

Volumetric Depression: A Better Predictor for Subsidence in Tibial Plateau Fractures

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INTRODUCTION:

Depression of Schatzker II tibial plateau fractures is often measured on plain radiographs or a single CT image. The goal of this study was twofold: 1) To quantify the three-dimensional volumetric depression associated with these injuries, 2) correlate the amount of articular depression to clinical and functional outcomes.

METHODS: Thirty-eight patients with 38 Schatzker type II tibial plateau fractures treated surgically who had appropriate CT scans available were identified. Using the system tools on a picture archiving and communication system, we developed a method for calculating the volume area of articular depression of the lateral tibial plateau. Three-dimensional volume deficits were examined using coronal and sagittal CT scans. Volume was calculated for all patients. All patients underwent a similar procedure for fracture repair, including: open elevation of the articular surface, bone void filling, and plate and raft screw fixation. Postoperative radiographs were reviewed to identify those in whom articular subsidence had occurred. Clinical and functional outcomes were assessed at patients' final follow up. These metrics were compared between subsidence and non-subsidence group cohorts.

RESULTS: The patients had a mean age of 47.9 years and had average follow up of 17.4 months range: 6 – 60 months). Demographics between those with and without subsidence were similar. Patients with postoperative subsidence sustained larger initial volume deficits (avg: 2002.3 mm³) of the tibia plateau than patients with lower initial volume deficits (avg: 1222.9 mm³) (p < 0.05). A large volume deficit was determined to be >2000 mm³ based on the distribution plot and smaller was considered <2000 mm³. Calcium phosphate bone void filler was used at the same rate between both groups. There were no differences in distribution of the location of depression at lateral joint. There were no differences in complications, pain scores, knee ROM, SMFA at latest follow up, or development of PTOA. Therefore subsidence was correlated with larger volume deficit but this did not affect clinical outcomes.

DISCUSSION AND CONCLUSION:

Larger volume of articular depression of tibia plateau fracture following Schatzker II tibia plateau fracture is predictive of subsidence following open reduction internal fixation. Subsidence, however was not associated with clinical and functional outcomes.

Distribution Plot:

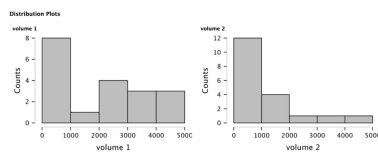


Table 1 Demographics:

	Post Operative Subsidence (N = 19)	No Subsidence (N=19)	p- value
Age (years, mean ± std)	47.9 ± 13.8	48.1 ± 14.0	0.97
Male Gender, n (%)	11 (57.9%)	11 (57.9%)	1.00
BMI* (kg/m ² , mean ± std)	27.9	26.8	0.62
Smoking Status	2/19	5/19	0.21
CCI	3-I, 2-III	3-I, 3-III, 1-IV	N/A
Location of Depression	AL: 10 (26.3%) PL: 10 (26.3%) AM: 9 (23.7%) PM: 9 (23.7%)	AL: 12 (28.6%) PL: 12 (28.6%) AM: 10 (23.8%) PM: 8 (19.0%)	0.909

Table 2 Outcomes:

	Post Operative Subsidence (N = 19)	No Subsidence (N=19)	p- value
Volumetric Depression mm ³	2002.3	1222.9	0.042*
Knee ROM degrees	124.7	125.4	0.90
Ca Phos Bone void	19	19	1.0
SMFA	67.8	70.6	0.75
Infection	2	2	1.0
Re-operation	1 (TKA)	2 (ROH)	0.55