

Direct Versus Indirect Fixation of the Posterior Malleolus in Trimalleolar Ankle Fractures: A Multicenter Cohort Comparison Study

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Purpose: The purpose of this paper is to examine the differences in functional outcomes between direct versus indirect surgical fixation methods of the posterior malleolus in the setting of trimalleolar fractures and identify any variables that affect patient satisfaction.

Methods: This was a multicenter retrospective cohort study of patients who underwent open reduction and internal fixation for a diagnosis of trimalleolar ankle fracture. Direct fixation of the posterior fragment was compared to indirect fixation. The primary outcome was PROMIS (Patient-Reported Outcomes Measurement Information System) scores for total pain and total function postoperatively. 117 patients were identified. The final study cohort consisted of 40 patients in the direct fixation group (D) and 77 in the indirect fixation group (I). The groups did not differ in terms of age or gender ($P = 0.12$ and $P = 0.12$) but did differ in terms of body mass index (BMI) and presence of comorbidities ($P = 0.03$ and $P = 0.03$). To compare between groups, continuous variables were analyzed using independent t tests for parametric variables and Mann-Whitney U test for nonparametric variables. Categorical variables were analyzed using a χ^2 test. Statistical significance was set at $P < 0.05$. A univariate and multivariate linear regression model was performed to analyze which factors might affect the outcomes of Total Pain and Total Function.

Results: There was no difference in total pain between groups ($D = 47.9$, $I = 48.7$, $P = 0.65$) or total function $D = 47.0$, $I = 44.5$, $p = 0.19$. On univariate linear regression model for total pain, BMI, incidence of complication, tobacco use, and open injury all were significant. These factors increased pain levels with open injuries providing the greatest amount of additional pain (coefficient [c] = 11.8, $P = 0.01$). Variables that qualified for multivariate analysis included Workers' Compensation, diabetes, and tourniquet time ($P < 0.2$). On multivariate analysis BMI ($c = 0.27$, $P = 0.02$), incidence of complication ($c = 3.92$, $P = 0.05$), open injury ($c = 13.22$, $P = 0.003$), and tourniquet time ($c = 0.05$, $P = 0.008$) were all significant. For total function, univariate analysis showed age ($c = -0.15$, $P = 0.006$), BMI ($c = -0.30$, $P = 0.04$), incidence of complication ($c = -6.28$, $P = 0.02$), diabetes ($c = -6.14$, $P = 0.04$), use of external fixator ($c = 5.48$, $P = 0.02$), and tourniquet time ($c = 0.06$, $P = 0.001$) all were significant. Factors that qualified for multivariate analysis included sex, open injury, and presence of comorbidity. In the multivariate model, increased BMI ($c = -0.31$, $P = 0.03$), open injuries ($c = -12.62$, $P = 0.02$), and increasing tourniquet time ($c = -0.06$, $P = 0.005$) all decreased postoperative function while use of an external fixator increased postoperative function ($c = 6.91$, $P = 0.003$). Fixation type was not statistically significant for pain or function scores in our regression.

Conclusion: This study showed no difference in total pain and function utilizing the PROMIS outcome scores when comparing direct versus indirect fixation under uni- and multivariate models.

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