Injury to the tibiofibular syndesmosis can occur with ankle sprain or fracture. The incidence of syndesmotic injury has not been specifically studied at a population level. Data on syndesmotic injury were obtained from the Healthcare Cost and Utilization Project (HCUP), a federal-state-private partnership. It is administered by the Agency for Healthcare Research and Quality, a division of the US Department of Health and Human Services. Two HCUP databases were queried for 8 states: the State Inpatient Database and the State Emergency Department Database. The first 6 International Classification of Diseases, Ninth Edition (ICD-9) code diagnoses were searched for codes that are used for syndesmotic injury (ie, 845.03). These data, along with data from the 2010 US census, were used to yield incidence rates for syndesmotic injury, as well as for various demographic groups. National estimates of injury totals were also calculated. In the 8 states, there were a total of 1821 syndesmotic injuries. Given the population of these states, the incidence rate of syndesmotic injury was 2.09 syndesmotic injuries per 100,000 person-years. This incidence correlates to an estimated 6445 syndesmotic injuries per year in the United States. These data provide some baseline numbers as to the incidence of syndesmotic injury in the United States. Although the incidence was low relative to some other injuries, the fact that syndesmotic injuries tend to occur in younger patients may have a greater effect in terms of productive years of life lost.

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The distal tibiofibular syndesmosis is the articulation between the tibia and fibula that is just proximal to the ankle joint. This syndesmosis is stabilized by ligaments anteriorly, posteriorly, and centrally. Injuries to the tibiofibular syndesmosis can occur both with and without ankle fracture and sometimes with a proximal fibula, or Maisonneuve fracture. In terms of severity, these injuries can encompass a simple sprain all the way up to complete ligament disruption with frank diastasis. These injuries sometimes require operative treatment, and, in some patients, it is difficult to definitively know whether syndesmotic injury exists until surgery.

A host of studies have reported the incidence of various injuries in certain populations. Van Staa et al reported fractures in England and Wales between 1988 and 1998. Tibial, fibular, and ankle fractures were grouped together based on International Classification of Diseases, Ninth Edition (ICD-9) codes, and a rate of 14.8 fractures per 10,000 person-years was found.\(^1\) Yang et al performed 2 similar studies in Taiwan and found a rate of 13.1 ankle fractures per 10,000 person-years and 2.0 ankle dislocations per 100,000 person-years. The incidence of syndesmotic injury is not known, nor has it ever been specifically studied at a civilian population level. Some studies have documented syndesmotic injury in various populations of athletes and military personnel.\(^4,8\) However, none of them sought to define the incidence of this injury in the general population. The purpose of the current study was to define the incidence of syndesmotic injury in a large population.

**Materials and Methods**

Data were obtained from the Healthcare Cost and Utilization Project (HCUP), a federal-state-private partnership.\(^9\) It is administered by the Agency for Healthcare Research and Quality, a division of the US Department of Health and Human Services. The Healthcare Cost and Utilization Project is the largest collection of medical care data in the United States; it includes data for patients with all insurance types (Medicare, Medicaid, private, uninsured) and of all ages.

For this study, data from 2 HCUP databases were used: the State Inpatient Database (SID)\(^10\) and the State Emergency Department Database (SEDD).\(^11\) They both include patient-level data, including diagnosis, procedure, demographics, and charges. The SID includes these data on every inpatient, whereas the SEDD includes these data on every emergency department visit that did not result in hospital admission. In both databases, these data are recorded in a given state for a given year. Forty-four states participate in SID and 27 states participate in SEDD. A representative national sample of 8 states (Arizona, California, Florida, Iowa, Maryland, Massachusetts, New Jersey, and Vermont) that participated in both the SID and SEDD in 2009 was obtained. This allowed analysis of both emergency care and admitted patients.

The patients were identified by the first 6 diagnoses in each visit record from ICD-9,\(^12\) which reflected codes for syndesmosis injury (ie, 845.03). These totals were then divided by the populations of the states as reported by the 2010 US census\(^13\) to yield an incidence rate, reported as syndesmosis injuries per 100,000 person-years. Injury rates were also calculated by age group, sex, and socioeconomic status as measured by state quartile of median household income for the patient’s ZIP Code. National estimates of syndesmotic injury totals were calculated using the incidence rates established herein and the total US population. All statistical analyses were performed using Stata 9 statistical software (StataCorp, College Station, Texas).

**Results**

In 2009, in the 8 states studied, there were a total of 1821 inpatient or emergency department visits for which 845.03 was one of the first 6 ICD-9 codes. Given the population of these states, that results in an incidence of 2.09 syndesmotic injuries per 100,000 person-years. This incidence correlates to an estimated 6445 such injuries each year in the United States. The rate of syndesmotic injury for men (2.15 per 100,000 person-years) was higher than that for women (1.65 per 100,000 person-years). In terms of age, the highest rate was in patients aged 18 to 34 years, whereas patients aged 0 to 17 years had the lowest incidence. After the peak in 18- to 34-year-olds, the incidence slowly declined with age (Figure).
**Discussion**

These data provide a conservative estimate of the incidence of syndesmotic injury in a large population in the United States. However, the data must be viewed in light of several limitations. First, the data are only for patients who were either seen only in the emergency department or who were admitted to the hospital, according to those patients’ ICD-9 codes. As a result, any patient who went to a private office or clinic, bypassing the emergency department, was not counted, and any patient who was not admitted to the hospital was not counted. For example, a patient with this injury who saw an orthopedist in the office and then had an outpatient surgery was not counted. Moreover, it is possible that not all orthopedists or treating physicians specifically use the ICD-9 code for syndesmotic injury, perhaps using a more generic ankle sprain code (ie, 845.00). As a corollary, syndesmotic injury represents a spectrum, and some syndesmotic sprains could perhaps not be fully differentiated from other sprains and may therefore be underrepresented. In this way, the numbers in this study almost certainly represent an underestimate.

Syndesmotic injury represents a spectrum of injury from anterior inferior tibiofibular ligament sprain all the way to ankle fracture with tibiofibular diastasis; these injuries may be represented the same in this study, although they are treated differently by orthopedic surgeons. Perhaps even more, the difficulty involved in the accurate diagnosis of syndesmotic injury may cast some doubt over the accuracy of the ICD-9 code diagnosis. Certainly, the data are perhaps more dubious in the emergency department, in which the billing data are entered by emergency department physicians who may have less experience with syndesmotic injury, although controversy exists among orthopedic surgeons as to how best to diagnose syndesmotic injury. Many of the patients who were admitted to the hospital likely underwent surgery for their syndesmotic injury, so the diagnosis is perhaps more assured. However, these restrictions are all innate in a study that relies on these data.

The states chosen from the respective data banks were chosen because they were thought to be a representative sample of the nation as a whole from both geographic and population standpoints. Although including more states would have been beneficial and yielded more data, it was felt that these states gave a sufficient amount of data for evaluation.

The incidence of syndesmotic injury was low, at 2.09 syndesmotic injuries per 100,000 person-years. By way of contrast, a recent study from Sweden examined ankle fractures and found an incidence of 71 per 100,000 person-years. However, this estimate is also low because various other studies over the past quarter century have placed the incidence anywhere between 65 and 187 per 100,000 person-years. Even taking into account that the incidence is likely higher than the current data show, the incidence of syndesmotic injury is lower than the incidence of ankle fracture. However, syndesmotic injuries relate to the risk of posttraumatic ankle arthritis in the long term. Given the clinical difficulty of accurate syndesmotic reduction at surgery, these injuries could represent a significant burden of disease. Moreover, the fact that these injuries tend to occur in younger people adds to the burden of disease.

Data on the incidence of syndesmotic injury are limited, and most of them come from sports and the military. These injuries are thought to occur primarily in contact sports, and especially sports that involve rigid immobilization of the ankle in a boot, such as skiing and hockey. Flik et al prospectively assessed data on injuries sustained by 8 NCAA Division I hockey teams over 1 season. In 23,096 athlete exposures, there were 5 syndesmotic sprains. An exposure was defined as 1 player participating in 1 practice or game. Wright et al reported 14 syndesmotic sprains in 2 National Hockey League franchises over 10- and 7-year periods, respectively, although they did not normalize the data per player or exposure. Hopkinson et al retrospectively reviewed the clinical records and radiographs of 1344 ankle sprains at the US Military Academy over a 41-month period. There were 15 syndesmotic sprains, although only 2 were documented radiographically; the others were all diagnosed with the squeeze test. The squeeze test, as with many clinical tests for syndesmotic disruption, has been called into question with regard to its accuracy.

Waterman et al estimated the rate of and risk for syndesmotic injuries in an active cadet military population. Not only are cadets required to maintain the highest level of physical fitness, but they are also required to participate in intramural, club, or intercollegiate sports in each semester of their United States Military Academy attendance. The authors found the incidence of syndesmotic injury to be 4.8 per 1000 person-years. The incidence was slightly higher in men (4.9) than in women (4.6), although this difference was not statistically significant. This rate of injury is almost 200 times that of the current study; this difference is likely related to the intense physical training necessary in the military. Clearly, in those who maintain an active, rigorous lifestyle, the risk of syndesmotic injury is greatly increased vs the general population.

Perhaps not surprisingly, the rate of syndesmotic injury was greater in men than in women in the current study. These injuries are often thought to be associated with an active lifestyle and, more specifically, sporting activity, especially contact sports. This theory may at least partially explain the higher incidence in men. There is some evidence that female sex hormones affect the mechanical properties of ligaments, and receptors for estrogen have been identified in both ligaments and tendons. These ligamentous differences could also possibly play a role. The age data seem to support the theory...
that syndesmotic injury is correlated with activity level because 18- to 34-year-olds had the highest incidence, and the incidence steadily declined with age. In the young (0-17 years) group and the older (65 years and older) group, the incidence was relatively lower, likely due to the fact that those patients are more likely to sustain a growth plate injury (young group) or a fracture (older group). Again, the fact that these injuries tend to occur in younger patients adds to the burden of disease because some of these patients will develop posttraumatic arthrosis. Although the rate at which this happens is not known, some of these patients will have productive years of life lost secondary to disability from this injury.

**CONCLUSION**

This study’s data provide some baseline numbers as to the incidence of syndesmotic injury in the general population in the United States, which has not previously been reported in the literature. Younger, skeletally mature patients are at greater risk for syndesmotic injury, as are those who are active. Although the incidence is low relative to some other injuries, young patients with this injury may have some productive years of life lost as a result of sequelae from this injury.

**REFERENCES**


