MAK HILL Publications International Journal of Tropical Medicine

Research Article
doi: 10.36478/makijtm.2024.3.89.93

Management and Outcome of Unstable Intertrochanteric Fracture by Proximal Femoral Nail Versus Proximal Femoral Nail Anti-rotation in Elderly Patients: A Prospective Comparative Study

[1]Ashish Kumar Paswan, [2]Pratyush Parag and [3]Govind Mohan Jee

[1-3]Department of Orthopaedics, Darbhanga Medical College Hospital, Darbhanga Bihar, India

Abstract

Intertrochanteric fractures are common in the elderly, with significant morbidity and mortality. Various fixation devices are available, with Proximal Femoral Nail (PFN) and Proximal Femoral Nail Antirotation (PFNA) being widely used. However, comparative outcomes between these two methods in elderly patients remain under-researched. This prospective comparative study included 20 elderly patients (aged ≤65 years) who suffered unstable intertrochanteric fractures. They were randomly assigned to undergo surgery with either PFN or PFNA. The primary outcomes measured were post-operative mobility, complication rates and mortality at 6 months post-surgery.Both the PFN and PFNA groups exhibited considerable post-operative mobility, with PFNA patients achieving a higher rate of full mobility at six months (80% vs. 60% for PFN), However the difference was statistically not significant. Additionally, while not statistically significant at the conventional 0.05 threshold, the PFNA group demonstrated a lower rate of complications (20% vs. 40% for PFN) with a p-value of 0.96, indicating a trend toward better outcomes in terms of reducing post-operative complications. Moreover, PFNA was associated with a significantly higher rate of successful fixation (100% vs. 90% for PFN), suggesting more reliable and robust fixation in patients treated with PFNA. These results underscore the potential benefits of PFNA in the management of unstable intertrochanteric fractures in elderly patients, particularly in achieving better mobility and fewer complications. Both PFN and PFNA are effective for managing unstable intertrochanteric fractures in the elderly, though PFNA may offer some advantages in terms of lower complication rates. Further studies with larger sample sizes are recommended to confirm these findings.

OPEN ACCESS

Key Words

Intertrochanteric fracture, Proximal Femoral nail, Proximal Femoral Nail Antirotation

Corresponding Author

Pratyush Parag

Department of Orthopaedics, Darbhanga Medical College Hospital, Darbhanga Bihar, India

pratyushparag@gmail.com

Author Designation

[1]Senior Resident

[2]Senior Resident

[3]Professor and HOD

Received: 9 May 2024

Accepted: 12 June 2024

Published: 3 July 2024

Citation: Ashish Kumar Paswan, Pratyush Parag, Govind Mohan Jee, 2024. Management and Outcome of Unstable Intertrochanteric Fracture by Proximal Femoral Nail Versus Proximal Femoral Nail Anti-rotation in Elderly Patients: A Prospective Comparative Study. Int. J. Trop. Med., 19: 89-93, doi: 10.36478/makijtm.2024.3.89.93

INTRODUCTION

Intertrochanteric fractures represent a significant clinical challenge in the elderly population, primarily due to their association with high morbidity and mortality rates as well as the aging demographic's unique physiological considerations. These fractures, often resulting from low-energy trauma, are indicative of underlying osteoporosis, making surgical management complex due to poor bone quality. The choice of fixation device is critical to ensure stability, promote early mobility and reduce the risk of complications.[1]

Proximal Femoral Nail (PFN) and Proximal Femoral Nail Antirotation (PFNA) are two widely utilized surgical implants for these fractures. PFN, designed to provide stable fixation in multi-fragmentary fractures, is complemented by PFNA, which incorporates an antirotation blade to enhance stability against rotational forces. Comparative studies have varied in outcomes, making it crucial to evaluate these devices under controlled clinical conditions[2].

Recent advancements in surgical technology and techniques have aimed to reduce operation time, blood loss and intraoperative complications. Despite these improvements, the debate between the use of PFN versus PFNA in terms of recovery outcomes and long-term functionality in the elderly persists. This study aims to address this gap by providing a detailed comparison of these two techniques in a randomized cohort of elderly patients[3].

Aim and Objective

To compare the effectiveness and outcomes of Proximal Femoral Nail (PFN) versus Proximal Femoral Nail Antirotation (PFNA) in the management of unstable intertrochanteric fractures in elderly patients.

- To evaluate the post-operative mobility of patients treated with PFN versus PFNA.
- To assess the complication rates associated with PFN and PFNA.
- To compare the mortality rates at 6 months post-operation between PFN and PFNA groups.

MATERIALS AND METHODS

Source of Data: The data was sourced from elderly patients presenting with unstable intertrochanteric fractures at our institution.

Study Design: A prospective, randomized, comparative study.

Study Location: The study was conducted at Darbhanga Medical college Hospital.

Study Duration: The study duration was from July 2023 to May 2024.

Sample Size: A total of 20 elderly patients were included, with 10 in each study group.

Inclusion Criteria: Patients aged 65 years or older with radiologically confirmed unstable intertrochanteric fractures.

Exclusion Criteria: Patients with severe comorbid conditions, previous hip surgeries, or those who declined to participate.

Procedure and Methodology: Patients were randomly assigned to receive either PFN or PFNA. Surgical procedures were performed under general or spinal anesthesia, following standard preoperative preparations and postoperative care protocols.

Sample Processing: Not applicable as this study did not involve biological samples.

Statistical Methods: Data were analyzed using chi-squared tests for categorical variables and t-tests for continuous variables. Statistical significance was set at $p<0.05$.

Data Collection: Data were collected through patient medical records, operative reports, follow-up visits and telephonic interviews to ensure completeness and accuracy.

RESULTS AND DISCUSSION

The (Table-1) presents the outcomes of two different fixation methods, Proximal Femoral Nail (PFN) and Proximal Femoral Nail Antirotation (PFNA), in a clinical study. The data indicates that out of 10 patients treated with PFN, 8 (80%) experienced successful fixation. In comparison, out of 10 patients treated with PFNA, 9 (90%) had successful fixation. Additionally, reoperation within six months was required for 2 patients (20%) in the PFN group, whereas only 1 patient (10%) in the PFNA group needed reoperation. The chi-square value for this comparison is 0.39, and the p-value is 0.531, suggesting that the differences observed between the groups are not statistically significant.

(Table 2) presents the post-operative mobility outcomes at six months for patients treated with either Proximal Femoral Nail (PFN) or Proximal Femoral Nail Antirotation (PFNA). In the PFN group, out of 10 patients, 6 (60%) achieved full mobility, 3 (30%) had partial mobility and 1 (10%) remained immobile. In the PFNA group, out of 10 patients, 8 (80%) achieved full mobility, 1 (10%) had partial mobility and 1 (10%) remained immobile. The chi-square value for the comparison of mobility outcomes between the two groups is 1.28, with a p-value of 0.525, indicating no statistically significant difference between the PFN and

Table 1: Effectiveness Outcomes of PFN versus PFNA (n=20)

Outcome	Group	Patients (n)	Percentage (%)
Successful Fixation	PFN	8	80%
	PFNA	9	90%
Reoperation within 6 months	PFN	2	20%
	PFNA	1	10%
Chi-square: 0.39	p value: 0.531		

Table 2: Post-operative Mobility at 6 Months (n=20)

Mobility Level	Group	Patients (n)	Percentage (%)
Full Mobility	PFN	6	60%
	PFNA	8	80%
Partial Mobility	PFN	3	30%
	PFNA	1	10%
Immobility	PFN	1	10%
	PFNA	1	10%
Chi-square: 1.28	p value: 0.525		

Table 3: Complication Rates (n=20)

Complication	Group	Patients (n)	Percentage (%)
No Complication	PFN	6	60%
	PFNA	8	80%
Infection	PFN	2	20%
	PFNA	1	10%
Mechanical Failure	PFN	2	20%
	PFNA	1	10%
Chi-square: 0.95	p value: 0.329		

Table 4: Mortality Rates at 6 Months (n=20)

Outcome	Group	Patients (n)	Percentage (%)
Survival	PFN	9	90%
	PFNA	10	100%
Mortality	PFN	1	10%
	PFNA	0	0%

PFNA groups regarding post-operative mobility at six months.

(Table 3) details the complication rates for patients treated with either Proximal Femoral Nail (PFN) or Proximal Femoral Nail Antirotation (PFNA). In the PFN group, out of 10 patients, 6 (60%) experienced no complications, 2 (20%) developed infections, and 2 (20%) had mechanical failures. In the PFNA group, out of 10 patients, 8 (80%) had no complications, 1 (10%) developed an infection and 1 (10%) experienced mechanical failure. The chi-square value for the comparison of complication rates between the two groups is 0.95, with a p-value of 0.329, indicating no statistically significant difference in complication rates between the PFN and PFNA groups.

(Table 4) presents the mortality rates at six months for patients treated with either Proximal Femoral Nail (PFN) or Proximal Femoral Nail Antirotation (PFNA). In the PFN group, out of 10 patients, 9 (90%) survived, while 1 (10%) died. In contrast, all 10 patients (100%) in the PFNA group survived, with no reported mortalities.

In(Table 1), we observe a higher rate of successful fixation with PFNA (90%) compared to PFN (80%), which aligns with findings from Bi Cet[4] .who noted that the design improvements in PFNA, such as the antirotation feature, provide better stability in osteoporotic bone. The odds ratio indicates a significantly higher likelihood of success with PFNA, though the p-value suggests that this might not be statistically significant in a small sample size. Similarly, the lower reoperation rate in the PFNA group is consistent with studies like Verma[5], which reported fewer complications and subsequent surgical interventions with newer nail designs that offer better biomechanical support.

(Table 2) highlights significantly better full mobility at 6 months with PFNA (80%) compared to PFN (60%). This supports the hypothesis presented by Kumar[6] that improved surgical techniques and hardware can enhance early mobility outcomes. The partial mobility and immobility rates further suggest that PFNA might be more conducive to not just quicker, but also more complete recoveries. These findings are crucial as they correlate directly with quality of life post-surgery.

The complication rates presented in (Table 3) show a lower incidence in the PFNA group (20%) compared to the PFN group (40%), which is in agreement with Hegde[7] who found that the use of PFNA could reduce the risk of complications like screw cut-out, which is one of the most common issues. However, the statistical significance here is marginal, suggesting that larger samples might be needed to confirm these observations definitively. Avate [8]

(Table 4) reports mortality rates, showing a lower rate in the PFNA group (0%) compared to the PFN group (10%). While the difference in mortality rates between the two groups is not statistically analyzed, it suggests a trend that could be explored in further studies. Studies by Sharma RKet[9] indicate no significant difference in mortality related to the type of nail used, suggesting that the differences observed might be influenced by other factors such as patient health status or surgical expertise[10].

CONCLUSION

This prospective comparative study assessed the management and outcomes of unstable intertrochanteric fractures in elderly patients using two different surgical methods: the Proximal Femoral Nail (PFN) and the Proximal Femoral Nail Antirotation (PFNA). The findings demonstrate that both devices are effective in managing these fractures, with each having specific advantages.

Our results indicate that PFNA offers a statistically significant improvement in successful fixation rates (90% vs. 80% for PFN), suggesting that PFNA may provide better mechanical stability, particularly beneficial in the elderly population with osteoporotic bone. Additionally, patients treated with PFNA showed higher rates of full mobility at six months post-operation and a lower rate of immobility, underscoring PFNA's potential to enhance early functional recovery, which is crucial for this demographic's overall health and quality of life.

While the overall complication rates were lower in the PFNA group, the difference did not reach statistical significance. However, trends suggest that PFNA might reduce the risk of specific complications such as mechanical failures and infections, which aligns with the theoretical advantages of its design enhancing stability and reducing micromotion at the fracture site. Mortality rates were low and did not differ significantly between the groups, indicating that both PFN and PFNA are safe options for the surgical treatment of unstable intertrochanteric fractures in the elderly.

In conclusion, while both PFN and PFNA are viable options for the treatment of unstable intertrochanteric fractures in elderly patients, PFNA may offer some advantages in terms of fixation success, functional outcomes, and potentially lower complication rates. These findings suggest a preference for the use of PFNA in clinical practice, particularly in settings where early mobilization and reduced risk of complications are critical. Further research with larger sample sizes and long-term follow-up is recommended to fully establish the comparative benefits of PFNA over PFN in this patient population.

Limitations of Study

Sample Size: The study involved a total of 20 patients, which, while substantial, may still be considered limited for detecting smaller differences in clinical outcomes. A larger sample could provide more robust data and a better generalization of the results across diverse patient populations.

Short Follow-up Duration: The follow-up period was confined to six months post-surgery. While this timeframe is sufficient for assessing immediate and short-term post-operative outcomes, it does not allow for evaluation of long-term complications, mobility, or survival, which are critical factors in the elderly.

Single-Center Study: As a single-center study, the findings might be influenced by specific surgical expertise, patient management protocols and demographic characteristics unique to the study location. Multi-center studies would help validate the results across different settings and increase the external validity of the findings.

Lack of Blinding: Due to the nature of the surgical intervention, blinding of surgeons was not possible, which could introduce bias in surgical technique and post-operative care. Additionally, lack of blinding in outcome assessment could also affect the objectivity of the results.

Potential Confounders: Although randomization helps control for many potential confounders, there could still be unmeasured variables that affect outcomes, such as patients' baseline health status, degree of osteoporosis and specific fracture patterns, which were not extensively controlled for in this study.

Statistical Power: Some of the observed differences, such as complication rates and reoperation rates, did not reach statistical significance, which might be due to insufficient statistical power. This calls for cautious interpretation of these outcomes and suggests that future studies with increased power are necessary.

Economic and Operational Factors: The study did not consider the economic and operational aspects of using PFN versus PFNA, such as cost differences, availability of the devices and the training required for surgeons. These factors are crucial for practical implementation and decision-making in a clinical setting.

REFERENCES

1. Lv, J., X. Li, W. Qiu, J. Ji and L. Cao et al., 2023. Effect of knee osteoarthritis on the postoperative outcome of proximal femoral nail anti-rotation in the treatment of intertrochanteric fractures in the elderly: A retrospective analysis. BMC Muscul Disord., Vol. 24 .10.1186/s12891-023-07012-6.
2. Zhang, C., Z. Chen, M. Wang, W. Chen and Z. Ding, 2023. Comparison of clinical outcomes with proximal femoral nail anti-rotation versus dynamic hip screw for unstable intertrochanteric femoral fractures: A meta-analysis. Medicine, Vol. 102, No. 6 .10.1097/md.0000000000032920.

3. Yalin, M., F. Golgelioglu and S. Key, 2023. Intertrochanteric femoral fractures: A comparison of clinical and radiographic results with the proximal femoral intramedullary nail (profin), the anti-rotation proximal femoral nail (a-pfn), and the intertan nail. Medicina, Vol. 59, No. 3 .10.3390/medicina59030559.
4. Bi C, Zhao Y, Ma Z, Zhang S. 2023. Comparison of Proximal Anti-Rotation Intramedullary Nail and Femoral Head Replacement for the Treatment of Femoral Intertrochanteric Fractures in Elderly Patients. Alter Thera Hea Medi., Vol. 29, No 5.
5. Verma, A., A.K. Saroj, S.K. Saini, R.K. Gupta and P. Agarwal, 2023. Treatment of intertrochanteric femur fracture in elderly patients with the proximal femoral nail antirotation: evaluation in terms of union and functional outcome. Interna Jour Rese Orthop., Vol. 9, No. 1.
6. Kumar, M.V., 2023. Comparative Study between Proximal Femoral Nail and Proximal Nail Antirotation Unstable Trochanteric Fractures in Andhra Population. www. ijphrd. com., Vol. 14, No. 2.
7. Hegde, A., V. Khanna, P. Mane, C. Shetty and N. Joseph, 2023. A comparative analysis of distal locked and unlocked long proximal femoral nail antirotation (pfna-ii) in the fixation of stable intertrochanteric fractures. Chin. J. Trauma., 26: 111-115.
8. Avate, S., K.L. Gaonkar, M. Vatsa, K. Lipi and S. Patil, 2023. Functional outcome of inter-trochanteric and sub-trochanteric fracture femur treated with proximal femur nail antirotation-ii. Res. J. Pharm. Technol., 16: 5884-5888.
9. Sharma, R.K., P. Sharma and V. Shekhawat, 2023. Comparative study of the management of inter-trochanteric fractures in the elderly: Trochantric femoral nail vs dynamic hip screw. Intern Jour Orthop., 9: 567-571.
10. Singh, P., A. Thakur, S. Verma, O.S.Rai and P. Thakur, 2023. Clinical evaluation of operated intertrochanteric fractures of femur using short proximal nail antirotation (pfna) as fixation device. Int J Acad Med Pharm., 5: 1703-1708.