Association of Knee Alignment and Quality of Reduction with Subsidence After Internal Fixation of Tibial Plateau Fractures in Elderly Patients

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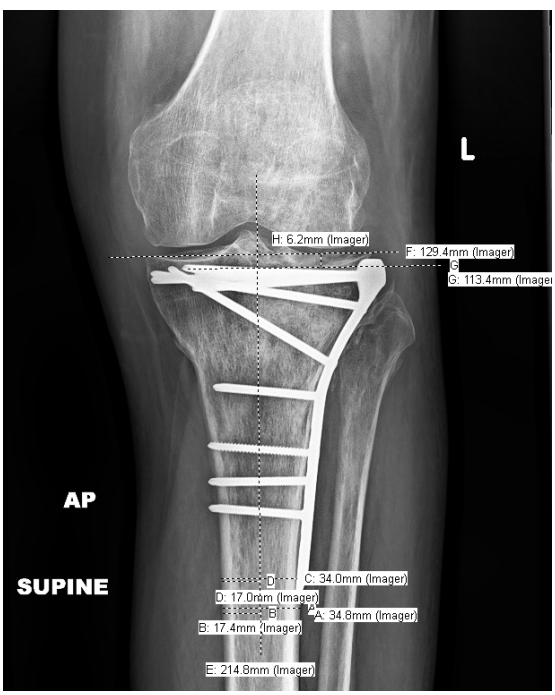
Background/Purpose: Tibial plateau fractures have been reported to occur in as much as 10% of all fractures in elderly osteoporotic patients. Subsidence within 3 months of open reduction and internal fixation (ORIF) with plating is a common complication in these patients, with some reports of as high as 85% incidence. Knee malalignment has been speculated to be a risk factor for subsidence but the association has not been clearly established. Femur-tibia axis (FTA) on knee AP radiographs has been established as a valid alternative to hip-knee axis (HKA) to assess knee alignment. We conducted this study with the intention to investigate the association of malalignment and quality of reduction with subsidence. Our hypotheses were: knee malalignment is a risk factor for subsidence and quality of reduction is associated with the final tibial plateau height in patients >50 years of age.

Methods: 99 patients older than 50 years of age with Schatzker I to V tibial plateau fractures internally fixed with plating were included. Retrospective review of the patient charts with immediate postoperative and final follow-up radiographs was done. Knee alignment was measured by the angle formed by the femur and tibia at the center of the tibial spine (FTAt) as described by Moreland et al with angles <20° and >40° of valgus considered as malalignment. To measure the tibial plateau height difference, the anatomic axis of the tibia was drawn and perpendiculars to this axis were drawn along the lateral and medial tibial plateaus (Fig. 1). Both the perpendiculars typically overlap in anatomically reduced state. Relative elevation of the operated tibial plateau over the nonoperated one was designated as "overreduction" and relative depression as "underreduction." Quantitative assessment of subsidence was done by measurement of the chronological change in the difference of the tibial plateau heights as described by Boraiah et al. >3-mm subsidence was considered "significant" as described by Ali et al. For all isolated unicondylar fractures, association between the immediate postoperative reduction (overreduction/anatomic reduction/



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underreduction) and the final articular state reached was performed. Logistic regression and X^2 tests were used for statistical analysis.

Results: 30% of the patients included were males with mean follow-up of 46 weeks, and 67% of them had low-energy injury. Malalignment appears to increase the risk of occurrence of significant subsidence (odds ratio 2.47, 95% CI 0.92-6.65) approaching statistical significance ($P = 0.07$). Out of the isolated unicondylar fractures (N = 81, Schatzker I to IV) 64% of the patients with overreduction postoperatively (30 of 47; mean height: 2.8 mm) ended up overreduced or anatomically reduced at final follow-up, whereas 100% of the patients with anatomic reduction postoperatively (N = 11) ended up underreduced. Thus, overreduction was effective in achieving better final anatomical state ($P < 0.0001$). The use of biological cement as a void filler (N = 23) was found to decrease the amount of subsidence but without statistical significance.

Conclusion: In this study knee malalignment was found to increase the risk of subsidence and overreduction was found to have preventive effect on subsidence. The major limitation of our study is a relatively small patient population. As patients with malalignment are at risk of subsidence, use of biological cement and protected weight bearing may be justified in them. Overreduction of the tibial plateau appears successful in achieving better final articular anatomy.

See pages 49 - 106 for financial disclosure information.