

Plate, Short Nail, or Long Nail? Revision Rates and Complications of Three Different Treatments for Intertrochanteric Femur Fractures

Mason Poffenbarger, Neil Werthmann, John Riehl, Kisan Parikh

INTRODUCTION:

Intertrochanteric femur fractures occur at a rate of 150,000 per year in the United States—about 50% of all proximal femoral fractures. These fractures have a bimodal incidence with the majority occurring in elderly patients due to low-energy mechanism and those occurring in younger populations as a result of high-energy trauma. Treatment with cephalomedullary nails (CMN) has become increasingly popular among surgeons due to a less invasive approach with reliable fixation, greater stability with a shorter moment arm, and the ability to return patients to mobility.

In general, CMN implants come in short (SCMN; 17-24cm) and long (LCMN; 26-48cm) options. Guidelines on when to choose a CMN over a plate and screw device (PSD) are well established but choosing the optimal length of CMN is left to surgeon preference and judgment. The American Academy of Orthopaedic Surgeons (AAOS) has several guidelines on intertrochanteric and peritrochanteric fracture treatment, but guidelines do not specify what length of intramedullary device to use in different circumstances.

Current surgical decision making often includes evaluation of the extent of fracture lines distal to the lesser trochanter in the shaft of the femur with some recent literature indicating a short CMN is adequate for up to 3cm of subtrochanteric extension.

Recent studies have shown decreased operative times, decreased intraoperative blood loss, and decreased need for transfusion with a short CMN with no difference in postoperative hardware failure or peri-implant fracture rates. This calls into question the notion of protecting the whole femur with a long nail. They also highlight a need to evaluate the morbidity of revising these peri-implant fractures as a long CMN often precludes the possibility of switching to a longer implant due to lack of adequate distal bone stock and will often require more invasive surgical fixation (e.g., lateral femoral locking plate).

METHODS:

Retrospective review of a multicenter database of orthopaedic patients with intertrochanteric femur fractures between January 1, 2016 to January 1, 2021. Data gathered by CPT and ICD-9/ICD-10 codes. Patients ages 18-89 years old with intertrochanteric femur fracture were reviewed for peri-implant fracture and associated revision surgeries within 12 months after their index surgery looking at length of hospitalization, death, DVT within 6 months of surgery, transfusion during hospitalization, length of stay, and rates of discharge to home. Patients were stratified by medical comorbidities (utilizing the Elixhauser Comorbidity Index), gender, age, race, and smoking status. Inclusion criteria were patients aged at least 18 years up to 89 years (due to database restrictions) with intertrochanteric and subtrochanteric femur fractures. Patients excluded from analysis were those who were pregnant, had diagnosis of any cancer, were revised for nonunion, age less than 18 or over 89 years, or had a measured outcome present on initial encounter.

RESULTS:

A total of 13,197 patients were included in the study. Of these, 5,924 patients received long nails, 6,464 received short nails, and 809 underwent plating. Significant differences in 12 month adverse events were observed in patients aged 30-49 compared to those 65-89 (OR 2.9, $p=0.01$) and in those receiving long nails compared to short nails (OR 1.53, $p=0.04$). Additionally, the rates of blood transfusion after the index surgery were statistically significantly higher in the long nail (0.6%) and plate/screw (0.9%) devices compared to short nails (0.2%; $p<0.05$) but not significantly different when comparing long nails to plate/screw devices. No significant difference was noted in terms of distal peri-implant fractures between any of the devices used in the index surgery (0.88% SCMN, 0.84% LCMN, 0.74% PSD; $p=0.89$). Rates of discharge home versus care managed facilities were similar between all three groups ($p=0.88$).

DISCUSSION AND CONCLUSION:

The use of either PSD, SCMN, or LCMN is associated with a similar risk of peri-implant fracture, need for hardware removal, and revision surgery. These findings confirm our hypothesis and indicate, along with existing literature, that use of a longer implant does not protect the femur from future fracture but instead moves the fracture to the distal femur. These distal femoral fractures often necessitate larger, more invasive surgery with at least a lateral femoral locking plate as there isn't enough distal bone stock to bypass the fracture with a longer intramedullary implant. These procedures are more physiologically burdensome on patients than a revision from a short nail to a long nail with a peri-implant fracture occurring in the diaphyseal femur. Further research into the fracture types and amount of subtrochanteric extension that can be tolerated by SCMN is warranted to minimize the morbidity associated with the initial LCMN surgery and potential future revision.