REVIEW

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Evaluation and management of common running injuries

ABSTRACT

Adults who run for sport or for pleasure often present to their primary care physician with musculoskeletal complaints. Rapid diagnosis and conservative management of common running injuries and referral of patients with injuries that have a propensity for morbidity, such as femoral neck stress fractures, are reviewed. Careful evaluation of the patient's running program and physical therapy are important components of management.

KEY POINTS

Sudden, significant changes in the training routine are the most frequent cause of injury in runners. Lack of rest between high-intensity workouts, a sudden increase in distance or intensity, and a workout that is too intense all contribute to injury.

Runners with stress fractures associated with a high risk of morbidity should be referred to an orthopedic surgeon.

Anterior knee pain is the most common complaint of runners, and usually results from overuse rather than an acute injury.

Running does not cause osteoarthritis, but running can accelerate its course.

AT LEAST 25% OF ADULTS who run for sport or for pleasure suffer musculoskeletal injuries, and many present to an internist for evaluation. Prompt initial evaluation and management of these injuries is needed in the primary care setting. This review focuses on how to quickly evaluate the most common running injuries, which conservative treatments to apply, and when to refer the patient for special treatment.

TAKING THE HISTORY OF A RUNNING INJURY

As in many other areas of medicine, the history is critical in assessing running injuries. When eliciting information about symptoms, ask specifically about onset, duration, precipitating factors, relieving factors, and prior treatment (**FIGURE 1**). Other features to note are:

- How long the patient has been running
- Competitive level
- Distance per week
- Frequency
- Type of terrain
- Warm-up and stretching routines
- Cross-training or supplemental activities
- Recent changes in running routine, shoes, or terrain.

Common features of running injuries in adults

Sudden, significant changes in the training routine are the most frequent cause of injury in runners. Lack of rest between high-intensity workouts, a sudden increase in distance or intensity, and a workout that is too intense all contribute to injury.

Causes of common running injuries

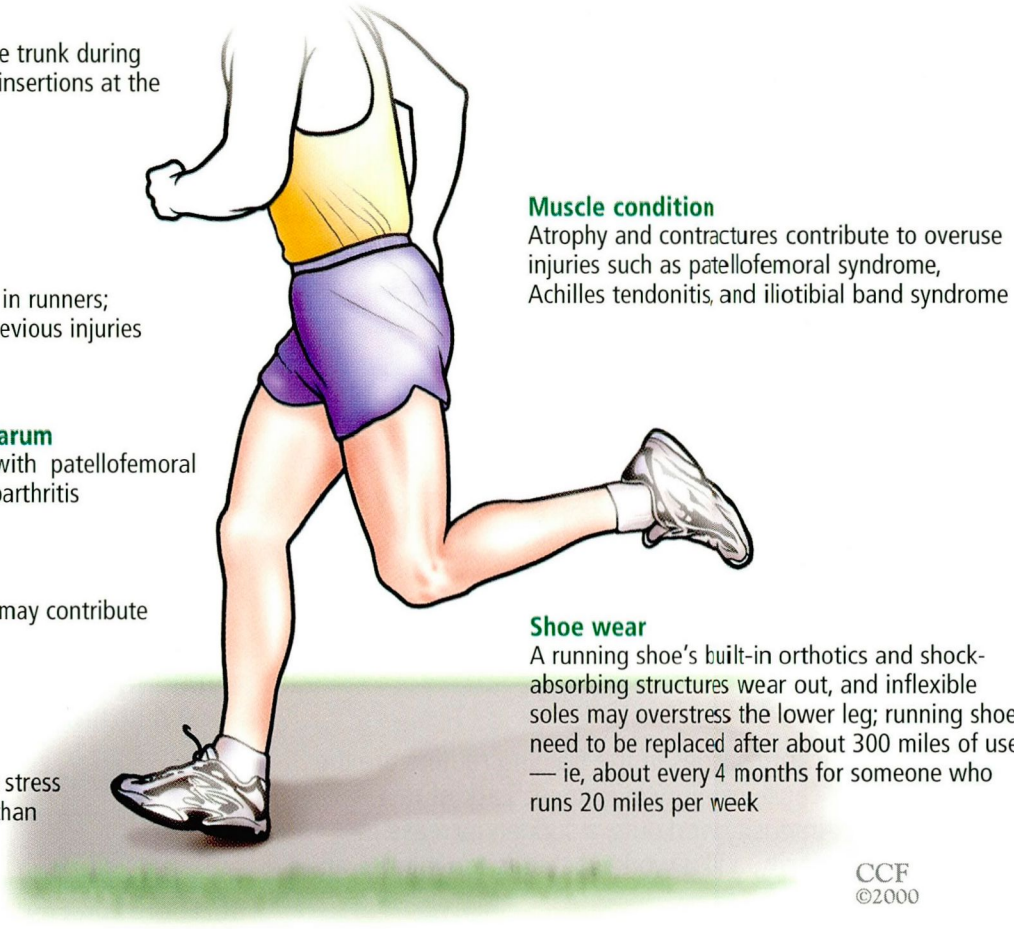


FIGURE 1

Injuries tend to be due to overuse rather than to acute damage. Particularly in the long-distance runner, injuries are due more often to overuse or insufficient tissue recovery after repetitive stress than to acute injury.

Reinjury is a common problem in runners. Always inquire about previous injuries.

Terrain can lead to injury. Running on asphalt or concrete stresses the lower extremities more than running on cinders or grass. The evenness of the surface and the camber are additional factors that may lead to musculoskeletal injury.

Shoes are very important. The shock-absorbing ability of most running shoes—irrespective of the cost or material—is diminished by at least 30% after 500 miles of use.[1,2] Beyond this point, increased force is transmitted to the lower extremities. Most experts recommend changing running shoes after 300 miles of use (eg, about every 4 months for someone who runs 20 miles per week). Damage to the running shoe's built-in orthotics, inadequate heel counters, and inflexible soles can lead to symptoms.

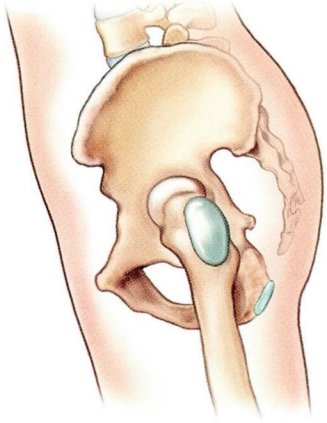
THE PHYSICAL EXAMINATION

The physical examination should include both an evaluation of the affected part and a general biomechanical evaluation, looking for evidence of scoliosis, genu valgum or varum, unequal leg length, muscle atrophy, and muscle contractures (FIGURE 1). Gait should be assessed,[3–5] and run-

Brief overview of common running injuries in adults

Apophysitis of the iliac crest is caused by excessive arm motion across the trunk, increasing the stress at the muscle insertions along the crest

Stress fractures may occur in the hip, pelvis, thigh, and femoral neck, and female endurance athletes are at increased risk



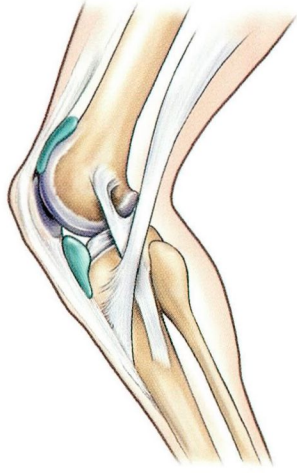
Trochanteric bursitis is characterized by tenderness along the posterior aspect of the greater trochanter

Snapping hip syndrome is characterized by hip pain and an audible snap heard when the flexed, abducted, and externally rotated femur is extended

Ischial bursitis or insertional tendonitis of the hamstring presents as pain exacerbated by sprinting, running on hills, or prolonged sitting

Anterior knee pain accounts for at least 29% of all running injuries. The differential diagnosis includes patellofemoral syndrome, chondromalacia, plica syndrome, bursitis, and tendonitis of the quadriceps or patella

Tibial stress fracture is differentiated from shin splints by pain that persists after the run, night pain, and pain during walking



Iliotibial band friction syndrome produces lateral knee pain due to friction of the band gliding over the lateral femoral condyle with repetitive knee flexion and extension

Shin splints (medial tibial stress syndrome) occur with exercise and are relieved with rest

Calcaneal stress fracture should be ruled out when considering a diagnosis of fat pad syndrome

Metatarsal stress fractures in runners usually occur in the second metatarsal bone and usually heal without complication

Achilles tendonitis is caused by repetitive impact, excessive pronation of the foot, tightness of the Achilles tendon complex, and changes in running routine

Fat pad syndrome presents as central heel pain caused by repetitive trauma, direct trauma, or corticosteroid injection

Plantar fasciitis presents as inferior heel pain with the first step of the day. Heel spurs are associated with plantar fasciitis but do not cause it

FIGURE 2

ning shoes should also be inspected. Careful inspection for asymmetry may help to direct the examination. In general, shoes should be inspected for an adequate heel wedge, forefoot cushioning, and medial arch support.

When evaluating the pain, ask the patient to describe where it hurts and when it occurs during the workout, since both are important to the differential diagnosis.

FIGURE 2 provides a basis for the following overview of common running injuries.

HIP, PELVIS, AND THIGH INJURIES IN RUNNERS

Apophysitis

Apophyseal injuries occur in the skeletally immature patient at a tendon insertion site.

Apophysitis of the iliac crest may present subacutely as an overuse syndrome in runners. It is caused by excessive arm motion across the trunk, which increases the stress at the muscle insertions along the crest. On examination there is tenderness to palpation of the iliac crest, and resisted abduction of the affected hip reproduces the pain. The condition is prevented by limiting excessive arm swing across the trunk.

Reinjury is common: always inquire about previous injuries

Apophysitis of the anterior superior iliac spine and anterior inferior iliac spine can occur in adolescent sprinters. Both present with the sudden onset of pain in the groin or anterior hip.

Apophysitis of the ischial tuberosity is another problem seen mainly in adolescent athletes. It may occur acutely and present as pain at the tuberosity.

Treatment of most apophyseal injuries consists initially of protection, icing, and analgesics, followed by exercises to recover range of motion and strength.

Trochanteric bursitis

Trochanteric bursitis is a common complaint in runners. It presents as lateral hip pain exacerbated by activity. Gluteus medius tendonitis should be considered in the differential diagnosis.[1] Bursitis results in tenderness to palpation along the posterior aspect of the greater trochanter. In contrast, gluteus medius tendonitis will result in tenderness to palpation above the greater trochanter.

Snapping hip syndrome is characterized by hip pain and an audible snap on extension of the leg from a flexed, abducted, externally rotated position. Back pain may also be reported. The syndrome is caused by the snapping of the iliotibial band over the greater trochanter. Repetitive friction in this region may result in trochanteric bursitis.

Treatment of both conditions consists of relative rest (ie, avoiding activities that exacerbate symptoms), stretching the iliotibial band, strengthening the trunk and hip girdle musculature, and nonsteroidal anti-inflammatory drugs (NSAIDs). If symptoms persist, then consider injection of the bursa with a local anesthetic and a corticosteroid.

Ischial bursitis or insertional tendonitis

Ischial bursitis or insertional tendonitis of the hamstring musculature may present as pain in the buttock or posterior thigh. Pain is usually exacerbated by sprinting, running on hills, or prolonged sitting. Driving a car may be particularly troublesome. Treatment consists of stretching, icing, NSAIDs, and use of a foam donut for sitting. Consider corticosteroid injection for refractory cases.

Stress fractures of the hip, pelvis, thigh

Stress fractures may occur in the hip, pelvis, or thigh when the bone fails to adapt to the mechanical loads placed on it. Stress fractures can occur either when abnormal stresses are applied to normal bone or when normal stresses are applied to abnormal bone.

Female endurance athletes in particular are at an increased risk for amenorrhea (resulting in a hypoestrogenic state) and stress fractures. Stress fractures of the pubic ramus may occur in long-distance runners and are more common in women. In most cases, a careful history will reveal a change in the training routine as the contributing factor; however, it is also important to consider underlying metabolic or endocrine disorders.

Symptoms and examination. Symptoms include pain in the inguinal, perineal, or adductor region, which is relieved by rest and exacerbated by activity.[6] Hip range of motion is usually normal. Pain is increased with

weight-bearing, and the patient may be unable to stand on the affected extremity without support. The affected extremity is tender to palpation. The patient often adopts a guarded (antalgic) gait to avoid the pain.

Diagnostic testing. Diagnosis is rarely made with radiographs, but they should be obtained if a stress fracture is suspected. A positive bone scan is diagnostic.

Treatment consists of protected weight-bearing (using crutches when walking) for 4 to 6 weeks, followed by a gradual return to activity. Recovery generally takes 3 to 5 months. It is critical that adequate recovery periods are allowed once activity is resumed. Follow-up radiographs may show an abundant callus, which should not be confused with malignancy.

Femoral stress fractures

Stress fractures of the femoral neck are potentially serious, carrying the risk of avascular necrosis and deformity.

Symptoms and examination. The patient presents with groin, anterior thigh, or knee pain. Pain occurs toward the end of range of motion, especially with internal rotation and flexion. The gait may be antalgic, and a single leg-hop test will reproduce symptoms.

Diagnostic testing. Radiographs are usually not positive for 2 to 4 weeks. A bone scan or magnetic resonance imaging (MRI) is recommended in runners with a suggestive history and negative radiographs.

Stress fractures of the femoral neck can occur in the superior cortex or the inferior cortex of the femoral neck. Fractures of the superior cortex have a high risk of displacement and subsequent nonunion, delayed union, avascular necrosis, and deformity; therefore, surgical fixation is the treatment of choice. Fractures of the inferior cortex are usually managed with protected weight-bearing and gradual resumption of activity.[7–9] However, owing to the morbidity associated with femoral neck fractures, referral to an orthopedic surgeon is indicated.

Stress fractures of the femoral shaft are less common and have a low complication rate. Patients generally complain of vague thigh pain that worsens with activity. Palpation may reveal local tenderness.

Diagnostic tests. Radiographs will be positive after 2 to 4 weeks. A bone scan will confirm the diagnosis.

Treatment consists of protected weight-bearing for 1 to 4 weeks, followed by gradual resumption of activity.

Osteoarthritis

Osteoarthritis may be a source of hip or groin pain in runners. Congenital hip dysplasia may predispose a person to osteoarthritis and is often undetected until he or she presents with premature degenerative changes.

Symptoms and examination. The patient usually complains of groin pain that is worse after activity and, sometimes, is accompanied by morning stiffness.

Treatment consists of modifying the runner's routine by adding cross-training activities with reduced loading, such as swimming or stationary biking, by changing to a softer surface such as cinders, by strengthening the hip girdle musculature, and by giving NSAIDs.

KNEE INJURIES IN RUNNERS

Anterior knee pain

Most running injuries respond to rest, icing, NSAIDs, stretching, and strengthening

Anterior knee pain is the most common complaint in runners, accounting for at least 29% of all injuries.[3,10] As with most knee problems in runners, it is an overuse injury rather than an acute injury.

The differential diagnosis includes patellofemoral syndrome, chondromalacia, plica syndrome, bursitis, and tendonitis of the quadriceps and patella. **Patellofemoral syndrome** is a general term for pain at the patellofemoral articulation. **Chondromalacia** is a specific condition in which the articular cartilage is softened and fibrillated.

Contributing factors. Abnormal tracking of the patella within the trochlea due to biomechanical abnormalities is thought to predispose the runner to injury. Anatomic factors include:

- Anteversion of the femur
- Tibial torsion
- Subtalar pronation
- Widened Q-angle: ie, the relationship of the patella to the anterior iliac spine and the tibial tuberosity (normal, 15°)

- Muscle imbalance between the vastus medialis oblique muscles and the lateral quadriceps musculature
- Decreased flexibility of the hip flexors, hamstrings, gastrocnemius, and iliotibial band.[10,11]

Symptoms and examination. The runner presents with deep, aching anterior knee pain that worsens with prolonged sitting, stair climbing, and running on hills. Examination should include the entire lower extremity, with particular attention to patellar alignment and tracking, vastus medialis oblique muscle bulk, crepitus, and areas of tenderness. Excessive tightness of the lateral retinaculum may contribute to poor tracking and anterior knee pain.

Diagnostic tests. Radiographs may not always be required initially, but they should be obtained if symptoms persist beyond 6 weeks of treatment or if the presentation is atypical. Radiographs should be taken during weight-bearing and should include anteroposterior, lateral, tunnel, and Merchant views.

Treatment consists of icing, relative rest with avoidance of squatting and stairs, and an exercise program that emphasizes lower-extremity flexibility and quadriceps strengthening, particularly in terminal extension.[11] Strengthening should not produce pain. This regimen often is more effective when individualized under the guidance of a physical therapist.[12] A "knee sleeve" or taping may relieve symptoms and facilitate rehabilitation. If anatomic abnormalities of the foot and ankle appear significant, the patient may benefit from custom orthotics.

Anterior knee pain is the most common complaint in runners

Quadriceps tendonitis and patellar tendonitis

Quadriceps tendonitis and patellar tendonitis, known together as "jumper's knee," can occur in runners.

Symptoms and examination. Pain generally occurs during a run but may not be severe enough to halt running. A key symptom of quadriceps tendonitis is tenderness of the insertion of the quadriceps into the proximal pole of the patella, whereas a key symptom of patellar tendonitis is tenderness of the quadriceps insertion into the distal pole. Squatting also frequently provokes the pain. In patellar tendonitis, tenderness to palpation is more pronounced with the knee extended rather than flexed.[11]

Treatment consists of a reduction in intensity of training, avoidance of hilly terrain, icing, NSAIDs, stretching, and strengthening.[1]

Plica syndrome

Plica syndrome produces anterior-medial knee pain. The plica is a congenital medial synovial fold present in 60% to 80% of people.[1] Excessive friction of the plica over the medial femoral condyle can produce a thickened and fibrotic band of tissue, which may result in a snapping sensation.

Symptoms and examination. On examination, the plica is palpable and tender, with localized tenderness over the medial femoral condyle at the level of the medial border of the patella. A snapping sound or crepitus may be noted. An effusion is atypical and suggests a mechanical etiology such as a chondral lesion, meniscal tear, or osteoarthritis. Resisted knee exercises may aggravate the condition.[11]

Treatment consists of rest, icing, NSAIDs, stretching, and strengthening. Failure to respond to adequate conservative measures is an indication for arthroscopic excision.[1]

Pes anserine bursitis

Pes anserine bursitis produces medial knee pain, usually distal to the joint line. The pes anserine is the common insertion of the sartorius, semitendinosus, and gracilis muscles into the medial tibia. The condition may be confused with a medial meniscal tear.

Symptoms and examination. Tenderness at the insertion and pain with resisted flexion of the knee are diagnostic.

Treatment. If conservative measures (rest, icing, NSAIDs, stretching, strengthening) do not resolve the pain, corticosteroid injection may be helpful.

Osteoarthritis of the knee

It is generally accepted that running does not cause osteoarthritis, but once a runner develops osteoarthritis the running program should be modified or discontinued because running

can accelerate the course of osteoarthritis.

If the patient is unwilling to abandon running, then changing the terrain, decreasing the distance, and substituting low-impact cross-training activities on certain days can minimize forces placed on the joint.[11]

Iliotibial band friction syndrome

Iliotibial band friction syndrome produces lateral knee pain. It results from friction of the iliotibial band gliding over the lateral femoral condyle with repetitive knee flexion and extension.[1,10]

Symptoms and examination. Pain often begins 1 to 2 miles into a run and persists, then ceases once running has stopped. Downhill running and running on a banked terrain aggravate the symptoms.

Predisposing factors include calcaneal varies, tibia varum, and hip abductor weakness.[1] On examination, tenderness is usually proximal to the joint line, which distinguishes this condition from a lateral meniscal tear.

Treatment consists of icing, stretching, and strengthening the hip musculature. If the problem persists, the patient may benefit from ultrasound, ionophoresis, or corticosteroid injection. Surgery is indicated for intractable symptoms.

LOWER LEG INJURIES IN RUNNERS

Most cases of lower leg pain in runners are due to medial tibial stress syndrome (shin splints), tibial stress fracture,[13,14] or exertion compartment syndrome.

Tibial stress fracture

Tibial stress fracture can be difficult to distinguish clinically from medial tibial stress syndrome. In both conditions, patients report insidious onset of anterior tibial pain that occurs early in the run. In the case of shin splints, pain may resolve during the run, whereas in tibial stress fracture, the pain often persists after the run.

Symptoms and examination. Pain that persists after running, night pain, and pain with ambulation should increase the index of suspicion for stress fracture. On examination, tenderness is usually localized. Swelling may or may not be noted. Percussion proximal or distal to the suspected fracture may reproduce the pain.

Diagnostic tests. Radiographic evaluation should begin with plain radiography, looking for evidence of periosteal reaction in the region of maximal tenderness. Late findings include fracture lines or callus formation. Unfortunately, radiographs do not become positive for at least 2 to 3 weeks; therefore, a negative radiograph does not rule out stress fracture.[7] If clinical suspicion for a stress fracture is high despite negative radiographs, then a triple-phase bone scan should be performed. If available, MRI is also useful in confirming the clinical diagnosis.

Treatment depends on the location of the fracture. Fractures of the anterior middle third of the tibia have a risk of nonunion, delayed union, and displacement. Healing is prolonged, and patients risk considerable morbidity; therefore, patients with this type of fracture should be referred to an orthopedic surgeon.[7,10]

Shin splints

Medial tibial stress syndrome, or shin splints, results from inflammation of the tibial periosteum. It is an overuse injury in which repetitive muscle contraction results in a periostitis of the muscle insertion into the tibia.

For shin splints, advise stopping running and starting cross-training activities such as water running

Symptoms and examination. Pain occurs with exercise and is relieved with rest. It often occurs in the novice runner or at the beginning of the season.[1] The condition is associated with excessive pronation of the subtalar joint or midfoot. On examination, tenderness is elicited with palpation along the posteromedial tibia.

Diagnostic tests. A bone scan may show diffuse increased uptake, whereas uptake is focally increased in tibial stress fracture.

Treatment consists of cessation of running on land until tenderness resolves. During that time cross-training activity and water running are permitted as long as they do not exacerbate symptoms. Once symptoms resolve, the patient may gradually resume running, but the routine should include adequate recovery periods and should initially be performed only on soft surfaces. Use of NSAIDs and ice massage may help resolve periosteal inflammation.

Increasing the flexibility of the gastrocsoleus complex and the strength and endurance of the anterior musculature is also important.[10]

Exertional compartment syndrome

Exertional compartment syndrome in runners is generally a subacute condition caused by an exercise-induced increase in the pressure within the fascial compartment due to muscle hypertrophy and swelling.[10] This leads to ischemia, which results in episodic pain, paresthesia, and weakness associated with exercise, which are relieved with rest.[1,10]

Symptoms and examination. The patient often complains of tightness, weakness, or a deep ache after 15 to 20 minutes of running. Rest generally relieves the symptoms. Symptoms may be bilateral. The physical examination may be normal. Often, the patient may be able to localize symptoms to a particular compartment.

Diagnostic tests. The diagnosis is confirmed by measurement of intracompartmental pressures via a catheter connected to a pressure gauge.

Treatment is generally conservative, consisting of rest, NSAIDs, and stretching. If symptoms fail to respond, fasciotomy of the involved fascial compartments provides symptom relief.

Heel spurs are associated with plantar fasciitis, but do not cause it

FOOT AND ANKLE INJURIES IN RUNNERS

Achilles tendonitis

Achilles tendonitis is a common overuse injury at the insertion of the tendon or, more often, within the mid-substance of the tendon (2 to 6 cm proximal to the insertion). In some patients, the retrocalcaneal bursa may also be involved.

Causes include repetitive impact loading, excessive pronation of the foot, tightness of the Achilles tendon complex,[14,15] and changes in the running routine (eg, distance, duration, or terrain).[16]

Symptoms and examination. Patients complain of posterior heel pain that is worse in the morning and after exercise. If the patient complains of a sudden onset of pain or disability or both, then evaluate for a partial or complete rupture of the Achilles tendon. Examine for local tenderness, crepitus, or nodularity, and inspect for bursal involvement and limited dorsiflexion.[10]

Treatment consists of restricting activity, icing, NSAIDs, heel lifts, and a stretching and strengthening program. Recalcitrant cases may respond to the use of a walking cast for 2 to 4 weeks. Failure to respond to these nonoperative treatments is an indication for surgical referral. Steroid injections increase the risk for tendon rupture and should be avoided.[16]

Plantar fasciitis

Plantar fasciitis is the most common cause of inferior heel pain in runners. The plantar fascia originates from the medial calcaneal tubercle and inserts distally into the base of each proximal phalanx. It supports the arch during toe push-off. The condition is thought to be the result of repetitive microtrauma to the fascia at its origin, with an ensuing inflammatory response. Persistent overuse results in chronic inflammation. Tightness of the gastrocsoleus complex is associated with this condition. Heel spurs are associated with plantar fasciitis but do not cause it.

Symptoms and examination. The classic presentation of plantar fasciitis is inferior heel pain with the first step of the day, which recedes with continued activity. Examination reveals focal tenderness at the medial calcaneal tubercle and, sometimes, at the mid-arch level.

Treatment. Conservative measures are effective in 95% of patients, but the condition may take up to 6 months to respond. In our center, initial measures include icing, NSAIDs, heel pads, stretching, and strengthening.

Stretching is the key to any conservative program and should be performed three to four times a day, with attention to the Achilles tendon and plantar fascia. Low-impact aerobic exercise and water running should be substituted for running.

Those who do not respond may be candidates for either night splints, which place the foot in 5 degrees of dorsiflexion, or (rarely) for custom orthotics. Avoid corticosteroid injections, as they can cause fat pad atrophy and plantar fascia rupture.[10,16] Surgery may be considered when symptoms persist despite 6 to 12 months of conservative treatment.

Fat pad syndrome

In fat pad syndrome, atrophy of the heel pad causes central heel pain. The condition may be due to repetitive trauma, direct trauma, or corticosteroid injection.

Symptoms and examination. The center of the heel pad is tender to palpation.

Treatment consists of additional shoe-cushioning, usually with a heel cup or pad. Occasionally, a custom orthotic is required.

Calcaneal stress fracture

Symptoms and examination. Calcaneal stress fracture should be ruled out when considering a diagnosis of fat pad syndrome. A distinguishing feature is that palpating along the medial and lateral borders of the calcaneus and squeezing the heel reproduce the symptoms. Swelling is usually present.

Diagnostic tests. Plain radiographs usually reveal the fracture.

Metatarsalgia vs Morton neuroma

Symptoms and examination. Metatarsalgia is pain on the plantar aspect of the ball of the foot. It occurs most commonly in runners with a hypermobile first ray or a long second ray and is due to excessive weight transfer during push-off. It results in synovitis with pain at the second or third metatarsal head, or both.[17]

Metatarsalgia should be distinguished from Morton neuroma, which occurs due to irritation of the interdigital nerve between the metatarsal heads.[1] Classically, Morton neuroma occurs in the third web space but may occur in the second web space. First and fourth interspace involvement is exceedingly rare. Neuroma produces a burning or stabbing pain that is relieved with shoe removal.

Treatment. Both conditions usually respond to the use of metatarsal pads. Metatarsal pads shift some of the weight-bearing away from the lesser metatarsal heads and back to the first ray.[17] A more generalized metatarsalgia may be due to a tight heel cord and the resulting restricted dorsiflexion which produces clawing of the toes. Shoes with a wide toe box often provide relief in the case of a neuroma. If recalcitrant, neuroma often responds to corticosteroid injection.[18]

TABLE 1

Protocol for returning to running after prolonged inactivity

WEEK	ACTIVITY
1	Walk 1-2 miles every day, 1 minute fast and 1 minute at a normal pace
2	Walk 2-3 miles every day, 1.5 minutes of fast walking or jogging and 1.5 minute at a normal pace
3	If no pain, substitute a 10-minute jog daily in lieu of walking or jogging
4	Same as week 3, but jog 15 minutes daily in lieu of walking or jogging
5	Jog 15 minutes 1 day, then 25 minutes the next
6	Jog 20 minutes 1 day, then 30 minutes the next
7	Jog 20 minutes 1 day, 35 minutes the next
8	Jog 20 minutes 1 day, 40 minutes the next
9	Resume normal running routine

Metatarsal stress fractures

Metatarsal stress fractures in runners occur most commonly in the second metatarsal bone.

Recommend easing back into running, after injury

Symptoms and examination. On examination, diffuse swelling and increased warmth are frequently present. Palpation over the metatarsal elicits tenderness.

Diagnostic tests. Radiographs should be obtained. If they demonstrate a stress fracture, weight-bearing is allowed as tolerated, and the foot is protected in a walking-cast boot. If radiographs are negative, a decision should be made either to treat and follow symptomatically or to obtain a bone scan to make a more definitive diagnosis. Clinically, it is often difficult to distinguish a stress reaction from a stress fracture.

Fifth metatarsal fracture vs Jones fracture. In the case of stress fracture of the fifth metatarsal, the clinician must be careful to differentiate a stress fracture from a Jones fracture—an acute fracture at the junction of the diaphysis and metaphysis of the fifth metatarsal. Whereas stress fracture of the fifth metatarsal and avulsion fracture of the fifth metatarsal base will usually heal without com-

plication, Jones fracture has a propensity for nonunion or delayed union, and referral to an orthopedic surgeon is recommended.

RESUMING RUNNING AFTER INJURY: WHAT TO RECOMMEND TO PATIENTS

For patients who wish to return to running after an injury, especially an overuse injury, recommend a graded return to activity with appropriate recovery periods. Easy days or rest days should be incorporated in the workout schedule. This allows healing tissue to gradually adapt to increased stress.

Return to running after injury depends on the weeks of activity missed.[11] The following guide is useful when recommending return to activity:

- **Less than 1 week missed due to injury:** no modification of the training routine is needed
- **1 to 2 weeks of running missed:** reduce the routine by 25% for the first week of return, then resume appropriate routine
- **2 to 3 weeks of running missed:** reduce the routine by 50% for the first week of return, by 25% for the second week, then resume appropriate routine
- **4 weeks or more of running missed:** follow the 9-week protocol outlined in **TABLE 1.**

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