Early External Fixation of Tibial Plateau Fractures Is Associated With Increased Odds of Compartment Syndrome

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Purpose: Tibial plateau fractures are often associated with high-energy trauma necessitating external fixation (ex-fix) as a means of temporization. There is evidence that pin placement and fracture distraction may result in transient increases in compartment pressures, and the optimal timing of ex-fix placement is unknown. This study sought to determine the effect of early versus late ex-fix placement on the risk of compartment syndrome after a tibial plateau fracture.

Methods: The Trauma Quality Improvement Program (TQIP) was retrospectively queried between 2015-2019 for adult patients with a tibial plateau fracture who underwent ex-fix placement. Patients with concomitant tibial shaft and/or distal femur fractures, requiring lower extremity fasciotomy before ex-fix, or ex-fix >7 days after admission were excluded. A restricted cubic spline (RCS) accounting for the baseline probability of compartment syndrome at the time of ex-fix placement was used to identify a threshold where the odds of compartment syndrome no longer significantly decreased with time. A Markov chain Monte Carlo simulation identified a single expected threshold. This threshold was used to divide the cohort into late and early ex-fix groups. Multivariable logistic regression was used to model the adjusted odds ratio (aOR) of post-ex-fix compartment syndrome and venous thromboembolism (VTE). Significance was defined as $P<0.05$.

Results: A threshold of 1.4 days was used to identify 468 late and 2717 early ex-fix patients. The late ex-fix group was more severely injured (ISS: 11.8 vs 8.6) on admission and admitted for 5.5 days longer. The ex-fix was placed 2.6 and 0.5 days after admission on average for the late and early ex-fix cohorts, respectively. Significantly lower odds of compartment syndrome were observed in the late group (aOR = 0.28 [95% confidence interval (CI) = 0.11-0.73]); however, this group had higher rates of VTE (aOR = 1.69 [95% confidence interval = 1.01-2.88]).

Conclusion: The present data should not dissuade orthopaedic surgeons from implementing early temporizing stabilization of these fractures; instead, it should increase awareness and surveillance of these patients.