THE IMPACT OF TROCHANTERIC LOCKING SCREW POSITION AND SCREW DISTANCE ON THE ANTEVERSION OF IM NAILED COMMUNICATED FEMORAL SHAFT FRACTURES

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Purpose: Rotational malalignment after locked intramedullary (IM) nailing of femoral shaft fractures can vary from patient to patient. Prior work has shown that differences greater than 15% of normal can lead to functional complaints. Espinoza et al created a technique that utilizes the inherent anteversion of an IM nail to avoid malrotation when treating comminuted femur fractures. While this technique has been validated by larger studies, it remains a question whether there are other factors that contribute to rotational malalignment after IM nailing of a femoral shaft fracture. The purpose of this study is to evaluate whether there is a link between trochanteric locking screw start and end point with the degree of difference in anteversion between the operative and non-operative limb. Furthermore, we aim to assess the screw to tip of femoral head distance and how it effects limb version. Finally, we evaluated whether use of a helical blade versus locking screw impacted rotational malalignment in the operative limb.

Methods: 21 patients with comminuted femoral shaft fractures had locked IM nailing with the Espinoza Technique. All patients were treated with antegrade lateral entry second generation nails. Each patient had a CT scanogram conducted postoperatively to determine femoral version of the operative and non-operative limbs. All measurements were conducted using the Bonesetter application with cuts from the CT scanograms. Version was measured with lines drawn along the axis of the femoral neck and the posterior aspect of femoral condyles. Each measurement was assessed by the averages from two independent reviewers. Screw distance was measured from apex of screw to the medial tip of the femoral head in the lateral view. A ratio was taken with the known diameter of the screw to obtain true distance in millimeters. Screw start point was determined on CT and recorded as either anterior, center or posterior to the center of the trochanter. Screw end point was determined on CT and was recorded as either anterior, center or posterior to the center of the femoral head. Linear regression analysis was performed to determine correlation of screw distance and version. An ANOVA analysis was used to determine association between screw start and end point with limb version. Finally, a two-sample t-test was performed to evaluate correlation between use of a helical blade versus locking screw impacted rotational malalignment in the operative limb.

Results: Within these 20 patients, the average difference in anteversion of operative versus non-operative limbs was 6.82 +/- 7.01 degrees with a range of 0.37 to 23.25 degrees. The average screw distance was 11.32 +/- 4.65 mm with a range of 4.65 to 26.40 mm. In our analysis, there was no correlation between screw start (p=0.108) and end (p=0.847) point against limb version. There was no correlation between screw distance and limb version (p=0.208). An independent two sample t-test determined that there was no significant difference in limb version when using a helical blade versus a locking screw (p=0.322).
**Conclusion**: As with previous studies using the Espinoza technique, we were able to on average achieve differences in femoral version which would be considered clinically insignificant. Screw starting and ending point had no correlation with the difference in limb version. Furthermore, there was no significance between the screw distance and its impact on femoral version. Finally, it can be determined that use of helical blade versus locking screw does not affect the difference in limb version. With average version differences of less than 15 degrees, the study indicates that proximal screw start/end position and screw distance have limited impact on the femoral version. However, using an intraoperative technique with imaging and anatomic landmarks may be more substantial at minimizing the impact of being exact with nail placement and fit.