

## Healing of Atypical Subtrochanteric Femur Fractures after Cephalomedullary Nailing: Which Factors Predict Union?

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**Purpose:** The purpose of this study was to (1) determine the healing rate and time to union of atypical subtrochanteric fractures treated with cephalomedullary nailing, (2) evaluate the factors that may affect healing of these fractures, and (3) report the complications encountered after cephalomedullary nailing.

**Methods:** Between January 1, 2005 and December 31, 2013, 132 suspicious, atypical femur fractures associated with bisphosphonates (BPs) in patients presenting to 6 Level I trauma centers in the Asia-Pacific region were screened for enrollment. The final cohort included 42 patients with 48 displaced, atypical, BP-associated subtrochanteric femur fractures. Data were collected using a unified Case Report Form from each center. Surgical records included the operative report for the surgical procedure, reduction technique, presence of reaming and amount of over-reaming of the intramedullary canal, and the type of implant used. Radiographs taken preoperatively, in the immediate postoperative hospitalization period, and at 3-month intervals postoperatively were evaluated in the study. The primary outcome in this study was radiographic healing and healing time.

**Results:** The primary healing rate after cephalomedullary nailing of BP-associated subtrochanteric femur fractures was 68.7% (33 of 48 patients). Mean time to union was 10.7 months. Malalignment was determined using the differences in neck-shaft angle (the difference between the normal side and the surgically repaired side), and sagittal angulation. These all proved to be significantly correlated with failure and delayed healing time. The cut-off points for neck-shaft angle, difference in neck-shaft angle, and sagittal angulation were 125.6°, 4.4°, and 5.5°, respectively (receiver operating characteristic [ROC] curve analysis).

**Conclusion:** The healing rate of atypical subtrochanteric femur fractures treated with cephalomedullary nailing is lower than that previously reported for atypical femur fractures. The quality of fracture reduction proved to be the most important factor in bony union and time to union.