Acute Posterior Ankle Pain in a Female Recreational Soccer Player

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Abstract: Os trigonum syndrome, a musculoskeletal disorder causing posterior ankle pain, occurs in approximately one in every 13 people. This condition can be challenging for the athletic trainer when evaluating an acute ankle injury. We present a unique case of an os trigonum successfully treated with conservative rehabilitation without a definitive diagnosis.

Ankle injuries in the pediatric population are common; however, proper evaluation requires a comprehensive understanding of the anatomy of the lower extremity in children. During periods of rapid growth, the centers of growth in bones, referred to as epiphyseal plates, are weak and vulnerable to injury. Pediatric ligaments are often stronger than the bones to which they attach; therefore, when the ankle is stressed the bones may fail before the ligaments. To confuse matters, the premature skeleton consists of accessory bones, such as the os trigonum, which may later fuse to larger bones after skeletal maturation. These non-fused accessory bones can be mistaken for fractures on radiographs (X-rays). An accurate diagnosis is of utmost importance when treating pediatric ankle injuries (Marsh & Daigneault, 2000); however, our case illustrated that in the current managed health care climate, Athletic Trainers can achieve a successful return to full activity without expensive diagnostic tests and definitive diagnoses.

Soccer presents a high risk of injury to the young athlete's ankle because of the skills required. For females, ages 10-14, soccer ranked third, behind basketball and bicycling, for incidence of non-fatal injuries requiring emergency room treatment (NEISSAIP, 2000). Ankle injuries account for nearly one-quarter of all injuries in soccer, with most ankle injuries resulting from tackling or being tackled (Giza, Fuller, Junge, & Dvorak, 2003). Since 77% of ankle injuries are sprains to the lateral ligament complex, the evaluation and diagnosis methods for these injuries are well documented (Woods, Hawkins, Hulse, & Hodson, 2003). However, due to the infrequency of posterior ankle injuries, evaluation of such injuries is less well understood.

Evaluating an ankle requires the clinician to follow a logical sequence of questions and observations. The information gleaned from the history, observation, and palpation portion of an orthopedic exam will guide and help the clinician in determining which special tests to perform. The bump and compression tests are used to rule out the possibility of fractures to the tibia and/or fibula. The anterior/posterior drawer tests are used to determine the laxity of the anterior and posterior talofibular ligaments, respectively. The inversion/eversion tilt tests are used to determine laxity of the calcaneofibular and deltoid ligaments, respectively, while the Kleiger test evaluates the integrity of the distal tibio-fibular syndesmoses. The Thompson test is used to rule out an Achilles tendon rupture (Magee, 1992). Accurate diagnoses can increase the likelihood that rehabilitation will be successful; however, our case illustrates the reality that clinicians may achieve a safe return to activity without a definitive diagnosis.

The goal of conservative treatment of posterior ankle pain is to return the athlete to full activity with minimal invasive techniques and reduced chance for re-injury. Rehabilitation is begun after necessary immobilization which can range from a few days to six weeks, with gradual progression to full weight bearing (Martin, 1989). Short term goals in the conservative treatment of posterior ankle pain are: restoring pain-free range of motion, increasing joint

stability/ proprioception, normalizing the gait pattern, and regaining pre-injury strength of the stabilizing muscles (Physical Therapy Notes, 2004). The long term goals are a return to pre-injury level of function and to reduce the risk of re-injury (Blake, 1992). We present a clinical case report of a 13-year-old female recreational soccer player suffering an injury to her left ankle resulting in posterior ankle pain. The purpose of this case report was to detail the successful non-operative management of this condition and add to the clinical evidence base regarding musculoskeletal injury in pediatric sport participants.

Background and Significance

Initial Evaluation

A 13 year old female recreational soccer player (pseudonym AM to protect anonymity) presented with a left ankle injury sustained after jumping up for a header and landing with her ankle in a hyper-plantarflexed and slightly everted position. AM reported feeling a "popping" in her posterior ankle and eight days later she reported to her family orthopedic physician with posterior ankle pain increasing with flexor hallucis and posterior tibialis contraction, point tenderness over the posterior soft tissue triangle, positive whip-snap test, and limited sensory deficits on the great toe. The examining physician reported AM's ankle appeared generally neurovascularly intact and stable to anterior/posterior drawer tests. (Physician Notes, 2003-2004)

Plain radiographs indicated no evidence of an epiphyseal fracture to AM's distal tibia or fibula; however, radiographs revealed a possible non-displaced fracture of the talar posterior process. Following initial physician evaluation and review of the radiographs, the course of action consisted of (a) applying a short-leg plaster cast for three weeks; (b) following-up with radiographs; and (c) if symptoms did not subside, performing a computed tomography scan (CT scan or magnetic resonance imaging (MRI). (Physician Notes, 2003-2004)

Follow up Evaluations

Four weeks after the initial injury, AM returned to the physician with moderate tenderness in her posterior ankle, a positive whip-snap test, and decreased pain compared to her previous visit. If the symptoms did not resolve, the physician discussed the possibility of ordering an MRI prior to considering injections or surgery. The MRI, an expensive diagnostic test, would be performed to rule out os trigonum syndrome or a tendon injury so as to rule out the necessity of injections. At this time, the plaster cast was removed and AM was fitted with a controlled ankle motion (CAM) walker-type boot and released with an appointment to reassess after three more weeks. (Physician Notes, 2003-2004)

Six weeks post-injury, AM presented with marked improvement of ankle pain and decreased pain with a whip-snap test. The athlete experienced increased pain with resistive inversion and point tenderness over the posterior tibialis tendon; however, she had no pain over the flexor hallucis tendon. In light of the significant resolution of the signs and symptoms, the orthopedic physician decided to continue with a conservative, non-surgical treatment plan which did not include an MRI. AM was placed into an Aircast® (Aircast, Inc., Summit, NJ) brace and scheduled for a re-assessment in two weeks. (Physician Notes, 2003-2004)

At eight weeks post-injury, AM stated that her symptoms had decreased significantly although she was unable to wear the Aircast® brace due to restrictions in her school dress code. Instead, the athlete was wearing the CAM walker-type boot at school. Upon physical exam, the whip-snap test was now negative, and the lower extremity was neurovascularly intact, but she was now tender to deep palpation on the posterior ankle. A Swede-O® ankle brace (Swede-O, Inc. North Branch, MN) was issued to the athlete and she was given an eight week prescription for physical therapy to strengthen her ankle. (Physician Notes, 2003-2004)

At nine weeks post-injury, the athlete reported to physical therapy with a diagnosis of left ankle pain. The chief complaint was sudden, sharp medial and lateral ankle pain with walking. The ankle was tender upon palpation over the medial calcaneous and deltoid ligament. Manual muscle testing measured strength at 4/5 for plantarflexion, dorsiflexion, inversion, and eversion. Bilateral girth measurements revealed equality between left and right ankles. The only significant difference in range of motion (ROM) at the ankle compared bilaterally was a deficit of 10 deg for both active and passive inversion. A proprioceptive test using a foam balance pad revealed an inability to maintain normal balance for more than 15 s compared to greater than 30 s on the uninvolved ankle. (Physical Therapy Notes, 2004)

After one month (11 visits) of physical therapy with the primary investigator, AM had made considerable progress with increased ROM and manual muscle testing compared to the initial evaluation. Manual muscle tests revealed increased strength to 5/5 for all motions except eversion, which was measured at 4+/5. Active and passive inversion ROM deficit were narrowed to 5 deg compared bilaterally. Based on the findings of the physical exam, the primary investigator and athlete agreed on setting specific short and long-term goals for her return to soccer activity. (Physical Therapy Notes, 2004)

Methods

The primary investigator developed this descriptive research project retrospectively as an athletic training student in his clinical education rotation through a physical therapy clinic. The primary investigator guided the subject of this case study through her ankle rehabilitation program. A signed medical release form was obtained from the athlete's parents in compliance with Florida International University's Institutional Review Board policies. We analyzed directly quantified observations during repeated measurements over the course of treatment as well as empirical data from diagnostic tests to establish the long range success of the treatment (Portney & Watkins, 2000). Data were evaluated and analyzed from the following sources: physical therapy evaluation and discharge forms, orthopedic physician clinical notes, and plain radiographs. Background data were collected by searching internet databases: PUBMed, Medline, and First Search using the following keywords: os trigonum, os trigonum syndrome, posterior ankle impingement, fracture of the talar posterior process, and talar compression syndrome. This information presented in this case study provides empirical findings that can be used to increase the realm of accepted knowledge and professional experience.

Results

Goals of Rehabilitation Program

Short term goals. The short term goals of physical therapy were to decrease the frequency and intensity of pain and to facilitate lower extremity function by improving ROM, strength, and proprioception. We achieved these goals after three weeks of physical therapy. Ice massage was used to control post-exercise pain and edema; standing gastrocnemius stretches and stationary bicycling to regain lower extremity ROM; four-way Theraband® (Hygenic Corporation, Akron, OH) resistance exercises and heel raise exercises to increase lower extremity strength; and a biomechanical ankle platform system (BAPS), foam balance pad, anterior/posterior balance board, and trampoline exercises to facilitate increased proprioception.

Long term goals. The long term goals of physical therapy were: (a) return the athlete to pre-injury level of function and (b) reduce the risk of re-injury to the ankle. We achieved these goals after seven weeks of physical therapy. To achieve pre-injury level of function, the athlete performed sport-specific exercises, specifically: light weight ball kicks, jogging simulation on a Cybex® leg press (Customized Fitness Systems, Los Angeles, CA), treadmill running, lateral

shuffling, lateral/forward bounding, resistive kicking using green Theraband®, figure-eight agility drills, and alternating toe-touches on a soccer ball. The athlete returned to pain-free recreational soccer activity approximately six months post-injury. To reduce the risk of re-injury to the ankle the athlete was encouraged to wear an ankle brace during athletic activities. (Physical Therapy Notes, 2004)

Discussion

Uniqueness of the Case

The posterior talus has a bifurcated shape, creating a groove formed by medial and lateral processes through which the flexor hallucis longus tendon runs. The os trigonum is an accessory bone shaped like a smooth pebble found adjacent to the lateral process of the posterior talus. A true os trigonum, not to be confused with os trigonum syndrome, is a secondary center of ossification that does not fuse with the talus after skeletal maturation (Grogan, 1990). Improper terminology and misidentification has resulted in a wide range of reported incidence of an os trigonum: 2-20% of the population (Blake, 1992). Os trigonum syndrome can be an inflammation of the posterior ankle joint capsule or ligaments surrounding the os trigonum, a fracture of the os trigonum itself, or pathology of the lateral process of the posterior talus (Blake, 1992). An os trigonum can exist asymptomatically; however, excessive plantarflexion can cause injury to the os trigonum because of its location between the posterior talus and the posterior distal tibia. The most accurate method for diagnosing os trigonum syndrome is though the use of MRI with a radiologist evaluation (Bureau, 2000). The aims of treatment should be returning the full functional capacity of the ankle with minimal invasive intervention (Blake, 1992). If the os trigonum syndrome involves only soft-tissue structures, then the ankle should be immobilized for 3-4 weeks (Martin, 1989). If the os trigonum is fractured, then immobilization could last 4-12 weeks (Kravitz, 1989). Surgical excision should only be considered after conservative treatments and local injections of anti-inflammatories have failed to resolve symptoms (Weinig, 1990).

The uniqueness of our case was that we achieved a safe return to play without a definitive diagnosis. The athlete in our case presented with a history and signs/symptoms consistent with os trigonum syndrome, however, she was diagnosed with a more generic and less descriptive condition of posterior left ankle pain. No radiological diagnostic tests such as bone scans, CT scans, or MRI were performed due to the substantial resolution of signs and symptoms within the first six weeks. Since the conservative methods had proven successful in treating the injury, the physician could not justify the cost of performing further diagnostic tests (i.e., MRI, CT scans). One week after discharge from physical therapy, the family physician noted no functional difference between the involved and noninvolved ankles (Physician's Notes, 2003-2004).

Clinical Implications

As athletic trainers, we may often find ourselves charged with the responsibility of creating a rehabilitation program without a specific diagnosis of injury from a physician. Nevertheless, our case illustrated that it is still possible to achieve a successful rehabilitative outcome. It is important for allied health professionals to be aware of os trigonum syndrome when evaluating posterior ankle injuries and to be open to non-invasive methods of treatment. Signs and symptoms of this condition are often confused with other common injuries of the ankle such as tibialis posterior and flexor hallucis tendonitis, Achilles tendon rupture, peroneal subluxation, tarsal tunnel syndrome, Sever's disease, and injury to the talar posterior process. Clinicians should be aware that the os trigonum syndrome can be a source of posterior-lateral ankle pain (Brown et al., 1995) and can only be accurately diagnosed via MRI and/or bone scanning (Bureau, 2000).

References

Blake R. L., Lallas P. J., & Ferguson H. (1992). The os trigonum syndrome: A literature review. *Journal of the American Podiatric Medical Association, 82,* 154-161.

Brown G. P., Feehery R. V., & Grant S. M. (1995). Case study: The painful os trigonum syndrome. *Journal of Orthopaedic and Sports Physical Therapy, 22,* 22-25.

Bureau N. J., Cardinal E., Hobden R., & Aubin B. (2000). Posterior ankle impingement syndrome: MR imaging findings in seven patients. *Radiology, 215,* 497-503.

Giza E., Fuller C., Junge A., & Dvorak J. (2003). Mechanisms of foot and ankle injuries in soccer. *American Journal of Sports Medicine, 31,* 550-554.

Grogan D. P., Walling A. K., & Ogden J. A. (1990). Anatomy of the os trigonum. *Journal of Pediatric Orthopedics, 10,* 618.

Kravitz S. R. (1989). The biomechanics of dance and dance related injuries. *Sports Medicine of the Lower Extremity.* New York, Churchill Livingstone.

Magee D. J. (1992). *Orthopedic physical assessment* (2nd ed.). Philadelphia: W. B. Saunders Company.

Martin B. F., (1989). Posterior triangle pain: The os trigonum. *Journal of Foot Surgery, 28,* 312.

Marsh J. S., Daigneault J. P. (2000). Ankle injuries in the pediatric population. *Current Opinion in Pediatrics, 12,* 52-60.

National Electronic Injury Surveillance System All Injury Program. (2001). *National estimates of nonfatal injuries treated in hospital emergency departments. United States, 2000.* MMWR 2001; 50, 340-346.

Physical Therapy Notes. (2004). Heartland Rehabilitation Services (Mandarin), 11363 San Jose Boulevard/Suite 201 Jacksonville, FL 32223.

Physician's Notes (2003-2004). Nemours Children's Clinic, 807 Children's Way, Jacksonville, FL 32207.

Portney L. G., & Watkins, M. P. (2000). *Foundations of clinical research*. Upper Saddle River, NJ: Prentice Hall Health.

Weinig, J. A. (1990). Os trigonum syndrome. *Journal of American Podiatric Medical Association, 80,* 278.

Woods C., Hawkins R., Hulse M., & Hodson A. (2003). The Football Association Medical Research Programme: An audit of injuries in professional football: An analysis of ankle sprains. *British Journal of Sports Medicine, 37,* 233-238.

Figure 1

Figure 2

Figure 1. Lateral radiograph of an ankle with an os trigonum. Accessed from: http://www.sma.org.sg/smj/4503/4503me1.pdf on December 10, 2004.

Figure 2. Lateral radiograph of the ankle in our case. Accessed from: Physician prescribed radiographic images.