Single-Incision Fasciotomy Decreases Infection Risk Compared to Dual-Incision Fasciotomy in Treatment of Tibial Plateau Fractures with Acute Compartment Syndrome

Graham John Dekeyser, Eli w. Bunzel, Dillon Christopher O'Neill[1], Sean E Nork[2], Justin Haller[3], David Barei[2]
[1]Orthopaedics, [2]Harborview Med Ctr, [3]University of Utah

INTRODUCTION: Tibial plateau fractures with concomitant acute compartment syndrome (ACS) are devastating injuries associated with high rates of infection and nonunion. Both single-incision (SI) and dual-incision (DI) fasciotomies have been proven to adequately decrease lower extremity compartmental pressures. The purpose of this study was to compare surgical site infection rates in tibial plateau fractures with ipsilateral ACS treated with SI versus DI fasciotomies.

METHODS: A retrospective review of patient with ACS and tibial plateau fractures was conducted at two level-1 trauma centers from 2001-2021. All patients underwent emergent four-compartment fasciotomy and eventual definitive plate and screw fixation of their tibial plateau fractures with a minimum of three-month follow up. The primary outcome was surgical site infection requiring surgical debridement.

RESULTS: One-hundred-ninety patients met inclusion criteria (SI: n=127, DI: n=63). These were almost exclusively high-energy injuries with 86.8% bicondylar fractures, 14.2% open fractures, 8.4% with an associated vascular injury, and 57.9% AO/OTA 41-C3 fractures. Similar to previous studies, the overall infection rate in this setting was 25.8% (49/190). Both groups were similar in terms of demographic variables including age, gender, body mass index (BMI), diabetes, smoking status, injury mechanism, polytrauma, vascular injury, open fracture, unicondylar versus bicondylar, and AO/OTA classification (all $p>0.05$). The SI fasciotomy patients had significantly fewer surgical site infections compared to the DI fasciotomy patients (SI 18.1% vs. DI 41.3%; $p<0.001$; OR 2.28, [CI 1.42 – 3.66]). This difference in infection rates remained significant in multivariate regression analysis controlling for other risk factors (vascular injury, diabetes, BMI and gender; SI vs. DI OR 3.62, $p=0.001$). Patients with a dual (medial and lateral) surgical approach and DI fasciotomies developed a surgical site infection in 60% (15/25) of cases compared to 21.3% (13/61) of cases in the SI group ($p<0.001$). The nonunion rate was similar between the two groups (SI 5.5% vs. DI 9.5%; $p=0.3$). The SI fasciotomy group required fewer debridements ($p=0.04$) until closure but there was no difference in days until closure (SI 5.5 vs. DI 6.6; $p=0.09$). There were zero cases of incomplete compartment release requiring return to the operating room.

DISCUSSION AND CONCLUSION: Tibial plateau fractures with concomitant ACS demonstrate high rates of surgical site infections. However, patients with DI fasciotomies were more than twice as likely to develop a surgical site infection compared to SI patients despite similar fracture and demographic characteristics between groups. Orthopaedic surgeons should consider prioritizing SI fasciotomies in this setting.