Equivalent Functional Outcomes Following Injury-Specific Fixation of Posterior Malleolar Fractures and Equivalent Ligamentous Injuries

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Background/Purpose: Supination external rotation (SER) IV and pronation external rotation (PER) IV ankle fractures (OTA 44) characteristically consist of a posterior injury involving the posterior inferior tibiofibular ligament (PITFL) or a posterior malleolar (PM) fracture in addition to a medial injury to either the deltoid ligament or a medial malleolar fracture. Previous studies have suggested that the presence of a malleolar fracture predisposes patients to poorer outcomes compared to fracture patterns with intact malleoli and corresponding ligamentous injuries. Specifically, the presence and increased size of a PM fracture has been associated with inferior outcomes compared to equivalent injuries with an intact PM. Although the size of the PM fracture fragment has traditionally determined whether surgeons treat the fragment with fixation, the indication for operative fixation of PM fractures to restore the anatomy of the PITFL has increased in favor. The purpose of this study was to determine if the presence of a PM fracture in rotational ankle fractures affects functional outcomes when addressed with anatomic fixation methods.

Methods: A prospective institutional registry of operatively treated ankle fractures was used to identify all operatively treated SER IV and PER IV ankle fractures from 2004 to 2014. Additional inclusion criteria were age >18, minimum 1-year Foot and Ankle Outcome Score (FAOS), and injury-specific anatomic repair of the posterior injury. Of the cases meeting inclusion criteria, radiographs were reviewed to determine posterior injury fixation method (posterior malleolar plating or PITFL repair with a screw and soft-tissue washer). Patient demographics, medical comorbidities, and injury characteristics were recorded for each case. Independent samples t tests and $\chi 2$ were used to compare baseline characteristics and the primary outcome of FAOS scores between groups. A P value of less than 0.05 was deemed statistically significant.

Results: Of the 312 patients who met the inclusion criteria, 224 fractures were treated with injury-specific anatomic repair using either a buttress plate for PM fracture fixation (n = 161) or screw with soft-tissue washer for PITFL repair (n = 63). The PM plate group was significantly older than the PITFL repair group at the time of surgery (mean 53.7 vs 44.2; P <0.001). The PM plate group also had significantly more women (76.4% vs 39.7%; P <0.001) and lower mean body mass index compared to the PITFL group (27.5 vs 30.5; P = 0.013). There were no statistically significant differences between the two groups in type of rotational pattern (SER vs PER), fracture side, rate of open fractures, or smoking status. The PM plate group had a higher rate of hypertension (P = 0.008) but there was no difference in the presence of other recorded comorbidities. The groups showed no difference in FAOS scores for any of the five summary domains (Symptoms, Pain, Activities of Daily Living, Sports, or Quality of Life). Median length of follow-up at the time of most recent outcome measurement was 39.6 months in the PM group and 32.1 months in the PITFL repair group (P = 0.002).

Conclusion: Previous studies have suggested that patients with PM fractures have inferior clinical outcomes compared to those with equivalent ligamentous injuries. In our cohort of rotational ankle fractures treated with injury-specific fixation, we have demonstrated comparable clinical outcomes in stage IV rotational ankle fractures with and without PM fractures, indicating that the presence of a PM fracture may not result in inferior outcomes compared to ligamentous equivalent injuries if these fractures are addressed in an anatomic injury-specific manner. Prior studies suggesting that the presence of a PM fracture predisposes to inferior clinical outcomes have not uniformly addressed the posterior fracture fragments with anatomic reduction and fixation. In this study, the PM fracture group contained a significantly older and thinner population, with a higher percentage of female patients. Further analysis will determine the potential significance of the different patient demographics and comorbidities between the two groups.

See pages 49 - 106 for financial disclosure information.