PROMIS Physical Function and Pain Interference Scores Are Correlated With Tibial Shaft Fracture Nonunion Following Intramedullary Nailing

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Purpose: The purpose of this study was to assess trends in Patient-Reported Outcomes Measurement Information System (PROMIS) Physical Function (PF) and Pain Interference (PI) in tibial shaft fracture patients, treated by intramedullary nail, progressing to union vs nonunion.

Methods: Operatively treated tibial shaft fractures were retrospectively identified using CPT codes. Mean PROMIS PF and PI scores at 0-1, 1-3, 3-6, 6-9, and 9-12 months were compared between patients progressing to union and patients requiring nonunion repair. Pearson's $\chi 2$ and univariate/multivariate regression analysis were performed. A receiver operating characteristic (ROC) curve was used to determine an optimal threshold value for PROMIS PF and PI.

Results: A total of 234 patients (196 union, 38 nonunion) were included. Open fractures and AO/OTA type C fractures were more common in the nonunion group. A significant difference in mean PROMIS PF between union and nonunion patients was observed at 1-3 months, 3-6 months, 6-9 months, and 6-12 months. The odds of developing nonunion for every unit decrease in PROMIS PF was significant at 3-6 months (odds ratio [OR] 1.07) and 6-9 months (OR 1.17). A significant difference in mean PROMIS PI between union and nonunion patients was observed at 1-3 months, 3-6 months, and 6-9 months. The odds of developing nonunion for every unit increase in PROMIS PI was significant at 1-3 months, 3-6 months (OR 1.10), and 6-9 months (OR 1.23). A PROMIS PF score less than 39.5 at 3-6 months (area under the ROC curve [AUC] 0.719) and/or less than 41.75 at 6-9 months (AUC 0.719) are at higher risk of developing nonunion. A PROMIS PI score greater than 69.25 at 1-3 months (AUC 0.710), 66.68 at 3-6 months (AUC 0.698), and 66.50 at 6-9 months (AUC 0.715) are at higher risk of developing nonunion. Within-subject comparisons in the nonunion group demonstrated significant improvement in PROMIS PF between 1-3 months x 0-1 months and 3-6 months x 1-3 months.

Conclusion: Poorly trending PROMIS PF and PI in the clinical setting is another factor that can be used to evaluate progression to nonunion following tibial shaft repair where imaging studies may lag behind.