

Outcomes Following Syndesmotic Screw versus Anatomic Fixation in Rotational Ankle Fractures with Syndesmotic Injury

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Background/Purpose: Rotational ankle fractures (OTA 44) frequently involve injury to the ankle syndesmosis. Characteristic patterns of syndesmotic disruption involve either a soft-tissue avulsion of the posterior inferior tibiofibular ligament (PITFL) or an intact PITFL attached to a posterior malleolar fracture fragment. Both of these injuries compromise the integrity of the PITFL and associated transverse ligament, which provide nearly half of the overall strength of the syndesmosis. In combination with open reduction and internal fixation of medial and lateral malleolus fractures, syndesmotic instability must be addressed to restore proper ankle mechanics. The syndesmosis has traditionally been stabilized with transsyndesmotic screws; however, anatomic fixation of either the posterior malleolar fracture or soft-tissue repair of the PITFL to its native attachment along the posterior tibial tubercle has gained popularity in recent years. The strategy of anatomic fixation also includes deltoid ligament repair if there is no medial malleolar fracture and intraoperative stress testing indicates residual talar instability after posterior anatomic fixation. The purpose of this study is to compare disease-specific functional outcomes in operatively treated rotational ankle fractures undergoing syndesmotic fixation with either conventional transsyndesmotic screws or anatomic fixation of the posterior and medially based injuries.

Methods: A prospective institutional registry of operatively treated ankle fractures from 2003 to 2015 was used to identify all adult (age >18) supination external rotation (SER) and pronation external rotation (PER) stage IV ankle fractures with a minimum of 1 year functional outcome data. Treatment differences reflect a change in the primary surgeon's evolution of treatment strategies from syndesmotic screws at the start of this prospective registry to his now preferred anatomic fixation method. Patient demographics, medical comorbidities, and injury characteristics were recorded for each case. Radiographs were reviewed for patients meeting the inclusion criteria and the type of syndesmotic fixation used was recorded (syndesmotic screws, anatomic repair, or combination of methods). One-way analysis of variance (ANOVA) and χ^2 statistics were used to compare baseline characteristics between syndesmotic fixation groups. One-way ANOVA was also used to evaluate the primary outcome of Foot and Ankle Outcome Score (FAOS) summary domains by syndesmotic fixation type. A *P* value of less than 0.05 indicated statistical significance.

Results: Transsyndesmotic screw fixation alone (*n* = 69, 23.4%), anatomic fixation alone (*n* = 138, 46.8%) or combined techniques (*n* = 88, 29.8%) were utilized in 295 rotational ankle fractures. There were no statistically significant differences between the three groups in age at surgery, body mass index, sex, race, fracture side, rate of open fractures, smoking status, or the presence of recorded comorbidities. The anatomic fixation group consisted of significantly more SER ankle fractures (94.9%) compared to the syndesmotic screw (71.0%, *P* < 0.001) and combined groups (72.7%, *P* < 0.001). There was no statistically significant difference in FAOS

scores for any of the five summary domains (Symptoms, Pain, Activities of Daily Living, Sports, or Quality of Life) between the three fixation groups. Additionally, no differences in outcome scores were found between the anatomic-only fixation group and fractures treated with syndesmotic screws (alone or in combination with anatomic fixation). In this cohort, 80.2% of patients with transsyndesmotic screw fixation underwent removal of hardware compared to 42.6% of patients without transsyndesmotic screws ($P < 0.001$).

Conclusion: Transsyndesmotic screw fixation often requires a subsequent surgical procedure for screw removal. This analysis confirms higher rates of hardware removal in patients with transsyndesmotic screws compared to those without this type of syndesmotic fixation. In this cohort of rotational ankle fractures, the type of syndesmotic fixation method resulted in comparable disease-specific patient-reported outcome scores at a minimum of 1 year postoperatively. Given the equivalence in functional outcomes, surgeons should consider the option of anatomic fixation of syndesmotic injuries in rotational ankle fracture patterns to prevent the cost and risk of morbidity associated with additional surgery for syndesmotic screw removal.