



Clinical Examination Considerations for an Adolescent Distance Runner with a Fibular Stress Fracture

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Abstract

The case involved a 15-year-old distance runner with lateral ankle pain. The examination findings led the therapist to instruct the patient to stop running and recommended imaging for suspected bone stress injury. The patient was diagnosed with a fibular stress fracture. Any alternative diagnosis would have potentially exposed the patient to increased risk of displaced fracture

Introduction

Distance runners are endurance athletes that place high biomechanical stress on bone, ligament and myotendinous structures of the lower extremities. These athletes are at a greater risk of developing Bone Stress Injuries (BSI), when compared to other track and field athletes [1]. This greater risk is a result of the increased biomechanical loads placed on the lower extremities during running. Warden et al. described the occurrence of load related microdamage to bone as an essential part of the normal loading and remodeling process that enhances the ability of bone to respond to the strain associated with running [2-4]. However, when this micro damage process occurs continuously and without adequate time for tissue remodeling to take place, symptomatic BSI can occur.

Clinicians, treating distance runners, are faced with the difficulty of differentiating between the multiple possible structures that can cause lower extremity pain and dysfunction. Kerr et al collected epidemiological data on male and female collegiate cross country runners between 2009 and 2014. They reported the occurrence of lower extremity injuries involving a wide variety of structures including; ankle ligamentous injury, tendinitis, muscle strains, joint inflammation and BSI [5].

The continuum of BSI includes stress reactions, stress fractures and complete fractures [2]. Stress reactions are characterized by periosteal edema and accelerated rate of bone

turnover due to excessive tissue stress [2]. A runner experiencing a stress reaction will commonly present with increasing pain during running, and will only report diminished symptoms with cessation of running activity [6]. Differential diagnosis between stress reaction and stress fractures can be determined by the presence of a fracture line on Magnetic Resonance Imaging (MRI) when a stress fracture is present [7].

Orthopedic manual therapy approaches for differential diagnosis of musculoskeletal conditions have been previously reported [8,9]. Petersen and Hayes demonstrated the construct validity of the Cyriax system of selective tension testing for differential diagnosis of the knee and shoulder [10]. However, to the authors knowledge no validation study exists for manual therapy differential diagnosis of the foot and ankle. The purpose of this case review is to present clinicians with a systematic manual therapy approach to the differential diagnosis, and appropriate referral for a male adolescent distance runner who developed a fibular stress fracture.

Case Review

Patient History: The patient was a fifteen-year-old male distance runner who had recently completed cross country season and was being seen by a physical therapist for left lateral ankle pain in the region of the distal fibula (see Figure1). The subject complained of moderate to severe pain with long runs (50 minutes or greater).

Figure 1

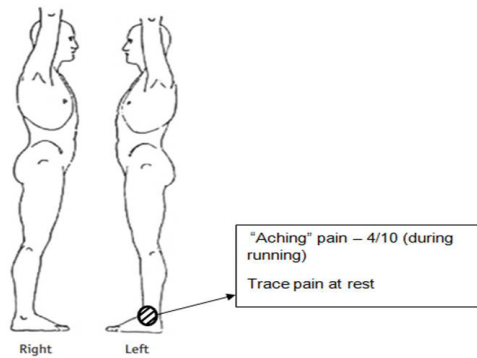


Figure 1: Patient pain drawing.

Clinical Examination: An examination was performed based on the tissue specific manual therapy examination approach described by Sizer, et al. [9]. The findings of the examination were as follows: Ambulation was normal without gait deviations. The patient reported trace/mild lateral ankle pain with unilateral standing heel raise. Passive talocrural dorsiflexion and plantarflexion were pain free with no limits in range of motion. Subtalar joint inversion and eversion were pain free with no limits in range of motion. Isometric resisted and passive diagonal tests were performed to provoke possible pain related tendopathy [9]. The patient had trace/mild pain on the left side with resisted dorsiflexion combined with eversion (extensor digitorum) as well as with resisted plantar flexion combined with eversion (peroneus longus and brevis). All other resisted and passive diagonals did not provoke pain. The right lower extremity was pain free with all passive and resisted tests. The anterior drawer test was performed to assess the capsule ligamentous structures of the ankle [9,11]. This test was negative bilaterally. The final aspect of the clinical examination performed by the therapist consisted of the tuning fork test [12]. This special test provoked symptoms that the patient described as “My pain”.

Evaluation: The clinical examination directed at the joints and soft tissue structures (tendon and ligamentous) was inconclusive with only vague response to provocation testing (standing heel raise and resisted diagonals). The examiner did not suspect tendopathy secondary to inconsistent findings with resisted and passive diagonals. According to Sizer et al tendopathy provocation occurs as a result isometric load of the tendon (resisted diagonal) and tensile loading of the tendon and or tenosynovium (passive diagonal) [9]. The examiner was able to provoke pain with resisted diagonals (dorsiflexion combined with eversion and resisted plantar flexion combined with eversion) but not with the opposite passive diagonals. Joint involvement was ruled out based on the absence of either the talocrural or subtalar joint capsular pattern of limitation [8,9]. See Table 1 for differential diagnosis considerations. Based

on the patient’s severe complaints of pain with long runs, severe pain and limits with race performance, positive tuning fork test and inconclusive soft tissue examination the physical therapist suggested to the patient’s parents that additional imaging be performed for differential diagnosis.

1. Possible Pain Generators Following Subjective History	Objective Examination Findings
Lateral ligaments (anterior talofibular, calcaneofibula, posterior talofibular ligaments)	No pain or instability assessed with anterior drawer. Ruled Out
Extensor digitorum tenosynovitis	Trace/mild with resisted dorsiflexion combined with eversion. No pain with passive plantar flexion combined with inversion. Ruled Out (inconsistent pain provocation pattern)
Peroneal tenosynovitis	Trace/mild with resisted plantar flexion combined with eversion. No pain with passive dorsiflexion combined with inversion. Ruled Out (inconsistent pain provocation pattern)
Talocrural and subtalar joints	Capsular pattern of limitation for the talocrural or subtalar joints not present. Ruled Out
Bone stress injury	No specific examination findings warranting additional special test considerations.
2. Possible Pain Generators Following Objective Examination	Special Test Findings
Bone stress injury	Positive tuning fork test Bone stress injury ruled in.

Table 1: Clinical decision chart of subjective and objective examination.

Intervention/Outcome: The patient was seen by his pediatrician who ordered a plain radiograph. Results of imaging revealed a nonossifying fibroma in the distal left tibia (see Figure 2). At this time an orthopedic consult was ordered by the patient’s pediatrician. The orthopedic surgeon reviewed the radiographs and diagnosed the patient with a fibular stress fracture and determined that the nonossifying fibroma was an incidental finding and not related to the subject’s symptoms. An MRI was performed to confirm this diagnosis. The patient was placed in a walking boot for three weeks and given specific return to running instructions. He was allowed to begin combined walking and jogging during the fourth week and jogging during week five. Full return to running was initiated at 8 weeks. At this time the patient was able to run 40 minutes without pain.

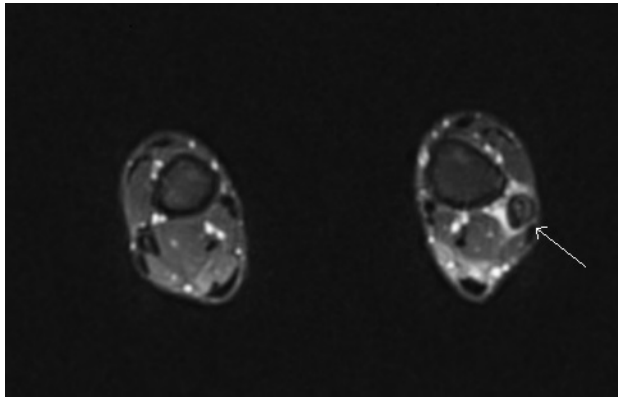


Figure 2: T2 axial MRI findings: Arrow points to periosteal reaction with surrounding soft tissue edema and focal bone marrow edema involving the distal fibular diaphysis.

Discussion

This patient presented with clinical history and examination findings consistent with a BSI of the distal fibula. A clinician's ability to differentiate BSI from other possible repetitive trauma injuries in runners is critical. An important component of the management of BSI is early diagnosis and activity modification which most often includes immediate cessation of running activity [2,13]. Misdiagnosis and failure to modify and or stop running can lead to progression of BSI to displaced fracture [14].

Other possible regional causes of this individual's pain included: lateral ligamentous structures, myotendinous structures (peroneal longus and brevis and extensor digitorum), and joint structures (talocrural and subtalar joints). The therapist's use of a systematic manual therapy examination process allowed him to rule out these conditions (see Table 1). Presence of BSI occur most frequently in the tibia accounting for 45% of BSI injuries in track and field athletes [1]. In this patient case the BSI occurred in the distal fibula which was previously reported to account for 12% BSI in track and field athletes [1].

Implications for Clinical Practice: Clinicians involved in the examination and treatment of adolescent distance runners must consider the potential for pathology of the fibula along with the more common tibial BSI. The physical therapist's use of a careful history, subjective and objective clinical examination, and special tests led to a successful functional outcome for an adolescent distance runner with a gradual onset of lateral ankle pain.

Conclusion

This case provides clinicians treating adolescent distance runners with essential considerations, and a systematic manual therapy approach to differential diagnosis of lower extremity pain related BSI.

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