Effect of Complications and Reoperations on PROMIS Scores for Tibial Plateau Fractures

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INTRODUCTION:

Tibial plateau fractures, comprising approximately 1% of all fractures, are typically caused by high-energy trauma and present complex challenges due to their impact on joint stability, soft tissue, and long-term function. These injuries often require precise restoration of the articular surface and joint alignment, and are frequently complicated by issues such as arthrofibrosis, hardware failure, nonunion, fracture-related infection, knee instability, and post-traumatic osteoarthritis—many of which necessitate reoperation and may negatively affect patient wellbeing. Despite this, limited literature exists on how such complications influence patient-reported outcomes (PROs), partly due to challenges with follow-up and variability in individual responses.

The Patient Reported Outcome Measurement Information System (PROMIS) has emerged as a standardized tool to assess pain, physical function, and mental health across diverse populations, yet its use in orthopaedic trauma remains limited compared to elective subspecialties. To interpret PROMIS scores in a clinically meaningful way, the minimal clinically important difference (MCID) is used to identify the smallest change perceived as beneficial by patients. This study aims to evaluate whether complications following tibial plateau open reduction internal fixation (ORIF) are associated with lower PROMIS scores at 6 months postoperatively, hypothesizing that complications will result in worse outcomes, potentially exceeding the MCID.

METHODS:

Following institutional review board approval, a retrospective review was performed to identify patients with tibial plateau fractures treated at a Level I trauma center between July 2022 and May 2024. Patients were identified from the institutional trauma database using Current Procedural Terminology (CPT) codes 27535 and 27536.

Inclusion criteria were patients aged 18 or older diagnosed with tibial plateau fractures (AO/OTA 41) who underwent ORIF, had clinical follow-up confirming radiographic healing, and had PROMIS scores available at the 6-month time point. Patients were excluded if they had insufficient electronic medical record (EMR) documentation, were treated non-operatively or with closed reduction percutaneous fixation (CRPF) or lacked PROMIS scores at the 6-month timepoint.

PROMIS scores were collected using an institutional automated electronic survey sent directly to patients. The primary outcome was 6-month PROMIS scores for physical function (PF), pain interference (PI), global physical health (GPH), global mental health (GMH), anxiety and depression. Secondary outcomes included percent of normal function (0-100%) (percent of normal) and scores on the Brief Resilience Scale (BRS). The complications assessed in this study were deep vein thrombosis or pulmonary embolism (DVT/PE), unplanned reoperation within 6 months, FRI, and reoperation to promote bone healing at any time point. Patients with FRI were identified according to the consensus definition published by Metsemakers et al. in 2018. All scores (PROMIS scores, percent of normal, BRS) were compared between individuals who experienced complications and those who did not.

Demographics, comorbidities, injury details, and outcomes were extracted from the EMR. Categorical data were summarized as counts and percentages; continuous variables were reported as means with standard deviations. PROMIS, percent of normal, and BRS scores were compared between patients with and without complications using independent t-tests, with significance set at $p < 0.05$ (SPSS v29.0.2.0).

RESULTS:

A total of 106 patients with tibial plateau fractures were included, with a mean follow-up of 261.5 days and mean age of 50.4 years (Table 1). Complications occurred in 25.5% of patients, including fracture-related infection (FRI, 10.4%), thromboembolic events (DVT/PE, 7.5%), and reoperations within 6 months (11.3%) (Table 2).

Patients with FRI demonstrated significantly lower PROMIS-PF scores at 6 months compared to those without FRI (31.5 vs. 37.4, $p = 0.015$), and this difference exceeded the MCID (Table 3).

Other PROMIS domains were not significantly different among patients with and without FRI. Patients undergoing early reoperation prior to 6 months, or reoperation to promote bone healing at any time point, demonstrated lower PF scores, though these differences did not reach statistical significance.

DISCUSSION AND CONCLUSION:

In this cohort of patients with tibial plateau fractures, FRI was associated with significantly worse physical function at 6-months as measured by the PROMIS-PF score. This difference was also clinically significant, exceeding the MCID. Furthermore, while not statistically significant, patients who underwent reoperation to promote bone healing at any point, as well as those who required reoperation within 6 months, demonstrated a trend toward lower 6-month PROMIS-PF scores. No other PROMIS domains, as well as BRS and percent of normal, differed significantly across complication subtypes.

Table 1. Demographic and clinical characteristics of 106 patients with tibial plateau fractures.

Variable	
Follow-up (days), mean (SD)	261.5 (136.0)
Age, mean (SD)	50.4 (14.3)
Sex, n (%)	
Female	51 (48.1)
Male	55 (51.9)
Race, n (%)	
White	75 (70.8)
Black	26 (24.5)
Other	5 (4.7)
Body mass index (kg/m^2), mean (SD)	31.4 (10.4)
Diabetes, n (%)	21 (19.8)
Hypertension, n (%)	48 (45.3)
Tobacco use, n (%)	31 (29.2)
Alcohol use, n (%)	57 (53.8)
ASA score, n (%)	
1	3 (2.8)
2	31 (29.2)
3	67 (63.2)
4	5 (4.7)

SD = standard deviation, kg/m^2 = kilograms per meter squared, ASA = American Society of Anesthesiologists.

Table 2. Postoperative complications and timing observed in 106 patients with tibial plateau fractures.

Variable	
Fracture-related infection, n (%)	11 (10.4)
Reoperation before 6 months, n (%)	12 (11.3)
Reoperation to promote bone healing at any time, n (%)	7 (6.6)
Deep vein thrombosis/pulmonary embolism, n (%)	8 (7.5)
Time to complication (days), mean (SD)	103.2 (69.3)

SD = standard deviation.

Table 3. Six-month patient-reported outcomes and resilience scores by FRI status.

Variable	FRI, mean (SD)	No FRI, mean (SD)	p-value
PF	31.5 (8.1)	37.4 (6.7)	0.015
PI	60.8 (3.3)	61.0 (7.5)	0.941
GPH	42.6 (7.9)	40.5 (8.3)	0.447
GMH	45.4 (6.1)	45.0 (8.6)	0.847
Depression	52.9 (12.4)	54.6 (11.0)	0.663
Anxiety	55.3 (13.0)	55.5 (10.8)	0.961
Percent of normal	57.6 (24.7)	52.1 (24.5)	0.545
BRS	3.6 (1.2)	3.6 (0.7)	0.933

FRI = fracture-related infection, SD = standard deviation, PF = physical function, PI = pain interference, GPH = global physical health, GMH = global mental health, BRS = brief resilience scale.