Comparison of 3 Hip Nails and 1 Sliding Hip Screw Regarding Screw Protrusion, Femoral Neck Shortening, and Lateral Thigh Pain in the Treatment of Intertrochanteric Femur Fractures

ABSTRACT

Introduction: There have been substantial improvements in implant designs for the open reduction and fixation (ORIF) of intertrochanteric femur fractures. Multiple fixation options are available to stabilize intertrochanteric femur fractures, including cephalomedullary nails with both fixed and sliding lag screw options and sliding hip screws. Multiple studies have failed to demonstrate differences in outcomes between cephalomedullary nails and sliding hip screw implants.[1,2] As these designs improve, major complications such as screw cut-out and failure are becoming increasingly rare, however other complications still occur such as lateral screw protrusion that contributes to lateral thigh pain, or femoral neck shortening that alters gait mechanics. This study aims to identify other complications associated with current fixation devices for intertrochanteric femur fractures that can guide implant choice.

Methods: A retrospective cohort of 256 patients $\geq$ 65 years who underwent open reduction and internal fixation (ORIF) of intertrochanteric femur fractures between 2015 and 2022. Four internal fixation constructs were included: Arthrex Trochanteric Nail, Synthes Trochanteric Femoral Nail, Synthes Advanced Trochanteric Femoral Nail and Synthes Dynamic Hip Screw. Radiographic measurements including tip-apex distance (TAD), lateral screw protrusion, and lag screw shortening were obtained from intra operative fluoroscopy, 6 weeks post op visit, and 3 month post op visit. The presence of lateral hip pain, hardware failure, or corticosteroid injection for lateral hip pain were evaluated at both the 6 week and 3-month postoperative visit.

Results: Two hundred patients comprised the study population with 50 receiving the ATN implants, 50 receiving DHS implants, 55 receiving TFN implants, and 51 receiving TFN-Advanced implants. The cohort was 66.02% female with an average age of 78 years old. The ATN was found to have statistically significant less protrusion and shortening at both 6 weeks and 3 months after surgery ($p < 0.001$). Additionally lateral hip pain and both protrusion and shortening was found to be statistically significant (

p = 0.048, 0.005). However, ATN implant demonstrated motion between the lag screw and nail in 40% of cases that unexpectedly increased lateral protrusion considering the telescoping nature of the lag screw. DHS demonstrated significantly greater shortening than the cephalomedullary nails overall.

Conclusion: . Patients receiving the ATN implant had the least amount of nail protrusion and lowest incidence of lateral thigh pain (24%) when compared with the other cephalomedullary implants. This demonstrates the utility of the telescoping nature of the lag screw in that shortening still occurred through the fracture, but the same degree of protrusion was not appreciated when compared with TFN, TFNA, and DHS with sliding lag screw designs.