

Straight Nail Insertion Through Laterally Shifted Entry for Diaphyseal Atypical Femoral Fractures with Bowing: Good Indication and Limitation of the Technique*Seong En Byun, MD; Youngho Cho, MD; Young-Kyun Lee, MD**CHA Bundang Medical Center, Seoul, Korea, Republic of*

Purpose: To achieve good quality of reduction in atypical femoral fracture (AFF) with anterolateral bowing is challenging but essential for favorable outcome. A simple technique, shifting the entry point of straight nail (piriformis fossa entry nail) laterally to the tip of the greater trochanter, has been introduced and used for treating AFFs with bowing. The current study aimed to determine the degree of bowing, which this nail entry shifting technique can successfully manage, by retrospective analysis of diaphyseal AFFs.

Methods: Diaphyseal AFFs treated with nail entry shifting technique at three institutions were retrospectively analyzed. 25 patients with 29 cases of diaphyseal AFFs, including 23 complete and 6 incomplete fractures, were analyzed. Radiologic parameters, including preoperative and postoperative bowing, location of nail entry and tip, union time, and complications were evaluated. The complete AFFs were divided into two groups according to the severity of the preoperative femur bowing: grade 0-II bowing and $<20^\circ$ lateral bowing (minimal or moderate deformity group, N = 15) and grade III bowing or $\geq 20^\circ$ lateral bowing (severe deformity group, N = 8). Analysis according to the postoperative malalignment, $\geq 5^\circ$ of lateral or anterior bowing change, was also performed.

Results: For the complete AFFs, a significant difference was found in preoperative lateral and anterior bowing between groups. Three out of 15 minimal or moderate deformity group showed $>5^\circ$ of lateral or anterior bowing change (malalignment) postoperatively. On the other hand, all the complete AFFs with severe deformity showed malalignment postoperatively. Change of bowing was significantly higher for severe deformity group in both lateral and anterior bowing (2.32° vs 5.13° for lateral bowing, 2.35° vs 7.59° for anterior bowing). Complications including iatrogenic fracture and nonunion showed no difference between groups. In the comparison according to postoperative malalignment, a significant difference was found for the percentage of severe deformity. Other parameters such as nail entry / tip location, fracture location (isthmic or infra-isthmic), and nail size did not significantly differ between well-aligned and malalignment groups. All incomplete AFFs were united without complication. There was no case of severe deformity for incomplete fractures.

Conclusion: Straight nail insertion through laterally shifted entry was found to be a simple method to manage diaphyseal AFFs with grade 0-II bowing and $<20^\circ$ anterior bowing successfully. However, for AFFs with more severe deformity, malalignment was found in all cases. Therefore, for AFFs with grade III bowing or $\geq 20^\circ$ anterior bowing, other techniques such as inserting a contralateral nail or plating should be considered.