

## Diagnosis of syndesmosis sprain (Comparing radiography and physical examination)

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### Introduction:

The syndesmosis refers to a wide sheet of a ligament that connects the fibula to the tibia. Normal movement of the ankle depends on a precise relationship determined by the syndesmosis. The majority of ankle injuries are mild and easy to manage. The syndesmosis injury however has a far much serious implication. Despite the severity of ankle syndesmosis injuries, it has been argued that they are relatively poorly detected. This condition however, is difficult to diagnose by radiological examination when the tears are incomplete or if there is no opening of the distal tibiofibular joint. Magnetic resonance imaging can identify rupture of syndesmosis with a high degree of sensitivity and specificity.

### Methods and materials:

100 patients with acute ankle sprains were first routinely examined and then asked to volunteer in this study, from June 2006 till January 2007. Inclusion criteria were skeletally mature adult with acute ankle sprain who had no fracture and the patients were examined on the day of injury. Physical examination included: 1) palpation of syndesmosis 2) Squeeze test 3) External rotation test 4) Crossed leg test. Crossed-leg test was performed as following: the seated patient crossed the injured leg and placed the junction of the middle third and distal third of the leg (pivot point) on the noninjured knee. A downward force was applied by the patient's hand to the medial aspect of the knee (or by examiner). Pain produced at the syndesmosis was suggestive of a syndesmosis injury.

On the AP & mortise radiographs the tibiofibular clear space was measured. Tibiofibular clear space >6 mm was assumed positive. The second radiologic evaluation was medial clear space, which more than 4 mm was assumed positive.

Magnetic resonance imaging scans were performed for all patients on a Esaote arthros scanner with a wrap-around extremity coil designed for the ankle. The examination protocol consisted of transverse T1-weighted, spin-echo sequences and transverse T2-weighted, spin-echo sequences. Only axial planes were obtained because they are the most useful in the evaluation of the tibiofibular syndesmosis. The diagnostic criteria for determining a tear were discontinuity, a decrease of tension or an abnormal course of the ligament.

We evaluated the AP and mortise radiographs and physical examination regarding to sensitivity and specificity compared with MRI.

### Results:

The patients' age averaged 28.5 years (range: 18 to 60), 58 patients were women and 42 men. On the basis of MRI, 4 patients had syndesmosis sprain, which only one of them was complete. Three patients had partial ruptures. X-ray was positive in one patient. Thus one true positive, 96 true negative, 3 false negative and no false positive were detected for radiographic findings. Therefore, the sensitivity was 25%, and the specificity 100% (table.1)

Crossed-leg test was positive in 29 patients, external rotation test was positive in 40 patients, squeeze test was positive in 40 patients and tenderness of syndesmosis was positive in 44 patients (table.1)

Table 1: The diagnostic results for each diagnostic method

	True (+)	True (-)	False (+)	False (-)	Sensitivity (%)	Specificity (%)
Radiography	1	96	0	3	%25	%100
Crossed-leg test	4	71	25	0	%100	%74
External rotation test	4	60	36	0	%100	%62.5
Squeeze test	3	59	37	1	%75	%61.5
Tenderness of syndesmosis	4	56	40	0	%100	%58.3

### DISCUSSION:

Sprains of lateral ligaments of the ankle are the most common musculoskeletal injury in sport and make 12% of visits to emergency departments. In spite of common occurrence of ankle sprains, syndesmosis injuries are rare, but very debilitating and frequently misdiagnosed. The incidence of syndesmosis sprain varies in different articles from 1%-17%. In our study it was 4%. Foot and ankle injuries were the second most common injury at 2002 Winter Olympics.

Ramsey and Hamilton showed the first 1-mm lateral displacement of the talus reduced the contact area at the tibiotalar articulation up to 42%, increased force transmission per unit area and an increased likelihood of progression to degenerative disease.

*LARGE changes may occur after MINOR ligamentous disruptions.* Weening and Bhandari found that reduction of the syndesmosis was a significant predictor of functional outcome. Similarly, in an athletic population, the most predictive factor of residual symptoms 6 months after an ankle injury was a syndesmosis sprain. Those patients sustaining incomplete injuries to the ankle syndesmosis had a recovery time of almost twice of those patients with severe (3rd degree) ankle sprain. After syndesmosis injury, chronic ankle pain can occur if the diagnosis is missed and appropriate treatment is not rendered.

Thus, patients would **greatly benefit** from an early diagnosis regarding the ligaments involved. Therefore, we should focus on diagnostic tools: physical examination, standard radiographs, stress radiographs, arthrography, arthroscopy, MRI.

Stress radiographs need general anesthesia thus it is not wise to take the patient to the operating room and give the risk of anesthesia to him or her for diagnosis of syndesmosis sprain. Arthrography in the most instances has been replaced by MRI since it is expected to have a similar high sensitivity and specificity. Recently, arthroscopy has become a standard procedure for the diagnosis and treatment of disorders of the ankle (but not for syndesmosis sprain). It has some disadvantages: 1) It is not justified to take the patient to the operating room and give the risk of anesthesia and the cost of arthroscopy for a diagnostic procedure 2) The interosseous tibiofibular ligament is attached approximately 1 cm or more above the joint line and is difficult to identify at arthroscopy 3) Inability to diagnose intra ligamentous rupture 4) Inability to diagnose joint congruity & bone bruise comparing with MRI 5) Potential of distribution of fluid in acute setting. Therefore, in spite of usefulness of arthroscopy in diagnosis of syndesmosis injury in patients who need to go to the operating room, it is not justified as a diagnostic procedure for syndesmosis sprain.

Physical examination has high sensitivity and low specificity. Crossed-leg test is the most accurate clinical test. The crossed-leg test mimics the mechanism of the squeeze test, but avoids some of its disadvantages: the pivot point where the leg is squeezed may be inconsistent among different examiners and the test is difficult and requires more power for pressure in large legs. Alonso reported that the interobserver reliability of the squeeze test is moderate. We have found that the external rotation test is almost impossible to be performed in acute setting (due to pain and swelling) and may lead to false positive test. Crossed-leg test requires no manipulation and it uses gravity and the pair-force of gravity (action and reaction). Another advantage of crossed-leg test is that the size of the leg has no effect on the result. So the crossed leg test is the most reliable clinical test for diagnosing the syndesmosis sprain.

AP & mortise view have low sensitivity (25%) and high specificity (100%). Sensitivity and specificity of radiography and physical examination were not satisfactory for the consistent diagnosis of a tear of the tibiofibular syndesmosis. A magnetic resonance imaging (MRI) may be useful in the athlete or those with equivocal findings, who may have a syndesmosis injury without fracture. In addition MRI can diagnose intra ligamentous rupture, joint congruity, bone bruise and cartilage damage. Only axial planes are necessary for evaluating tibiofibular ligaments, so it is more cost-effective. MRI is recommended in athlete or those with equivocal findings.