Evidence-based Approach to Treatment of Acute Traumatic Syndesmosis (High Ankle) Sprains

Annunziato Amendola, MD, Glenn Williams, PhD, PT, ATC,† and Dan Foster, PhD, ATC‡*

Abstract: Ankle sprains in the athlete are one of the most common injuries, and syndesmosis or "high-ankle" sprains seem to being diagnosed at an increasing rate. As a result, there has been a heightened interest in recognizing and treating these difficult injuries on a timely basis, particularly in the athlete. Although the recognition and diagnosis of these injuries have improved, there still exists a paucity of information on optimal conservative and operative management. In this paper, a systematic review of the literature was conducted to provide an evidence-based rationale in the diagnosis and treatment of syndesmosis (high ankle) sprains in athletes. It is obvious from the low level of evidence available in the literature on this topic that a great deal of work is needed before conclusive statements regarding the management of these injuries can be made with confidence. The current diagnostic tests are not very specific. Because this is a spectrum of injury, there is a lot of variability in the time lost from sport. It is clear that we need a much more definitive diagnostic process for this injury that allows us to predict the severity of the injury, time loss from sport, and the treatment required.

Key Words: ankle sprains, syndesmosis, mortise, high ankle sprains

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Ankle sprains in the athlete are one of the most common injuries, and syndesmosis type sprains seem to being diagnosed at an increasing rate. Although the incidence of syndesmosis injuries, or "high ankle sprains," has only been reported previously to represent from 1% to 11% of ankle sprains, these reports may have underestimated the frequency of these injuries due to a low index of suspicion and a lack of recognition of the signs and symptoms of syndesmosis injury.[1,2]

Nussbaum et al[3] recently prospectively followed 60 consecutive collegiate athletes over a 3-year period at a single institution with syndesmosis ankle sprains. This included all degrees of injury, but may herald that these injuries are more common than previously recorded. Although the recognition and diagnosis of these injuries has improved, there still exists a paucity of information on optimal conservative and operative management.

The objective of this paper is to systematically review the evidence-based rationale in the diagnosis and treatment of syndesmosis (high ankle) sprains in athletes. Syndesmosis injury associated with fracture or obvious widening of the mortise is better understood and should be treated with operative reduction and stabilization. This does not involve any controversy.

Although the examination, imaging modalities, and treatment will be discussed, the focus of this paper will be an assessment of the evidence in the literature through a systematic review of high ankle sprains focusing on diagnosis, the time lost from sports, and treatment regimens administered.

PHYSICAL EXAMINATION

Special tests for the evaluation of syndesmosis injuries include the squeeze test, the external rotation test, the fibula-translation test, the Cotton test, and the crossed-leg test.[4] The squeeze test is performed by compressing the tibia and fibula proximally in the calf. Pain at the level of the ankle joint indicates a positive test. The dorsiflexion—external rotation test is performed by placing the ankle in a dorsiflexion position and applying an external rotation force. Pain with this maneuver indicates a positive test. A positive dorsiflexion—external rotation test is associated with a longer return to preinjury activities. The fibular mobility test is performed by stabilizing the tibia with one hand and attempting to translate the fibula in an anterior-posterior direction with the other hand. Pain with this maneuver and increased translation compared to the contralateral side indicate a positive test. This test is poorly correlated with both syndesmotic rupture in a cadaveric model and the clinical presence of a syndesmosis rupture. Although the presence of any of these positive tests should arouse suspicion to this injury, there are no studies demonstrating that one test is reliably predictive of the severity of a syndesmosis sprain.

Beumer et al[4,5] performed a biomechanical evaluation of 4 special tests to determine the degree of distal tibiofibular displacement induced by each test in intact cadaveric ankles and after sectioning of the anterior

From the *Department of Orthopaedic Surgery, University of Iowa, 200 Hawkins Drive 01018 JPPLL; †Department of Physical Therapy and Rehabilitation Science, University of Iowa, 200 Hawkins Drive 1-247 MEB; and ‡Department of Exercise Science, University of Iowa, 200 Hawkins Drive 414FH, Iowa City, IA 52242.

Reprints: Annunziato Amendola, MD, Department of Orthopaedic Surgery, University of Iowa, 200 Hawkins Drive 01018 JPPLL, Iowa City, IA 52242 (e-mail: ned-amendola@uiowa.edu).

talofibular ligament, the posterior talofibular ligament, and the deltoid ligament. The average increase in displacement after sectioning of all ligaments was only approximately 1 mm. Another biomechanical evaluation of the squeeze test demonstrated that the distance between the tibial and fibular attachment sites of the anterior tibiofibular ligament only increased by approximately 0.2 mm after sectioning of syndesmotic ligaments.[6] Therefore, clinical evaluation of displacement cannot be used to predict the extent of syndesmosis injury.

IMAGING

Imaging of syndesmosis injuries of the ankle should begin with plain radiographs to rule out fracture and to look for the presence of diastasis of the syndesmosis (Fig. 1). Diastasis is identified by an increased tibiofibular clear space on an anteroposterior radiograph to a value of 6 mm or greater.[7] Avulsion fractures from the anterior or posterior tibia can occur in up to 50% of syndesmosis injuries and aid in identifying disrupted structures[8] (Fig. 2). Radiographs may also demonstrate calcification at the area of interosseous injury above the syndesmosis or posteriorly at the tibial attachment of the posterior inferior syndesmotic ligament.

FIGURE 1. X-ray demonstrating acute syndesmosis disruption with increased medial clear space and decreased tibiofibular overlap.

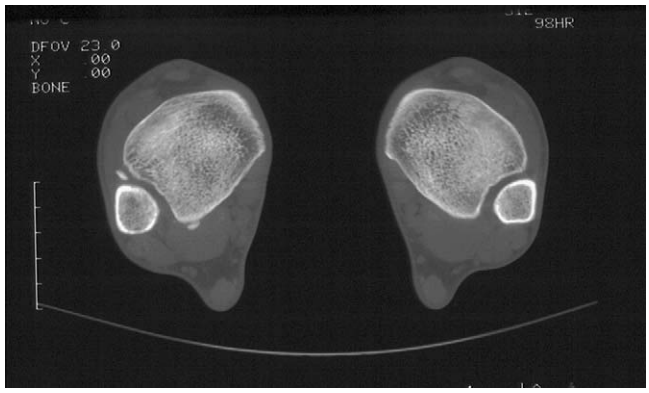

FIGURE 2. CT scan demonstrating avulsions of both the anterior and posterior ligaments but without diastasis.

Some authors have advocated using stress radiographs to identify injuries to the syndesmosis. Beumer et al[9,10] used radiostereometric techniques to evaluate changes in translation and rotation with 7.5 Nm external rotation stress after sequential sectioning of the syndesmotic ligaments in cadaveric ankles. Even after sectioning the anterior tibiofibular, posterior tibiofibular, and deltoid ligaments, the mean medial-lateral translation was only 1.01 mm (range 0.1 to 2.1 mm), and the mean anterior-posterior translation was only 1.86 mm (range 6.15 mm posterior to 3.45 mm anterior). Based on these data, external rotation stress views cannot be reliably used to predict syndesmosis injury. If stress views are used manual stress in external rotation may be applied, but a Telos stress device may be helpful in avoiding radiation (Fig. 3).

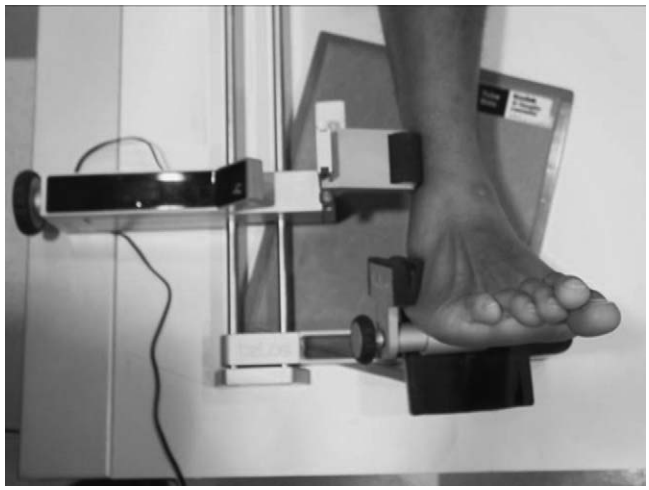

FIGURE 3. Positioning of an ankle in the Telos stress device over the x-ray cassette.

FIGURE 4. Lateral MRI view demonstrating the posterior edema from injury to the PITFL.

Magnetic resonance imaging (MRI) can be used to diagnose syndesmosis injury; however, it has been difficult to visualize subtle injuries. In one of the most recent studies,[11] MRI confirmed the diagnosis but did not alter treatment plan or prognosis (Fig. 4).

Takao compared the accuracy of the x-rays and MRI with arthroscopy of the ankle for the diagnosis of a tear of the syndesmosis. In comparison with arthroscopy, the sensitivity, specificity, and accuracy were poor for radiography. For MRI they were 100%, 93.1%, and 96.2% for a tear of the anterior inferior tibiofibular ligament and 100%, 100%, and 100% for a tear of the posterior inferior tibiofibular ligament. Based on this work, MRI was useful, but arthroscopy was the most accurate diagnostic tool[12] (Fig. 5).

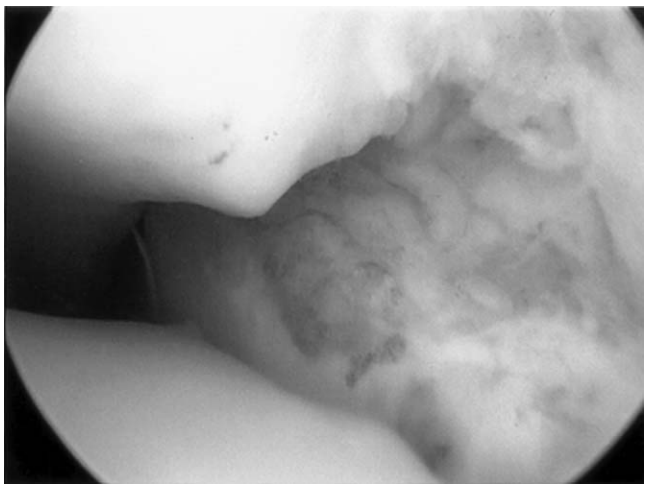

FIGURE 5. Arthroscopic view of disrupted anterior tibiofibular ligament.

Systematic Review of Syndesmosis Sprains

The database search did not identify any randomized controlled trials; the highest level of evidence available was level 4 (case series; retrospective review). Series were excluded unless they collected data prospectively on consecutive patients and included only athletically active patients. In addition, only studies dealing with isolated syndesmosis sprains without radiographic widening of the mortise or associated ankle fracture were included for review. Six studies met the criteria for review (Table 1).

DIAGNOSIS

The studies included in this review were published from 1992 to 2004. The patients reported on in all of the case series were highly active in sports including professional hockey players, football players, collegiate athletes, and army cadets. The diagnosis in all of these studies was a clinical diagnosis. Radiographs were performed but the diagnosis was not based on radiographic or MRI findings.

TIME LOST FROM SPORT

There was a large variation in the time lost from the sport and return to play. The average time lost ranged from 6.3 practices (in football), which is approximately 1 to 2 weeks to 52 days.[2,12] The range of time lost ranged from 0 to 137 days.[11] All of the studies demonstrate a significant variation in the time lost from sport. The average follow-up ranged from 6 to 47 months.[14] In terms of recurrence, not all articles reported recurrence rate. Nussbaum et al[3] reported a 6% recurrence (3 out of 53). Taylor et al[14] reported a 43% incidence of recurrent injuries; however, only 3 recurrent injuries were syndesmotic sprains.

Homogeneous outcome measures were not used in these studies. Generally, clinical type scales were used in terms of returning to function. In addition, functional outcome was not reported in every study. In 4 out of the 6 studies a functional outcome measure was used and most of the patients returned to good or excellent function once their injury recovered. In terms of surgery, Wright et al[11] had reported 1 out of 14 cases and Hopkinson et al[2] reported 1 out of 15 cases. In most of these reports, surgery was not required and conservative treatment was employed. A number of nonoperative modalities were used including removal from activity, immobilization, ice, anti-inflammatory medication, and a number of other physical therapy modalities and exercise. In general, once patients became pain free and were able to function and were reported to be in excellent condition, based on their pain and function, they were allowed to return to sport gradually. No consistent treatment regimen was employed.

Treatment

There is variability in the treatment of these types of sprains. In general, if there is mortise widening, operative stabilization is required. With most of these sprains the

TABLE 1. Studies on Acute Ankle Syndesmosis Sprains in Athletic People

Authors	Injuries	Level of Activity	Time Lost (Range)	Average Follow-up	Recurrent Injuries	Outcome Measure	Functional Outcome	Surgery
Wright et al[11]	14	Professional hockey	45 d (6-137)	Not specified	Not reported	None	N/A	1/14 (7%)
Boytim et al[13]	15	Professional football	6.3 practices (2-21), 1.4 games (0-5)	Not specified	Not reported	None	N/A	0% (0/15)
Nussbaum et al[3]	60	NCAA Division I athletes	13.4 d (5-24)	Minimum 6 mo for 53 patients	3/53 (6%) (3 with recurrent ankle sprains)	5-point scale for symptoms and function	4.7 (good-excellent function)	0% (0/60)
Taylor et al[14]	44	NCAA Division I Football	31 d (10-98)	47 mo	19/44 (43%) (15 lateral ankle sprains, 3 syndesmosis sprains, 1 bimalleolar fracture	5-point scale for symptoms and function	> 4 (none to mild symptoms)	0% (0/44)
Hopkinson et al[2]	15	Army cadets	52 d (17-115 d)	20 mo (7-39 mo) in 10 patients	None	None	4.2 (good-excellent function) No recurrent instability symptoms	1/15 (13%)
Gerber et al[15]	16	Army cadets	Not specified, although < 6 mo for all patients	Minimum 6 mo	Not reported	Acceptable/unacceptable (no pain, no decrease in function, functional hop > 80% of uninjured side)	Acceptable outcomes for 4/16 (25%) at 6 wk and 7/16 (44%) at 6 mo	

mortise is normal, even with external rotation stress; consequently, conservative treatment has been employed. It is evident from this review that time lost from sport is variable and the severity of the injury is difficult to accurately assess, which makes it difficult to accurately predict disability. Brosky et al[16] and Nussbaum et al[3] both employed a staged conservative regimen directed at reducing pain and swelling acutely, at regaining range of motion and strength subacutely, and then progress to functional training and finally return to sport. The timeframe for these was in the range of 2 to 6 weeks without very specific progression criteria.

Chronic sprains with recalcitrant pain and functional instability usually require operative treatment. Other than case series, very poor evidence exists as to the timing or type of procedure. Usually, arthroscopy is required to confirm the diagnosis, treat intra-articular problems, and provide fixation of the distal tibiofibular syndesmosis. The postoperative regimen used is generally the same as the one used when treating an acute syndesmosis disruption.

DISCUSSION

Syndesmotic or high ankle sprains continue to be a common injury that result in significant time lost from sport. It is obvious from the low level of evidence available in the literature on this topic that a great deal of work is needed before conclusive statements regarding the management of these injuries can be made with confidence. The conclusion that can be drawn from the current evidence is that the current diagnostic process probably fails to clearly assess the severity of the injury, which reduces the likelihood of accurately predicting the time lost from sport. The current diagnostic tests are not very specific. Because a spectrum of injury is included together with our current methods, it is not surprising that there is a lot of variability in the time lost from sport. Syndesmosis sprains can be significant injuries that result in an inability to play sports for significant periods of time (up to 137 d). Yet, some athletes diagnosed with syndesmosis injuries experience very little disability and are able to return to sport almost immediately. Obviously, these are 2 different types of injuries: one that is quite severe and disabling and one that is not very significant at all. It is clear that we need a much more definitive diagnostic process for this injury that allows us to predict the severity of the injury, time loss from sport, and the treatment required. In addition, one questions the use of conservative treatment for syndesmotic injuries in which several weeks are missed from the sport. Operative treatment may augment or improve the ability to return to sport at full function in a timely manner.

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