## Prognostic Value of Tip-to-Apex Distance in Prophylactic Fixation for Pathological Peritrochanteric Femur Fractures

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INTRODUCTION: Intramedullary prophylactic fixation provides early postoperative mobilization for patients with metastatic bone disease. The tip-apex distance (TAD) is the cumulative distance between the proximal lag screw tip to the central femoral head on anteroposterior and lateral films. Prior trauma literature demonstrates a TAD>25mm significantly increases implant failure risk, but limited data exists for pathologic fixation. The primary purpose was to examine the significance of TAD in predicting failure of prophylactic fixation of impending pathologic peritrochanteric femur fractures.

METHODS: Retrospective chart review identified patients at an academic institution from January 1, 2010 to January 1, 2020 undergoing intramedullary nailing for impending pathologic peritrochanteric fractures. Tip-apex distance was measured, and the study group was divided into two cohorts (TAD 0-25 mm, TAD>25mm). Pearson-chi square tests were used to compare for differences in baseline demographics, clinical characteristics, and study outcomes. Multi-variate logistic regression analyses were used to assess whether a TAD>25mm was associated with different rates of failure of fixation/cut-out.

RESULTS: A total of 127 patients met inclusion criteria, of which 45 had a TAD>25mm. Patients with a TAD>25mm demonstrated slightly higher rates of cut-out or fixation failure, need for revision surgery, and implant failure. The rate of fixation failure or screw cut out was insignificant between implant types ($p = 0.123$). Partial weight bearing was associated with a lower odds of screw cut-out or fixation failure when compared to weight bearing as tolerated postoperatively (OR 0.04 [0.004-0.36]; $p=0.004$). Multi-variate analysis showed higher TAD was not associated with greater odds of failure to fixation (OR 1.92 [95% CI 0.18-20.24]; $p=0.587$).

DISCUSSION AND CONCLUSION: A trend exists toward higher rates of fixation failure, revision surgery and low implant survival with TAD >25mm among patients undergoing pathologic peritrochanteric fracture fixation. Although it did not reach statistical significance, providers should still adhere to orthopedic trauma principles when treating impending pathologic hip fractures.