

Treatment of Closed Rotational Ankle Fractures Between Trauma-Trained versus Non-Trauma-Trained Orthopaedic Surgeons: A Quality and Cost Comparison

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Purpose: Rotational ankle fractures are common injuries that are treated by both orthopaedic trauma specialists and nontrauma orthopaedists on a routine basis. We evaluated the differences in radiographic outcomes and operative costs between providers who had completed a trauma fellowship versus those who had not. Our hypothesis was that outcomes and cost would be similar between these two groups of providers.

Methods: We identified surgically treated rotational ankle fractures treated from July 2013 through June 2014 at our Level I trauma center and at 8 of 17 other hospitals in our health system using a CPT code search for 27792, 27814, 27822, 27823, and 27829. Fractures included OTA 44-A-C injuries (lateral malleolus, bimalleolar, trimalleolar, and syndesmotic ankle injuries). We excluded open fractures, pilon fractures, isolated medial malleolus fractures, and cases performed by surgeons who left our system during the study period. We excluded cases that involved multiple procedures in a single operative setting to avoid incorporating non-ankle fracture-related costs. Patients with poor quality postoperative or follow-up radiographs were excluded from the radiographic analyses. Minimum radiographic follow-up was 6 weeks due to low likelihood of loss of reduction beyond this time point. Remaining patients were grouped into those treated by trauma-trained orthopaedic surgeons (TTOS) and non-trauma-trained orthopaedic surgeons (NTTOS). Quality of the initial reduction and final follow-up reduction were blindly graded by three surgeons using previously defined criteria. Implant-related costs of treatment for each procedure were calculated with a surgical inventory program we use to monitor cost of care. The software has the ability to calculate operative costs by summing all itemized costs associated with individual operating room patient encounters. Radiographic and operative cost differences between TTOS and NTTOS patients were analyzed using Fisher's exact test and Mann-Whitney *U* test, respectively.

Results: Our CPT code search yielded 295 fractures, of which 87 met exclusion criteria, leaving 208 fractures for analysis, 119 in the TTOS group and 89 in the NTTOS group. Acceptable fracture reduction was observed in 202 of 205 fractures, with the three unacceptable reductions being in the NTTOS group ($P = 0.08$). Three NTTOS patients lacked immediate postoperative radiographs for review, and 11 TTOS and 10 NTTOS patients were lost to follow-up prior to 6 weeks postoperative. There were five cases in which fracture reduction changed from acceptable to unacceptable during the follow-up period. This left 102/105 in the TTOS group and 74/79 in the NTTOS group with adequate reductions at final follow-up ($P = 0.29$). Cost analysis based on list price of implant-related costs revealed the median operative cost for the NTTOS group was \$2940 (range, \$633-\$6447) versus \$1233 (range, \$304-\$19,720) for the TTOS group ($P < 0.001$). Further analysis revealed that high cost drivers were locking plates, adjunctive external fixation, suture button fixation, and cannulated screws. Table 1 demonstrates significant differences in implant use between the two groups.

The FDA has stated that it is the responsibility of the physician to determine the FDA clearance status of each drug or medical device he or she wishes to use in clinical practice.

Of the five cases with late loss of reduction, three occurred in locking plate cases and two occurred in nonlocking plate cases ($P = 0.66$).

Table 1: High-cost Implant Usage in NTTOS versus TTOS

	Non-trauma Orthopaedists (n=89)	Trauma-trained Orthopaedists (n=119)	p-value*
Locking Plates	82	10	<0.0001
Cannulated Screws	35	3	<0.0001
Suture Button Fixation	14	0	<0.0001
External Fixator	0	4	0.14

*Two-tailed Fisher’s exact test

Conclusion: Our study found no significant differences in radiographic outcomes of operatively treated rotational ankle fractures between orthopaedic surgeons with and without trauma fellowship training. However, cost analysis demonstrated significantly higher implant-related costs for the NTTOS group with median operative session cost more than twice that of the TTOS group. The primary contributor to this difference was the use of locking plates and cannulated screws. Further investigation evaluating the clinical benefit of expensive, technologically advanced implants is warranted. Assuming radiographic outcomes adequately approximate clinical outcomes, our series demonstrated improved patient care value (quality:cost ratio) in the patients treated by TTOSs.