules should be individualized for each patient. Shoes must be examined for signs of wear and inadequate support, with replacement suggested every 500 km. Appropriate orthotics, if necessary, should be utilized. Finally, treatment plans consisting of dietary counseling and/or estrogen replacement therapy are recommended for athletes with eating disorders and female athletes with menstrual irregularities.

Gradual resumption of activity is recommended and should be individualized according to symptoms. Progression in activity should not be advanced until the offending activity is accomplished without pain. If pain recurs, activity must cease and should not be reattempted until the pain is alleviated. The patient may return to the lower loading activity after pain has been alleviated but should not proceed until each successive activity has been accomplished without pain. A period of rest also is recommended between activities before advancing to a higher loading activity. Although patients may expect to resume full training in 8 to 16 weeks, athletes must be aware that a prolonged recovery period may be necessary for more severe fractures, especially those involving the midanterior cortex, which often require a significant period of rehabilitation. In the majority of patients, nonoperative treatment is successful in treating tibial stress fractures. Surgery, however, may be required for severe cases, including midanterior or longitudinal tibial stress fractures, or for chronic nonunions of proximal medial stress fractures. Many orthopaedic surgeons, including the current authors, advocate intramedullary nailing for the treatment of high-demand patients with problematic stress fractures.

CHRONIC EXERTIONAL COMPARTMENT SYNDROME

Chronic ECS of the lower leg generally is induced by exercise that impairs neuromuscular function within the involved compartment and is characterized by an onset of pain after a specific amount of exercise. Chronic ECS commonly is observed in runners or ball- and pock-
In young athletes, chronic ECS often presents in bilateral form, with equal incidence in male and female athletes. Of the 4 lower leg compartments, the anterior compartment is affected more frequently than the lateral, deep, and superficial posterior compartments. Although symptoms of chronic ECS are general, the onset and subsidence patterns are specific to the condition. After cessation of activity, symptoms typically resolve, but they generally return at the same interval or intensity at the next training session. Patients with chronic ECS often complain of cramping, burning, or pain over the involved compartment(s) with exercise. Pain will become progressive with continued exercise or increased intensity but often will dissipate or decrease with rest. In extreme cases, however, pain may be constant.

In cases in which chronic ECS is suspected, a physical examination must be conducted immediately after the exercise that initiates the symptoms, as the preexercise physical and neurocirculatory examinations produce normal results. A diffuse palpable tenderness frequently is observed after exercise and should be distinguished from that associated with superficial peroneal nerve entrapment, which is focal at the site of entrapment. Focal muscle herniation may be associated with either condition and most commonly occurs where the superficial peroneal nerve exits the fascia. After exercise, a sensation of increased fullness, tension, or increased leg girth may be produced in the involved compartments. In cases of severe chronic ECS, muscle weakness and paresthesia may be elicited to light touch.

In addition to the physical examination, diagnostic testing, including radiographs, bone scans, and MRI or magnetic resonance angiography (MRA), may assist in distinguishing between chronic ECS and other possible lower leg conditions. Radiographic findings typically are normal in cases of chronic ECS. Bone scans may be obtained to eliminate MTSS and stress fracture diagnoses. In cases in which symptoms are accompanied with a visible or palpable mass in the leg or when physical examination suggests possible popliteal artery compression, an MRI or MRA is recommended.

The hallmark diagnostic tool to confirm chronic ECS, however, is compartmental pressure testing. The slit catheter is a convenient tool for obtaining these values. The authors use a handheld compartmental device to record the measurements. Patients should be placed in a supine position with the knee extended and the ankle in neutral dorsiflexion. The needle tip location and depth of penetration also must be controlled to obtain reliable pressure measurements.

Although many authors advocate performing pressure tests before, during, and after exercise, the current authors recommend only preexercise and postexercise testing because measurements during exercise often are difficult to obtain and, as a result, are unreliable. Pressure measurements after exercise should be recorded at 1- and 5-minute intervals. If 5-minute postexercise measurements are borderline, 15-minute postexercise compartmental pressure measurements must be obtained. A diagnosis of chronic ECS may be established with a resting pressure equal to or greater than 15 mm Hg, or with a pressure equal to or greater than 30 mm Hg at 1 minute, and/or with a pressure equal to or greater than 20 mm Hg taken at 5 minutes after exercise. If chronic ECS is not present, pressures generally will return to normal within 3 to 5 minutes after exercise. If pressures remain elevated for 5 to 10 minutes after exercise, chronic ECS is diagnosed. Many authors assert that preexercise pressure measurements greater than 15 mm Hg or a delay in normalization of pressures after exercise is key in confirming chronic ECS.

A nonoperative regimen, consisting of rest, is advocated initially to address the extrinsic and intrinsic factors that may contribute to chronic ECS. Modification of extrinsic factors, including training surface, shoe design, and training intensity, may decrease the condition’s symptoms. Strengthening and stretching exercises or orthoses may address intrinsic factors, such as muscle imbalance, flexibility, and limb alignments. Finally, biomechanical abnormalities should be addressed and corrected before gradual return to activity.

Because the identification and modification of all risk factors contributing to chronic ECS may be difficult to ascertain and may not fully alleviate the symptoms, operative management may be necessary to ensure return to competition. Fasciotomy, therefore, is suggested if symptoms persist for more than 3 months. In addition, release of any fascial tethering or compression must be performed in cases of concomitant, superficial peroneal nerve entrapment.

Early passive and active range of motion exercises are implemented postoperatively to prevent postoperative fascial scarring. Weightbearing ambulation is recommended as tolerated within 2 weeks after surgery. Exercise on a stationary bicycle may be initiated at 2 weeks postoperatively, followed by isokinetic strengthening exercise 3 to 4 weeks after surgery. At 5 to 6 weeks postoperatively, running may be implemented, with speed and agility drills added during the eighth week. Within 8 to 12 weeks after surgery, athletes typically return to full sports participation.

NERVE ENTRAPMENT

The common peroneal, superficial peroneal, and saphenous nerves are the most common nerves at risk for entrapment in the lower extremity. Trauma is a primary cause of all 3 forms of entrapment. Although superficial peroneal nerve entrapment often is observed in dancers and athletes involved in bodybuilding, horse racing, running, soccer, and tennis, common peroneal nerve entrapment commonly is associated with repetitive exercises involving inversion and eversion, such as running and cycling. Common peroneal nerve entrapment also may be caused by external compressive sources, such as tight plaster casts and anterior cruciate ligament...
braces, and internal compressive sources, including osteophytes or proximal tibiofibular joint ganglion cysts. If results from the history and physical examination suggest saphenous or superficial peroneal nerve entrapment, an electromyography is recommended to confirm the diagnosis of nerve entrapment. Alternatively, in cases of common peroneal nerve entrapment, an electromyogram is recommended and should be conducted before and after exercise.

Nonoperative treatment, consisting of modification of the precipitating activity, biomechanical correction, physiotherapy, and/or soft tissue massage, is the recommended management for common peroneal and saphenous nerve entrapments. Iontophoresis, an alternative to nerve blocks, is another option preferred by the current authors because of its less invasive nature. Nerve blocks, however, may be warranted if iontophoresis is not successful.

Nonoperative management often is successful in the treatments of common peroneal and saphenous nerve entrapments. Superficial peroneal nerve entrapment, on the other hand, typically requires surgical intervention. If nonoperative management has failed, fasciotomy is recommended. Although fasciotomy alone is sufficient in most cases, external neurolysis also may be required. In cases of common peroneal nerve entrapment, resection of osteophytes, ganglion cysts, or other obstructions may be necessary before performing neurolysis. Neurolysis may be warranted in the infrequent case of trauma-induced saphenous nerve entrapment. To minimize the incidence of neuroma or reflex sympathetic dystrophy, the nerve manipulation should be minimized and the surrounding tissue should be relatively undisturbed. After surgical intervention, activity may be initiated gradually upon wound healing.

POPLITEAL ARTERY ENTRAPMENT SYNDROME

Popliteal artery entrapment is caused by an anatomical variation, most commonly from a congenital anomaly that results in an abnormal course of the popliteal artery in the popliteal fossa. Several classification schemes have been proposed, all of which describe variations of anomalous migration of the medial head of the gastrocnemius muscle and its musculotendinous attachments in relation to the popliteal artery. This condition predominantly occurs in males under the age of 30. Often transpiring after high-intensity exercise with excessive dorsiflexion and plantar flexion of the ankle, PAES commonly occurs in football, basketball, soccer, and running athletes. Although PAES typically presents unilaterally, some studies report a bilateral incidence as high as 83%. Clinical presentation of PAES involves pain and claudication, which are related to the degree of entrapment of the popliteal artery. The differential diagnosis of healthy young patients with complaints of pain described as a deep ache or cramping involving the foot and leg should include PAES. Pain typically is posterior and occurs after strenuous or vigorous exercise. In PAES, claudication may occur with walking but not with prolonged leg exercise, which may be because of the more prolonged contraction of the gastrocnemius muscle that occurs with walking.

As with chronic ECS, physical examination results generally are normal at rest in cases of PAES, particularly if the artery is patent. Palpation of the bone and soft tissues may not elicit tenderness at rest, but tenderness often occurs in the posterior leg during exercise. In addition, exercise-induced swelling may be observed around the knee. Bilateral pulses should be examined to determine if reduction in pulse volume between limbs exists. Pulses should be palpated with the ankle in passive dorsiflexion or active plantar flexion with the knee in extension, as these provocative positions place tension on the artery.
gastrocnemius, leading to extrinsic compression of the popliteal artery.\textsuperscript{3,5,3} Reduction in pulses is considered pathognomonic of PAES.\textsuperscript{2}

A diagnosis of PAES may be determined with careful selection of diagnostic tests. Radiographs and bone scans often produce negative results in cases of PAES but should be conducted to rule out other causes of lower leg pain. When PAES is suspected, MRI and MRA are recommended as screening tests because a decreased flow with provocation is suggestive of PAES.\textsuperscript{1,3,2} If an MRI or MRA indicates PAES, arteriography is recommended to confirm the diagnosis.\textsuperscript{3,6,3} Arteriography, referred to as the gold standard test of PAES, is an invasive procedure involving radiographic imaging after injection of a radio-opaque material into the suspected arterial segment.\textsuperscript{4,5,3} Because arteriography findings may be normal when the ankle is in a neutral position and the knee is extended, the study should be repeated bilaterally after exercise or with the ankle in positions of provocation, as extrinsic arterial obstruction may be demonstrated with ankle plantar flexion.\textsuperscript{2,1,1,8,3,38}

Unlike the other chronic leg pain conditions presented in this review, which classically are first treated nonoperatively, the preferred management of PAES is surgery because PAES typically recurs with activity and may lead to long-term arterial damage if untreated.\textsuperscript{1,2,11,3,32,3} Early operative treatment involves release of the popliteal artery and restoration of normal arterial flow.\textsuperscript{1,6,3} When the physical examination indicates no arterial damage, a myotomy is performed with release of the offending fibrous band\textsuperscript{1,8,3,35}; however, in more advanced cases involving popliteal endofibrosis or arteriosclerosis, endarterectomy and vein patch angioplasty are warranted.\textsuperscript{1,5,3} Finally, if complete occlusion occurs, a saphenous vein bypass graft is required.\textsuperscript{2,1,8,3,3} Like other conditions causing lower leg pain treated with surgery, return to activity should be a gradual process.

**SUMMARY**

The most common causes of chronic leg pain in athletes are MTSS, stress fractures, chronic ECS, nerve entrapment, and PAES. Many of these conditions occur as a result of overuse and/or errors in training. Not only is there a similarity in symptoms among the causes of chronic leg pain, these conditions also may coexist, thereby making diagnosis difficult. An accurate diagnosis, therefore, requires obtaining a thorough patient history, performing a comprehensive physical examination, and coordinating the appropriate diagnostic studies to further distinguish the conditions. Once a diagnosis has been established, nonoperative management, consisting of rest from activity and modification of training, is effective in the majority of cases. Surgical intervention, however, may be necessary in cases in which nonoperative management has failed or in the treatment of nerve entrapment or PAES. Regardless of the form of treatment, return to activity must be gradual and individualized for each patient to prevent future athletic injury.

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