

Longer-Term Outcomes After Bicondylar Tibial Plateau Fractures: What Are the Risk Factors for Poor Outcome?

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Purpose: Little is known about the longer-term outcome of bicondylar tibial plateau fractures and even less is known about risk factors for poor outcomes after these complex injuries. Our hypotheses were: (1) longer-term outcomes would be relatively poor for these high-energy injuries, and (2) radiographic and clinical risk factors could be identified that are associated with poor outcomes.

Methods: Our study group was composed of 68 bicondylar tibial plateau fractures (OTA41-C3) treated operatively at a single Level I trauma institution from 2007-2013 with at least 2 years of follow-up (mean time from surgery, 5.1 years; range, 2.2-8.8). The demographics included a mean age of 52 years; 75% were male. Our primary outcome score was the WOMAC score (Western Ontario and McMaster Universities Osteoarthritis Index, which measures pain, stiffness and function with higher numbers being worse), which patients completed via a phone interview. Radiographs at time of injury and those nearest the 6-week follow-up point were reviewed. Radiographic parameters included intra-articular stepoff, condylar width ratio, and tibiofemoral alignment. Medical records were reviewed to evaluate previously suggested patient factors that might contribute to worse functional outcomes including: infection, compartment syndrome, time to definitive fixation, meniscus tear, medial collateral ligament calcification, nonunion, participation in organized physical therapy, and manipulation under anesthesia. Bivariate and multiple variable regression analyses were used to assess the independent association between each factor and WOMAC scores.

Results: The mean WOMAC score was surprisingly low at 13.4 (range, 0-60; 95% CI 10.2 to 16.6). Lower scores in the WOMAC scale reflect better outcomes. For comparison, scores after primary arthroplasty tend to be worse than this with scores typically around 20. Several factors were found to be associated with poor outcome (as measured by WOMAC) in the multiple variable regression model, with three showing strong predictive relationships: (1) surgical site infection (+16.9 [worse outcome] points on the WOMAC; 95% CI 8.9, 24.9; $P < 0.001$), (2) failure to participate in physical therapy postsurgery (+10.3 [worse outcome]; 95% CI +18.8, +1.72; $P = 0.02$), and (3) varus or neutral alignment limb (tibiofemoral angle $< 2^\circ$) (+11.0 [better outcome]; 95% CI -20.9, -1.1; $P = 0.03$). Other factors suggested a relationship but were not statistically significant. These included compartment syndrome and postoperative malreduction > 5 mm ($P < 0.1$).

Conclusion: As might be expected, infection was identified as a risk factor for poor outcome ($P < 0.001$). However, we also demonstrated that patients did better if they participated in physical therapy ($P < 0.02$) or were in slight varus alignment postoperatively ($P < 0.03$). It is possible that patients with more varus tibiofemoral angles (either by natural anatomy

or through malreduction) tend to unload the lateral joint, which typically has more intra-articular involvement, and therefore have an outcome advantage. The importance of physical therapy is also interesting as one might assume that worse injuries might be more likely to be prescribed therapy but patients with better socioeconomic factors might be more able to obtain physical therapy. Overall longer-term validated outcome scores appear to be reasonable with relatively low WOMAC scores.