Risk Factors for Surgery to Treat Knee Stiffness Following Tibial Plateau Fracture Fixation

Bradley Reahl, BA; Dimitrius P. Marinos, BS; Nathan N. O'Hara[1]; Brent T. Wise, MD; Michael A. Maceroli, MD; ***Robert V. O'Toole, MD[1]***

[1]R Adams Cowley Shock Trauma Center, University of Maryland, Baltimore, Maryland, USA

Purpose: Knee stiffness is common after tibial plateau fracture surgery that occasionally requires further surgical treatment. The primary aim was to determine risk factors for knee stiffness surgery following tibial plateau fixation. The secondary aim was to determine factors that predict failure of the subsequent knee stiffness surgery.

Method: The study groups were created for a case control study from a prospectively collected database of all 951 tibial plateau fractures treated with ORIF between 2007 and 2016 at a single Level I trauma center. The study group was 110 patients (12%) who had knee stiffness surgery that we defined as receiving a manipulation under anesthesia, arthroscopic lysis of adhesion, or quadricepsplasty after the fixation surgery. The control group was 319 tibial plateau fracture patients treated with ORIF without knee stiffness surgery with either a minimum of 1 year follow-up or clearly documented range of motion >110° with at least 90 days follow-up. Stepwise modeling techniques were used to select covariates based on a minimum AICc (Akaike Information Criterion) to be included in the final logistic regression models.

Results: The number of weeks in an external fixator (odds ratio [OR]: 1.6 per week, 95% confidence interval [CI]: 1.3-1.8, P<0.001) was the strongest predictor of need for a subsequent knee stiffness surgery, followed by having bilateral tibial plateau fractures (OR: 4.9, 95% CI: 1.6-15.0, P <0.01). No other factors were significant (P >0.20). The mean range of motion at follow-up after knee stiffness surgery was 105° (SD: 23.3), compared to 122° (SD: 14.4) in the control group (P <0.001). For patients with knee stiffness surgery, covariates including deep surgical site infection (-8.7°, P <0.01), having an upper extremity fracture (-4.8°, P = 0.02), and older age (-0.50°4˚ per year, P <0.01) were all associated with limited range of motion at follow-up. Improved range of motion after knee stiffness surgery was associated with patients of high socioeconomic status (15.7°, P = 0.02) and the number of weeks in external fixation (2.2° per week, P <0.01).

Conclusion: Clinicians should be aware that time spent in external fixation (P <0.001) and the presence of bilateral tibial plateau injury (P <0.01) are strong risk factors for requiring subsequent knee stiffness surgery. The patients with longer external fixator time may represent selection bias of worse soft-tissue injuries, but our finding may influence surgeons to remove external fixators earlier when possible.