Do We Need to Use the Largest Possible Size of the Proximal Femoral Nail Antirotation (PFNA) in Intertrochanteric Fracture? A Study of Distal PFNA Intramedullary Canal Occupying Ratio (ICOR)

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Purpose: The primary objective in this study is to evaluate the effect of proportion between the diameter of distal proximal femoral nail antirotation (PFNA) and diameter at intramedullary canal (intramedullary canal occupying ratio (ICOR) to bone union and complications. We hypothesized that higher ICOR would yield a higher rate of bone union. Secondary objective is to study the other factors that may affect bone healing.

Methods: Between January 2018 and January 2020, patients aged ≥60 years with unilateral intertrochanteric fracture treated with PFNA were retrospectively evaluated. Patients were divided into a high ICOR group (≥0.78) and low ICOR group (<0.78). The ICOR was calculated by measuring the ratio of distal PFNA diameter to diameter of intramedullary canal at femoral isthmus area in both-hip AP film. Bone union was evaluated using postoperative Radiographic Union Score for Hip (RUSH) method at 2 weeks, 6 weeks, and 3-month follow-up. Demographic data, AO classification, American Society of Anesthesiologists physical status (ASA), distal reaming status, RUSH, Baumgaertner reduction grade, tip-apex distance, estimated total blood loss calculated by Gross and Nadler method, intraoperative blood loss, length of stay, operation time, and postoperative pain score were compared between the 2 groups by using t and $\chi 2$ tests. The relationship of RUSH to ICOR and other parameters were assessed by multiple linear regression analysis.

Results: 115 patients were recruited in this study. 58 patients were allocated in high ICOR group and 57 patients were allocated in low ICOR group. The high ICOR group had average RUSH of 13.2 ± 1.5, 18.6 ± 1.9, and 27 ± 1.5 while low ICOR group had average RUSH of 13.8 ± 1.6, 18.6 ± 1.9, and 27.3 ± 1.5 at 2 weeks, 6 weeks, and 3 months, respectively. There was no significant relationship between RUSH and ICOR in all 3 time frames (P>0.1). The rate of bone union between the 2 groups was equal at 2 weeks (0% union) and 3 months (100% union). However, at 6 weeks, there was a higher rate of union in high ICOR group, even though there was no statistical significance (P = 0.64). However, the Baumgaertner reduction grade was actually the factor that affected the RUSH significantly (P<0.01).

Conclusion: None of the patients had bone union at 2-week follow-up (RUSH<18) and all of the patients had bone union at 3-month follow-up (RUSH ≥18). At 6-week follow-up, we found higher rate of bone union in high ICOR group but this was statistically insignificant. From multiple linear regression analysis, the quality of reduction showed significant relationship to bone union, which stresses the importance of good reduction over other evaluated factors in this study. Based on findings in this study, choosing the smaller size of PFNA (ICOR <0.78) in intertrochanteric fracture yields comparable bone union rate with larger nail size (ICOR ≥0.78). In addition, it can decrease the chance to perform intramedullary canal reaming.