Accurate Prediction of Antegrade or Retrograde Femoral Intramedullary Implant Length From Patient Height: A Review of 608 Cases

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Purpose: The aim of this study was to determine if patient height correlates with implant length selection of antegrade or retrograde femoral intramedullary implants.

Methods: This was an IRB-approved retrospective chart review of 608 operatively treated femoral shaft fractures at a Level I trauma center from 2011 to 2017. Patient height (PH) was recorded in cm as well as femoral intramedullary implant length. Implant length, PH, and technique (antegrade or retrograde) were recorded. Spearman and Pearson correlation coefficients were utilized for statistical analysis of implant length and patient height. A P value <0.05 was considered significant.

Results: 608 operatively treated fractures were reviewed: 350 antegrade, 258 retrograde. Pearson correlation coefficients for antegrade implants were 0.676 with P <0.01, retrograde implants 0.628 with P <0.01. Two separate equations were determined to accurately predict P <0.01 femur nail implant length based on PH. Antegrade equation: \( = 97.14033 + (1.76 \times \text{PHcm}) \). Retrograde equation: \( = 58.74479 + (1.89317 \times \text{PHcm}) \).

Conclusion: Femur nail implant length can be accurately predicted based on patient height and technique utilizing the above equations. This is the first study utilizing a large number of femora to establish simple equations to aid with several issues. These equations serve as a simple templating tool. There is nothing in the literature that describes an accurate prediction model. Templating allows a check for the intraoperative measuring that would prevent an implant of incorrect length being implanted and discarded. This also allows for immediate implant availability as the implant representative can have a small selection nails in the operating room, decreasing time spent waiting on implant retrieval. Another application is in the case of bilateral comminuted femur fractures to accurately estimate limb length. A fourth application is in remote environments where surgical planning is critical for determining implant needs.