

Statement of Purpose

The most prevalent type of ankle fracture is an oblique isolated fibular fracture. This injury is most often relatively benign and treated conservatively in a cast or fracture boot. With the absence of a medial malleolar fracture or equivalent, these injuries should be isolated to the fibula with no other concomitant injuries according to the Lauge-Hansen(1942) classification system. This case series documents several cases of syndesmotic ligament ruptures with instability in the presence of isolated, minimally-displaced fibular fractures

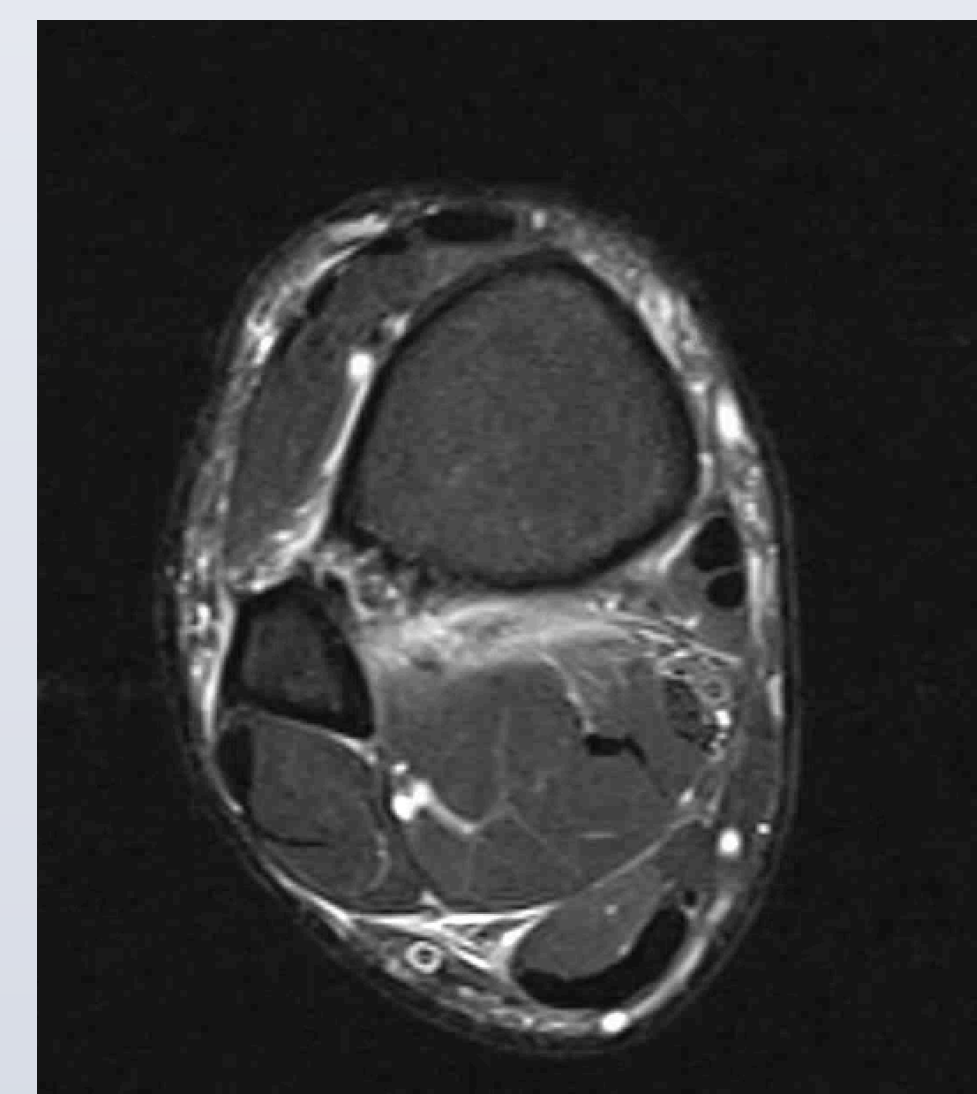
Methodology and Hypothesis

30 patients undergoing open reduction internal fixation of seemingly isolated oblique fibular ankle fractures with syndesmotic repair are included in this study. Isolated fibular fractures with a spiral oblique pattern and less than 4mm of displacement were included. Clinical suspicion of syndesmotic tears were documented in all 30 patients with pain on palpation over the anterior aspect of the ankle. Preoperative standard radiography was reviewed in each case including AP, Mortise, and Lateral ankle views. Medial clear space, tibiofibular overlap, and tibiofibular clearspace were measured preoperatively. Cases in which the preoperative measured values were within normal limits(medial clear space <4mm, tibiofibular overlap on AP view >6mm, tibiofibular clear space<6mm)¹ and confirmed syndesmotic ligament instability either via MRI or intraoperative stress test were included in this study.



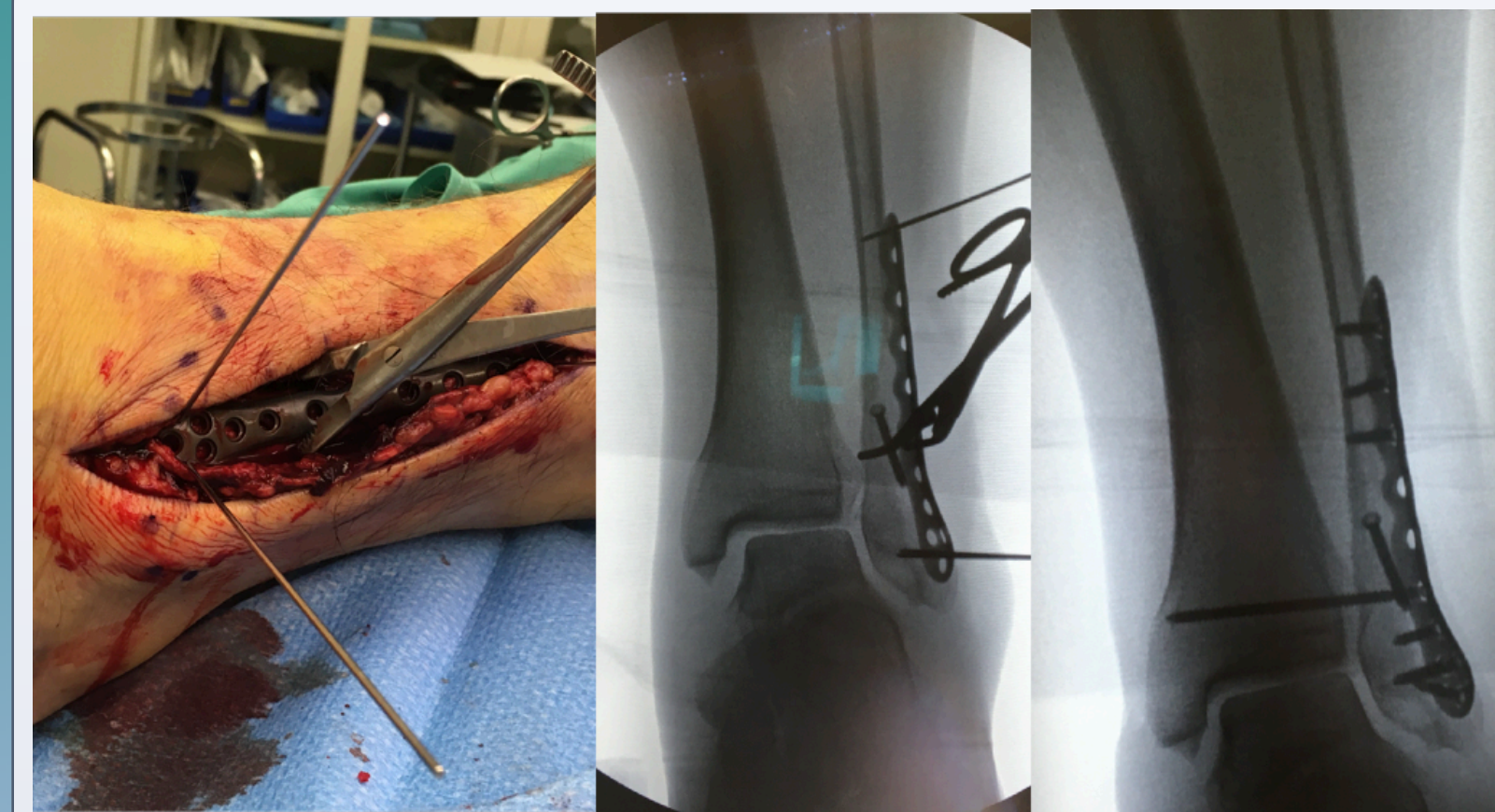
Methodology and Hypothesis

The most common rotational ankle fracture has historically been described as a spiral oblique isolated fibular fracture. Using current classification systems, this is most accurately described as a Supination-External Rotation 2 ankle fracture. There is a lack of research detailing the risk of concomitant syndesmotic ruptures in the presence of no discernable preoperative radiographic evidence of rupture. The current study aims to demonstrate 30 cases of seemingly isolated fibular fractures with no radiographic evidence of syndesmotic instability which have confirmed syndesmotic injuries via MRI or Intraoperative Stress test.



Procedure

30 patients undergoing ORIF of fibular ankle fracture with syndesmotic repair were reviewed. All cases were performed by a single surgeon over a 3 year period. All fractures were fixated with a standard anatomical fibular plate and syndesmotic repair was performed utilizing one tricortical syndesmotic screw.



Literature Review

Ankle fractures represent 9% of all traumatic injuries², only surpassed by proximal femur fractures in the lower extremity. The most common mechanism of injury is a low energy rotational force of the tibia on a planted foot.

Ashhurst and Bromer first described a classification in 1922 describing ankle fractures based on genesis. Lauge-Hansen went on to further refine this system and in 1942 published his landmark article³.

Lauge-Hansen's system was developed utilizing freshly amputated limbs which were fixed at the tibia and foot and subjected to manually applied force, by hand, to the hindfoot⁴. Examination of these limbs was documented in his work entitled: "The combined experimental-surgical and experimental-roentgenologic investigation". The classification was based on foot position and the direction of the injuring force, and the results were detailed in his work entitled "The genetic roentgenologic diagnosis of fractures of the ankle⁵". The supination-eversion injury pattern is widely regarded as the most common fracture mechanism with unimalleolar fibular fractures representing between 60-70% of all ankle fractures⁶. A supination-eversion injury with a unimalleolar fibular fracture is classified under Lauge-Hansen's nomenclature as a SE stage 2 and is accompanied with concomitant ATFL ligament tear.

Literature Review

Several authors have questioned the reliability and reproducibility of Lauge-Hansen's results and classification^{7,8}. One major pitfall of his original work is the results were obtained from cadaveric specimens undergoing manual traumatic manipulation. The inability of the system to classify certain fracture patterns as well as accurately correlate the fracture patterns to ligamentous injuries/instability has come under scrutiny recently. MRI studies performed by Gardner et.al found 53% of ankle fractures reviewed has a ligamentous injury or fracture that did not fit into the Lauge-Hansen classification criteria.

Syndesmotic ligament damage represents a complex and controversial injury associated with ankle fractures. Some authors estimate that 10% of all ankle fracture have additional syndesmotic injuries with this number doubling in patients requiring repair^{6,10}. MRI imaging of these injuries offer a highly specific and sensitive evaluation in pre-therapeutic assessment of ligamentous damage⁹. Controversy exists to whether the level of the fibular fracture correlates with syndesmotic injury. Van den Bekerom et al. concluded that there was no indication for transsyndesmotic fixation in low fibular fractures(<5cm above the ankle joint) if the malleoli are reduced and the deltoid is intact¹¹. While other such as Nielson et al. found that fibular fracture level did not correlate to syndesmotic interosseous disruption and further evaluate is required¹².

Results

30 patients with seemingly isolated fibular fractures were reviewed. The average age was 55.6 with a range of 24 to 78 years old. Of these patients, 18 were female and 12 being male. The mean medial clear space was noted to be 3.4mm (2.8 to 3.8), the mean tibiofibular clear space was 5.6mm (4.8 to 6), and the mean tibiofibular overlap was 7.4 (6 to 9.5).

Analysis and Discussion

The inability of the Lauge-Hansen classification to accurately determine ligamentous injury and ankle instability has potentially devastating consequences. In this case study, 30 unimalleolar ankle fractures without discernable syndesmotic instability on plain radiography were presented. There exists a sub-group of ankle fractures with syndesmotic instability in the presence of normal syndesmotic radiographic values. A combination of inconsistent radiographic positioning as well as inter-observational variability decrease the sensitivity of plain-film radiography in determining these injuries. This series looks to illustrate the importance of clinical suspicion for syndesmotic damage in all ankle fractures. The mean medial clear space, tibiofibular overlap, and tibiofibular clear space in all 30 cases were within normal limits in the presence of confirmed syndesmotic instability. Reviewing the injury mechanism combined with clinical evaluation of the syndesmosis is crucial in a complete ankle fracture work-up. Fibular fracture level is not always a consistent means of determining syndesmotic disruption.

Reference

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