# Short Cephalomedullary Nails for Intertrochanteric Femur Fractures are Not as Stable as We Think: The Rate of Postoperative Nail Toggle Compared to Long Cephalomedullary Implants

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INTRODUCTION:

Short cephalomedullary nails (CMN) are increasingly being used for stabilization of intertrochanteric femur fractures. While typically successful, these implants are still associated with complications including uncontrolled collapse, nonunion, and implant failure. Long versions of these implants that span the isthmus are available, but have not been shown to be superior clinically.

Recently, short cephalomedullary nail toggle has been described. This occurs when the medullary portion of the implant in the distal segment moves within the canal post-operatively, and has been associated with varus change in alignment. It is unknown whether there are effective methods to prevent toggle. It is unknown whether long cephalomedullary nails prevent toggle.

The purpose of this study was to determine whether short cephalomedullary nails were more often associated with toggle compared with long nails in the treatment of intertrochanteric femur fractures. Secondarily, we sought to identify the effect of nail-canal fill, distal nail end point and lateral cortex abutment on rates of toggle. Finally, we sought to determine whether the presence of nail toggle was associated with fixation failure and need for revision surgery.

METHODS: A retrospective study of patients treated between 2014- 2021 with standard or reverse obliquity intertrochanteric proximal femur fractures (OTA 31A) was performed. Nail toggle was defined as a change in position of the medullary portion of the implant relative to the final intraoperative position, excluding motion of the hip screw component due controlled collapse. Complications were recorded and analyzed.

RESULTS:

Eight-one patients were included the study (31 long and 50 short CMN). The mean follow up was 72 months, with a minimum follow up of 11 months. In the 31 long CMN group, there was 1 toggle event (3%); in the 50 patient short CMN group, there were 22 events (44%) ($p<0.001$).

In a sub-analysis of the short CMN group, there was erosion of the implant into the lateral cortex in 12 cases (24%).

Of the 19 cases where the implant did not abut the lateral cortex on final fluoroscopic images, 14 went on to do so (74%). Thus, in 90% of short CMN cases, the distal tip of the implant was noted to rest on the lateral cortex at final follow up. The mean canal fill when toggle did not occur was 78.4±12.5%, compared to 70.1±8.4% in cases where toggle did occur ($p=0.0132$). There was one catastrophic failure requiring revision surgery in a patient who experienced post-op toggle.

DISCUSSION AND CONCLUSION:

In this retrospective study of 81 hip fracture patients, we found that the use of a long nail significantly decreased the rate of post-operative nail toggle (44% vs 3%). In the short nail group, in 74% of cases where the nail distal tip ended medial in the canal not in contact with the lateral cortex initially, it changed position to rest against the lateral canal at final follow up. Toggle occurred more commonly when the canal-fill percentage was lower.

These data may inform surgeons who desire the intramedullary nail portion of the implant to act as a truly static, stable backstop for controlled collapse. Strategies to avoid postop nail toggle may include use of a long nail, the use of a larger diameter short nail to fill the canal, or an entrance angle that permits the distal nail tip to rest against the lateral cortex at the conclusion of the case. Nail design and shape changes to ensure immediate post-operative lateral cortex-nail contact may be investigated.

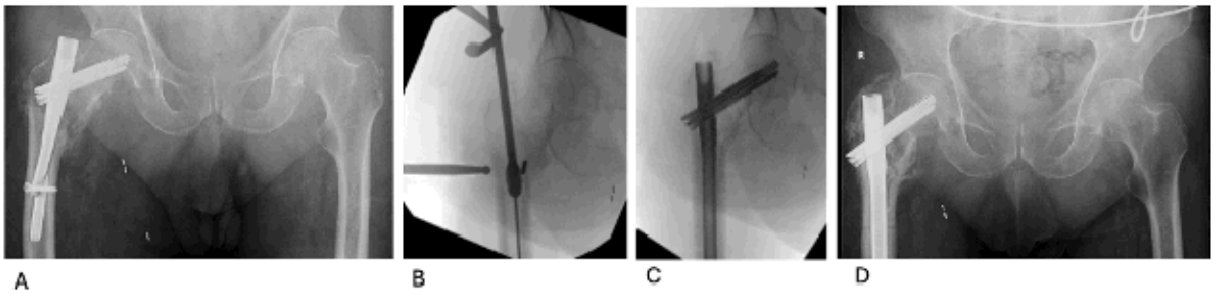


Figure 1. Clinical example showing short CMN toggle associated with nonunion, loss of alignment, and implant failure (A). The patient underwent nonunion repair with realignment and revision to a long nail (B and C). Ultimately the patient went on to fracture union following the reoperation (D).