Validity of Tip Apex Distance as a Predictor of Failure in Cephalomedullary Nails: A Single Center Study

*Paul Norio Morton, MD; **Anshul Agarwala, MD**; Anup Krishna Gangavalli; Gregory F. Carolan, MD; Chinenye Okezie Nwachuku; William G. Delong, MD*
St. Luke's University Hospital, Bethlehem, Pennsylvania, USA

Purpose: The concept of tip apex distance (TAD), introduced in 1995 by Baumgaertner et al, established a simple guide for optimal lag screw placement on orthogonal films of the hip mainly using side plating. With the recent rise in the use of cephalomedullary nails, the goal of this study is to add to the body of data and evaluate the use of TAD in cephalomedullary nails, and explore any nuances in the distribution of failure and success at our center.

Methods: Patients who underwent cephalomedullary nail fixation for a proximal femoral fracture from April 2004 to July 2011, who were 18 years of age, and had at least 3 months of follow up were retrospectively reviewed. Exclusion criteria included lesion within the femur, inadequate films, incomplete medical record, different type of implant, prior hip fracture, or preexisting deformity. Outcomes were categorized as cutout, failure, nonunion, or healed. Cutout was defined as penetration of the tip of the lag screw or blade through the articular surface of the femoral head. Standard postoperative instructions were issued to all patients allowing weight bearing to tolerance initially with follow-up at 2 weeks, 6 weeks, and 3 months.

Results: A total of 677 femur fractures were retrieved, of which 235 fractures met inclusion criteria. Fractures were excluded for less than 3 months of follow-up, incomplete data, inadequate films, and different type of implant. There were 183 implants with a TAD <25 mm and 52 patients with a TAD >25 mm. 215 implants had no implant complications, 12 had cutout, 5 required revisions for nonunion, and 3 had breakage of implants. The mean TAD was 23.51 ± 10.10 mm for implants that cut out, 21.30 ± 9.37 mm for breakage, 13.35 ± 4.77 mm for nonunion, and 20.10 ± 7.77 mm for successful union. Implants with a TAD >25 mm were significantly (P = 0.002) more likely to have cutout occur (13.5%) compared to those with TAD <25 mm (2.7%).

Conclusion: The goal of this study was to scrutinize TAD <25 mm against the outcomes of cephalomedullary fixation of peritrochanteric hip fracture at a single institution. Our study confirms the previous literature supporting the value of TAD >25 mm as a predictor of screw cutout. Within our cohort of cephalomedullary nails, the TAD value of 25 mm as a maximum cutoff in preventing cutout remains statistically significant (P = 0.002) and constructs with a TAD >25 mm were 5 times more likely to cut out.

See pages 401 - 442 for financial disclosure information.