

Implant Failure Rates and Cost Analysis of Contoured Locking versus Conventional Plate Fixation of Weber B Fibula Fractures

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Background/Purpose: Distal fibula fractures associated with rotational ankle injuries are one of the most commonly encountered and surgically treated injuries in orthopaedics. There has been a recent shift toward the use of fracture-specific locking plates, including those for distal fibula fractures; however, a clinical benefit of this shift has not been demonstrated in the literature. The aim of this study was to evaluate the relative use, failure rates, and cost of contoured locking and standard one-third tubular plates used for the treatment of Weber B fibula fractures (OTA-44B).

Methods: This retrospective cohort study compared findings of 330 consecutive patients over a 3-year period with rotational ankle injuries involving Weber B type fractures of the distal fibula treated with open reduction and plate fixation. The primary outcome was failure of the lateral plate fixation, indicated by loss of fibular fracture reduction, deformation of the fibular plate, or loss of distal screw fixation. Secondary outcomes were surgical wound infection requiring surgical debridement and implant removal, and persistent implant-related symptoms requiring implant removal. Patient, injury, and surgical characteristics were compared between the treatment groups and analyzed as risk factors for the outcome measures studied. An analysis of differential cost between the two constructs was performed. Statistical analysis was performed using Student *t* and χ^2 tests with significance set at a *P* value <0.05.

Results: Eleven patients were lost to follow-up. The remaining 319 patients had at least 4 weeks of postoperative follow-up and were included in the study; 97 were treated with a distal fibular contoured locking plate (CLP), and 222 with a one-third tubular plate (OTP). A significant increase in the relative use of CLPs versus OTPs was observed at our institution during the study period. The two groups were comparable with respect to BMI (body mass index), history of diabetes, surgical delay, and length of follow-up. The CLP group was on average older than the OTP group, 44 ± 13 and 38 ± 13 years, respectively ($P < 0.001$), and had a lower proportion of smokers, 27% and 17%, respectively ($P = 0.04$). There were no mechanical failures of lateral plates or distal fibular fixation in either group. Five cases required surgical revision within 4 weeks of the index surgery, all for revision of syndesmotic fixation—one in the CLP group and four in the OTP group ($P = 0.61$). The rate of deep infection requiring surgical debridement and/or implant removal was 6.2% in the CLP group and 1.4% in the OTP group ($P = 0.017$). The rate of lateral plate removal for either infection or symptomatic implants was 9.3% in the CLP group and 2.3% in the OTP group ($P = 0.005$). A typical CLP construct cost \$800 more than a comparable construct using a one-third tubular plate. Based on a calculated estimate of 60,000 locking plates used annually in the US, this translates to a potential avoided cost of \$50 million/year nationally.

Conclusion: The use of contoured locking plates for the treatment of Weber B distal fibular fractures has increased, and is associated with significant increased cost. This study demonstrates that this increased use is unsubstantiated by outcomes, as there were no lateral plate failures in either the contoured locking or standard plate groups. Furthermore, the CLPs may carry a higher risk of implant-related complications.

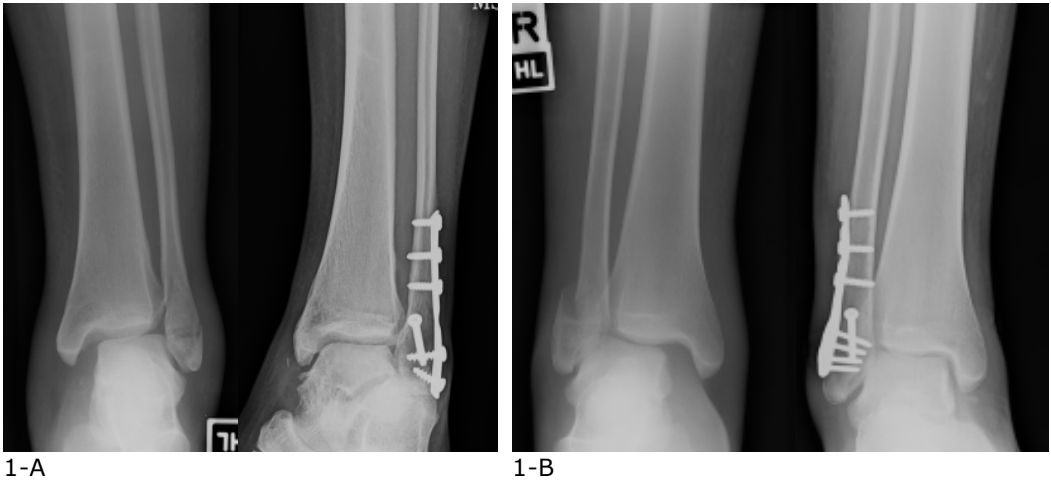


FIGURE 1. Preoperative and 12 week postoperative anteroposterior mortise ankle radiographs of similar lateral malleolar fractures. Both with a single interfragmentary lag screw, and neutralization plates of comparable lengths. **A**, treated with conventional one-third tubular plate. **B**, treated with contoured distal fibular locking plate and locking distal fragment screws.

TABLE 1. Demographic Data and Baseline Characteristics

	One Third Tubular Plate (n=222)	Contoured Locking Plate (n=97)	P value
Age (yr), mean (SD)	37.9 (13.1)	44.4 (13.3)	0.0001
Female (%)	37.4	60.1	
Body Mass Index , mean (SD)	30 (6.1)	30 (6.2)	0.86
Diabetes (%)	8.6	13.4	0.19
Smoking (%)	27.2	16.5	0.04
Time to Surgery (days), mean (SD)	10.0 (8.3)	10.1 (8.1)	0.86
Length of Follow Up (weeks), mean (SD)	22.5 (30.0)	23.7 (23.2)	0.72
median (25-75 percentile)	13.6 (10.0-22.7)	17.1 (10.5-26.5)	
Open Injury (%)	0.5	2.1	0.17
Syndesmotic Fixation , (%)	27.9	30.9	0.59
Lag Screw(s) , (%)	92.8	56.7	0.0001

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.

TABLE 2. Outcomes for OTP and CLP groups

	One Third Tubular Plate	Contoured Locking Plate	P value
Failure/Revision*	1.8 % (4/222)	1.0 % (1/97)	0.610
Infection	1.4 % (3/222)	6.2 % (6/97)	0.017
Hardware Removal**	2.3% (5/222)	9.3 % (9/97)	0.005
Symptomatic Hardware	3/5	4/9	
Infection	2/5	5/9	

(*) All 5 revisions were due to failure of syndesmotric fixation or failure to recognize and stabilize a syndesmotric injury at the time of the index surgery

(**) Removal of atleast all lateral hardware for any reason

TABLE 3. Cost breakdown of lateral malleolar plate constructs

	Conventional	Contoured Locking
Plate	1 (one-third tubular) at \$166 each	1 (fibular locking) at \$585 each
Lag Screw	1 (non-locking) at \$21 each	1 (non-locking) at \$21 each
Proximal Screws	3 (non-locking) at \$21 each	3 (non-locking) at \$21 each
Distal Screws	2 (non-locking) at \$21 each	4 (locking) at \$110 each
Total*	\$292	\$1109

* Contoured locking construct costs \$811 more than the conventional construct