

Long Segment Blocking Screws (LSBS) Increase Stability of Retrograde Nail Fixation in Geriatric Supracondylar Femur Fractures: Eliminating the “Bell-Clapper Effect”

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Purpose: This study was undertaken to determine the change in stiffness of a geriatric supracondylar femur fracture model with the addition of distal segment blocking screws versus proximal (long) segment blocking screws to the standard retrograde intramedullary nail construct.

Methods: Supracondylar femur fractures (AO/OTA 33-A3) were created in 12 osteoporotic, matched-pair, cadaveric femurs. These were instrumented with a retrograde intramedullary nail (R-IMN) and divided into 2 groups. Group 1 compared the standard construct (SC) to a construct augmented with blocking screws placed in the distal/short segment (SSBS). Group 2 compared the SSBS to a construct in which blocking screws were placed just proximal to the fracture in the long segment (LSBS). Specimens were then axially loaded and cycled to failure or runout. The main outcomes were (1) stiffness measured on a force/displacement graph during baseline assessment (axial load at 50 N) and cyclic loading for 10 K cycles at 3 Hz and (2) construct failure defined by actuator displacement of 15 mm above baseline.

Results: Group 1: There was no difference in stiffness at baseline ($P = 0.17$) or after 40 K cycles ($P = 0.34$) between the SC and SSBS. There was no difference in number of cycles to failure ($P = 0.330$). Group 2: LSBS specimens were significantly stiffer at baseline ($P = 0.023$) and after 40 K cycles ($P = 0.028$) compared to SSBS specimens. There was no difference in the number of cycles to failure ($P = 0.640$).

Conclusion: Blocking screw placement in the distal fracture segment provides no additional stability to the construct. Placement of LSBS significantly increases construct stiffness by eliminating the bell-clapper effect (Figure).

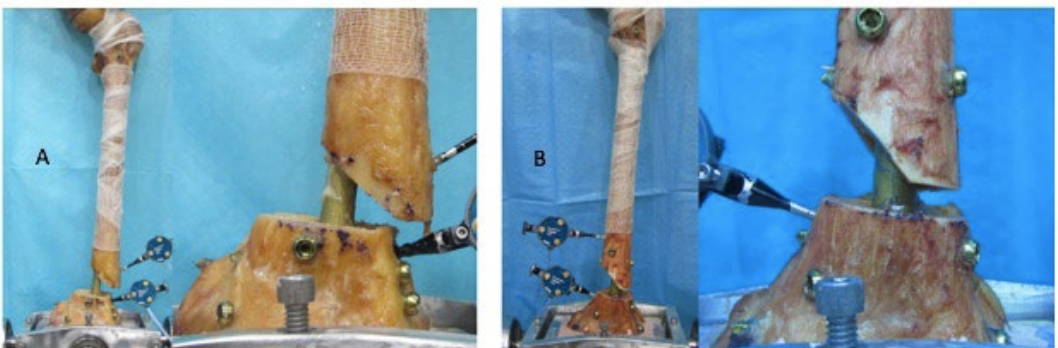


Figure 1. (A) Bell-clapper effect. Motion of the nail within the metadiaphysis/shaft with loading. (B) Addition of long segment blocking screws (LSBS) prevents bell-clapper effect.

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