

## **Radiographic Outcomes of Femur Fractures Following SIGN Fin Nailing in Low- and Middle-Income Countries**

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**Purpose:** The Surgical Implant Generation Network (SIGN) nail is a versatile, low-cost implant developed for intramedullary (IM) fixation of long bone fractures in resource-limited settings. A newer design iteration, the SIGN Fin nail, further simplifies IM nailing of femur fractures, and satisfactory clinical and radiographic outcomes have been reported in small case series. The purpose of this study was to evaluate clinical and radiographic outcomes of a large cohort of femoral shaft fractures stabilized with the SIGN Fin nail.

**Methods:** The SIGN Online Surgical Database was used to identify all femur shaft fractures stabilized with the SIGN Fin nail. A random number generator was used to select 500 cases. Fractures were classified using the AO/OTA and Winquist-Hansen classification systems. Immediate postoperative coronal and sagittal plane alignment was measured on AP and lateral radiographs, respectively, using a previously validated on-screen protractor tool. The deviation from anatomic alignment (DFAA) was recorded in both planes. Clinical outcome variables recorded in the database were also analyzed, including time to surgery, reduction method, fixation approach, patient age, and patient sex. Statistical analysis was performed using 2-sample t tests, Wilcoxon rank-sum tests, or  $\chi^2$  tests where appropriate.

**Results:** The overall incidence of malalignment ( $>5^\circ$  in any plane) was 7.7%. We identified a statistically significant difference in malalignment by Winquist-Hansen type (4.9% for type 0, 6.0% for type 1, 5.7% for type 2, 13% for type 3, and 37.4% for type 4, see table). Rates of malalignment were higher for fractures managed with closed versus open reduction and fractures located in the proximal or distal diaphysis compared to the midshaft.

**Conclusion:** Satisfactory postoperative alignment of femoral shaft fractures can be achieved using the SIGN Fin nail in resource-limited settings. The incidence of immediate postoperative malalignment is comparable to large published series using the standard SIGN nail.