

Staged Prone/Supine Fixation of High-Energy Multicolumnar Tibial Plateau Fractures: A Multicenter Analysis

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Background/Purpose: Historically, surgical tactics for tibial plateau fractures have emphasized anterior surgical approaches and techniques as supine patient positioning is most commonly performed to avoid potentially vulnerable retrocondylar neurovascular structures. However, occasionally the majority, if not entirety, of articular involvement is posteriorly based. Initial prone positioning to afford posterior medial surgical access, with subsequent supine positioning and additional definitive fixation employing an anterior approach, may offer a useful surgical strategy in several distinct fracture patterns. These include a subset of Schatzker type V (OTA type 41C) patterns with medial lesions in the coronal plane, and 3-column fracture-dislocations. In either scenario, medial and subsequent lateral column fixation may be performed supine in a “staged” manner. This may be performed in the same or delayed operative setting depending on soft-tissue concerns. This surgical strategy may prove advantageous and with less liability than supine-only positioning with regard to fracture visualization, reduction, and implant insertion in unique clinical scenarios. We present a surgical strategy to manage multicolumnar fracture pattern variants by addressing the predominant posterior fragment employing a Lobenhoffer approach in the prone position followed by supine patient repositioning and anterior approach access. This may be performed in the same or delayed operative setting. We predict this strategy will optimize surgical treatment generating satisfactory postoperative limb alignment, articular surface reduction, range of motion, and patient outcome scores.

Methods: A multicenter retrospective analysis was performed to assess staged fixation of multicolumnar tibial plateau fractures using a Lobenhoffer approach in the prone position followed by supine repositioning for anterior surgical access from three academic Level I trauma centers. 36 cases presenting with multicolumnar tibial plateau fractures met inclusion criteria for the staged protocol between 2003 and 2014. Patient demographic information was retrospectively reviewed with a mean follow-up time of 11.3 months (range, 3-36 months). Postoperative radiographic analysis, physical examination findings, and patient outcome scores from the KOOS (Knee injury and Osteoarthritis Outcome Score) questionnaire were recorded.

Results: The average time to union was 3.5 months (range, 3-9 months). 89% of patients had satisfactory articular reduction (less than 2 mm articular stepoff). All patients demonstrated satisfactory coronal (medial proximal tibia angle $87 \pm 5^\circ$) and sagittal alignment (posterior proximal tibia angle $9 \pm 4^\circ$). Condylar width averaged 1.6 mm. 30% of cases required posterior lateral columnar plating (in addition to posterior medial columnar plating), with only one of these cases requiring an extensile exposure modification (medial gastrocnemius origin

detachment) to gain access posterolaterally. In 14 cases the posterior approach was staged to allow for anterior soft-tissue recovery prior to subsequent staged supine positioning and lateral column fixation. The knee range of motion averaged 120° (total arc) of flexion. The average KOOS score was 79/100 (range, 29-95). 8.3% of the patients in the series developed a surgical site infection (n = 3) with 2 requiring formal irrigation and debridement. The most common aseptic complication was radiographic posttraumatic arthritis (20%). Clinically, one patient eventually required total knee arthroplasty.

Conclusion: High-energy multicolunar tibial plateau fractures with significant posterior columnar involvement in some clinical scenarios may be predictably addressed with prone posterior access and fixation followed by supine repositioning and the inclusion of an anterior approach. This study demonstrates excellent postoperative radiographic results and acceptable clinical outcomes invoking the described staged protocol. We conclude that the Lobenhoffer approach in the prone position serves well to address extreme posterior columnar tibial plateau fracture variants with regard to fracture visualization, reduction, and ease of implant application. In this manner a desirable and predictable foundation upon which to complete osteoarticular reconstruction is afforded. Utilizing this tactic in our series produced satisfactory radiographic and clinical outcomes.