

Femoral Shaft Fractures: Does Routine Use of Cephalo-Medullary Screws Prevent Future Fractures of the Proximal Femur?

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Purpose: Femoral shaft fractures are routinely stabilized with a statically locked intramedullary nail (IMN) employing 1 or 2 distal locking screws and 1 or 2 proximal locking screws. Options for proximal locking during antegrade nail placement include oblique/transverse screws (standard locking [STL]) or the use of cephalomedullary fixation (CML) with screws placed deep into the center of the femoral head. The routine use of CML has been proposed as a method of preventing a proximal femur fracture in the event of a future fall. The downside of routine use of CML is the increased operative time and radiation exposure needed for safe placement and risk of femoral head/neck penetration. We hypothesized that CML fixation would significantly increase the load to fracture, compared to STL, in a lateral fall cadaver model.

Methods: Ten matched pairs of fresh frozen cadaveric femurs from 3 male and 7 female donors were obtained with an average age of 71.1 years (± 11.5) and average neck T-score of -2.3 (± 1.0). Fixation was randomized with one limb from a donor fixed with STL (5-mm screws \times 2) and the other femur fixed with CML (6.5-mm screws \times 2). Femurs were instrumented with a 300 mm \times 11-mm diameter trochanteric entry IMN. A mechanical testing frame (MTS with 10kN load cell) was utilized to simulate a lateral fall with an impact on the trochanter. Loading constraints were based on a previously published method, and femurs were set at an adduction angle of 15° with loading at 100 mm/s until fracture. The load-displacement curve was recorded.

Results: The average CML load at fracture was 2530 (± 1621) N and STL was 2006 (± 1421) N ($P = 0.03$ paired 2-tailed t-test). In 2 cases, the CML specimens fractured at a lower load than the matched STL specimens. The STL specimens created a displaced basicervical/intertrochanteric fracture. CML fractures were nondisplaced.

Conclusion: Cephalomedullary fixation required an average 20% more force to fracture and resulted in minimal fracture displacement in this osteopenic lateral fall model compared to STL. These findings supply evidence that may justify routine use of cephalomedullary screws even when an occult femoral neck fracture is not of concern.



The FDA has stated that it is the responsibility of the physician to determine the FDA clearance status of each drug or medical device they wish to use in clinical practice.