Knee Arthrofibrosis Following Tibial Plateau Fracture

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Purpose: The purpose of this study is to determine the incidence and risk factors for developing arthrofibrosis following a tibial plateau fracture. Our hypothesis is that patients with high-energy tibial plateau fracture and patients who underwent spanning external fixator were at increased risk to develop arthrofibrosis, and patients who use a continuous passive motion (CPM) machine postoperatively were at reduced risk.

Methods: We retrospectively reviewed patients greater than 18 years of age who presented to our Level I trauma center with a tibial plateau fracture from 2005-2012. Patients with less than 6 months follow-up were excluded. Demographic data including age, sex, tobacco use, mechanism, and comorbidities were recorded. Fractures were grouped into low-energy (Schatzker classification I-III) and high-energy (Schatzker classification IV-VI) fracture patterns. Arthrofibrosis was defined as a patient who required either a manipulation under anesthesia (MUA) or Judet quadricepsplasty. Perioperative data including infection, surgical approach, use of spanning external fixator, and CPM use were recorded. Logistic multivariate regression model was used to predict the outcome of development of arthrofibrosis based on the following predictor variables: high- versus low-energy; CPM use; spanning external fixation; use of lateral, medial, or dual surgical approach; tobacco use; and presence of infection.

Results: Between 2005 and 2012, 404 tibial plateau fractures met inclusion criteria. 218 patients were excluded for <6 months follow-up, leaving 186 patients for the study cohort. The average patient age was 46 years (range, 19-83) and 60% were male. The average follow-up was 16 months (range, 6-80 months). 70% of patients sustained a high-energy tibial plateau fracture. A provisional external fixator was used for 98 patients (53%). The overall deep infection rate was 8.6%. 78 patients (41.9%) received a CPM machine in addition to physical therapy. There were 27 patients (14.5%) with arthrofibrosis requiring a secondary procedure (26 MUA and one quadricepsplasty). Of the 27 patients who developed arthrofibrosis, 23 patients were initially treated with a spanning external fixator (odds ratio [OR] = 4.63, 95% confidence interval [CI] 1.26-17.7, $P = 0.021$). The mean length of time in external fixation for those who developed arthrofibrosis was 12.1 days (SD ±5.9; range, 4-30 days) and for those who did not was 8.7 days (SD ±6.5; range, 1-33 days). The effect of time was found to be significant with an OR of 1.10 (95% CI 1.01-1.20, $P = 0.030$). 24 of 130 (18.5%) patients with high-energy plateau fracture developed arthrofibrosis. High-energy fracture and external fixation were highly associated (c^2, 1 df = 51.9, $P < 0.001$). Logistic regression modeling using all previously mentioned variables, with the exception external fixation, demonstrated that high-energy injury was not significantly associated with arthrofibrosis (OR = 2.44, 95% CI 0.47-12.7, $P = 0.29$). Surgical approach, infection, and tobacco use were not associated with increased development of arthrofibrosis. Similar analysis demonstrated that CPM use postoperatively was associated with significantly less arthrofibrosis (OR = 0.32, $P = 0.024$). Postoperative CPM use in patients with external fixation was significantly associated with less arthrofibrosis (OR = 0.3, $P = 0.011$).

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Conclusion: The incidence of arthrofibrosis following tibial plateau fracture was 14.5%. Provisional spanning external fixator was independently associated with increased development of arthrofibrosis. For each extra day of external fixation, the odds of developing arthrofibrosis increased by 10%. High-energy injury, surgical approach, infection, and tobacco use were not associated with the development of arthrofibrosis. Postoperative use of a CPM may decrease the risk of developing arthrofibrosis following tibial plateau fracture, especially in patients who undergo provisional spanning external fixation.

See pages 99 - 147 for financial disclosure information.