Open Access

Original Article

Stable Intertrochanteric Fracture in the Elderly. Is an Anti-Rotation Short Proximal Femoral Nail Better than a Dynamic Hip Screw?

Ejaz Ashraf Mallhi

Department of Orthopeadic Surgery, CMH Multan/Institute of Medical Sciences Multan/National University of Medical Sciences (NUMS) Pakistan

ABSTRACT

Objective: To compare a dynamic hip screw with an anti-rotation proximal femoral nail antirotation in a stable intertrochanteric fracture in the elderly, in terms of functional outcome, time to union, complications operating time and blood loss.

Study Design: Quasi-experimental study.

Place and Duration of Study: Orthopedic Department at Combined Military Hospital Multan, Pakistan from Oct 2019 to Jul 2021.

Methodology: We enrolled one hundred cases of stable intertrochanteric fractures in the elderly. Patients were randomly allocated to two groups: into Group-A (PFNA) and Group-B (DHS). Three patients were eliminated from the analysis, two possessing multiple lower limb fractures and one having a pathological fracture. We lost three patients in follow-up. Ninety-four patients were left. We evaluated them for operating time, intraoperative blood loss, time to union, complications and reoperation. Our team gauged functional outcomes using modified Harris hip scores at 3, 6 and 12 months.

Results: We established no significant discrepancy between time to union and complications and reoperation rate between Group-A (PFNA) and Group-B (DHA). Functional outcomes evaluated at 3,6 and 12 months have identical findings in both groups. However, operating time was considerably longer in Group-B, with extra blood loss compared to group-A.

Conclusion: We inferred that both DHS and PFNA could be used in stable intertrochanteric fractures in the elderly with proportional effectiveness. However, in the elderly with comorbidities and employing shorter anesthesia time and blood loss, PFNA should be given preference.

Keywords: Dynamic Hip Screw, Femoral Fracture, Fracture Healing, Geriatrics, Time to Union.

How to Cite This Article: *Ejaz Ashraf Mallhi. Stable Intertrochanteric Fracture in the Elderly. Is an Anti-Rotation Short Proximal Femoral Nail Better than a Dynamic Hip Screw?. Pak Armed Forces Med J 2025; 75(2): 267-271. DOI: https://doi.org/10.51253/pafmj.v75i2.9261*

INTRODUCTION

Intertrochanteric fracture is an extracapsular fracture that transpires along the intertrochanteric line from the greater trochanter to the lesser trochanter of the femur.[1] It predominantly occurs in the elderly because of poor bone density compared to younger people. It is broadly classified into stable and unstable fracture patterns.[2] A stable fracture is one in which the posterior-medial cortex is intact with unscathed lateral wall thickness.[2]

Historically these extracapsular fractures have been dealt with dynamic hip screws since their beginning in 1964.[3,4] It comprises a lag screw fixed in the femoral head, side barrel plate and screws to fix the plate to the femur. It delivers dynamic compression to the femoral head on the proximal femur resulting in a powerful union, requiring no remodeling. In stable extra trochanteric fractures, which have intact posterior-medial cortex varus, fracture collapse does not occur with this implant.

The anti-rotation proximal femoral nail,[5] consists of the spiral blade and a trochanteric entry nail.[5] The nail comes in 4 sizes, including 170 mm, 200 mm, 240 mm and full size. The spiral blade rotates and compresses the cancellous bone, empowering rotational and angular stability to the implant. This implant is generally used in unstable extracapsular intertrochanteric fractures to impede varus collapse. However, it can also be wielded with equal effectiveness in stable fracture configuration.

The anti-rotation proximal femoral nail benefit is well ascertained in unstable extracapsular intertrochanteric fractures.[6,7] Nonetheless, in stable fractures, especially in developing countries like Pakistan, the dynamic hip screw is still the go-to implant for stable extracapsular intertrochanteric fracture.[8] Numerous studies,[9,10] in literature compared anti-rotation proximal femoral nails with dynamic hips to treat unstable extracapsular intertrochanteric fractures. However, fewer studies pertained to the

Correspondence: Dr Ejaz Ashraf Mallhi, Department of Orthopeadic Surgery, CMH Multan/Institute of Medical Sciences Multan Pakistan
Received: 12 Sep 2022; revision received: 20 Mar 2023; accepted: 24 Mar 2023

results of these two implants in stable fracture configuration. The aim of our study is to make this comparison in our set-up.

METHODOLOGY

This Quasi-experimental study was conducted at the orthopedic department at Combined Military Hospital Multan, Pakistan, from October 2019 to July 2021, after obtaining approval from the Institutional Ethical Review Committee (ERB No. 31/2022).

Inclusion Criteria: Patients of either gender, aged over 65 years who had a stable intertrochanteric fracture were included.

Exclusion Criteria: Any patients with pathological or multiple fractures were excluded.

We used WHO calculator to calculate the sample size. Using a non-probability consecutive sampling, we enrolled 100 elderly patients, who were then randomly allocated into two groups, Group-A (proximal femoral nail faction) and Group-B (dynamic hip screw) by lottery method.

Stable intertrochanteric fractures were defined as those that retained intact posterior-medial cortex on x-ray and can withstand medial compressive pressure once reduced.

We omitted three patients from the study. One had a pathological fracture due to metastasis of the prostate, one had multiple lower limb fractures, involving an intertrochanteric fracture on one side and a fractured femur on the other and the third possessed an intertrochanteric fracture with a broken tibia on the same side. Three patients were lost to follow-up. Our department incorporated a total of 94 patients into the study (Figure).

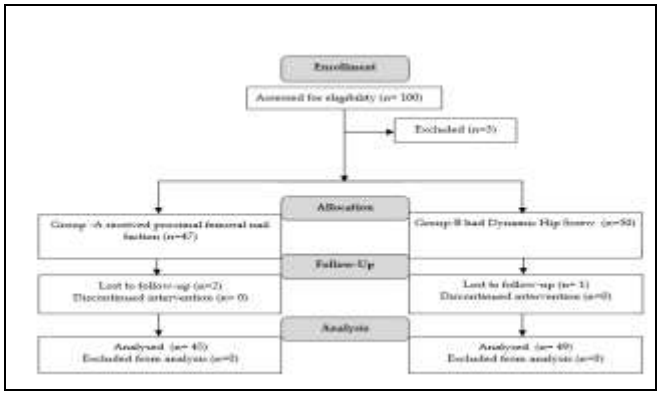

Figure: Patient Flow Diagram (n= 94)

The operating room assistant documented operational duration against each patient. Our operation theatre team evaluated blood loss by the percentage of gauze saturated in blood and blood accumulated in the suction drain. The orthopedic assistant in the operation theatre weighed each gauze before and after surgery, and 1 mg gain in weight was considered proportional to 1 ml. The house officer took out stitches at two weeks. We gauged every patient for infection, non-union varus collapse, screw cut-out implant failure, implant irritation and death. Our department documented patients in both groups that compelled implant removal because of screw cut-out implant failure or irritation. We followed these patients for one year. Initially, these patients were followed up monthly for up to 3 months, then for three months up to one year. The union was verified at each follow-up using a clinical examination and radiologic assessment tool. The orthopedic department also validated any malunion infection, implant irritation, or failure. We assessed each case functionally using a modified Harris hip score at three-month, six-monthly, and yearly intervals.

Data were analysed using Statistical Package for Social Sciences (SPSS) version 23. We computed Mean±SD for continuous variables and frequencies and percentages for categorical variables. Chi-square test was used to find the association of qualitative variables and t-test for comparison of means. A *p*-value ≤0.05 was considered significant.

RESULTS

We enrolled ninety-four patients with stable intertrochanteric fractures in the study, Group-A (Proximal Femoral Nail Anti-Rotation-Asia, PFNA), had 45(47.9%) patients, while 49(52.1%) were in group-B (Dynamic Hip Screw, DHS). The mean age of patients was 71.56±8.20 years range from 60 to 102. Fifty-nine (62.8%) were male patients, and 35(37.2%) were females. The mean age of the patients of Group-B was 71.43±8.96 years, and Group-A was 71.71±7.37 years.

In Group-A, 29(30.9%) patients were male and 16(17.0%) were female, while in Group-B 30(31.9%) patients were male and 19(20.2%) female. There was no statistically significant difference in age (p=0.868) and gender (p=0.832) across groups (Table-I).

The mean operating duration in Group-A was 19.31±4.46 minutes, while in Group-B it was 33.04±5.78 minutes, with a statistically significant difference (p=0.001). Mean blood loss in the DHS group (Group-B) was 30.41±8.82 ml, which was greater than the 16.09±5.51 ml in the PFNA group (Group-A) (p=0.001).

At the same time, there was no statistically significant difference of time-to-union (p>0.05) between groups.

There was no statistically significance (p>0.05) dissimilarity between Harris hip Score at 3 Months, at 6 Months and 12 months across groups, as seen in Table-III. This was the same for infection (p=0.064), varus collapse (p=0.438), screw cut-out (p=0.349), implant failure (p=0.349) and implant removal (p=0.089) between groups A and B, which can be seen in Table-IV.

Table-I: Comparison of Demographic variables Between Group-A and Group B (n=94)

Parameters	Group-A (n=45)	Group-B (n=49)	*p*–value
Age in years	71.71 ± 7.37	71.43 ± 8.96	0.868
Gender			
Male Female	29(30.9%) 16(17.0%)	30(31.9%) 19(20.2%)	0.832

Table-II: Comparison of Operating Time, Blood Loss and Time-to-Union between Group-A and Group-B (n=94)

	Group-A (n=45)	Group-B (n= 49)	*p*–value
Operating Time (Minutes)	19.31±4.46	33.04±5.78	0.001
Blood loss (ml)	16.09±5.51	30.41±8.82	0.001
Time to union (Weeks)	14.18±3.97	15.55±7.72	0.287

Table-III: Comparison of Harris Hip Score in Group-A and Group-B (n=94)

	Group-A (n=45)	DHS (n= 49)	*p*–value
Harris Hip Score at 3 Months	61.98±8.31	62.41±7.57	0.793
Harris Hip Score at 6 Months	77.20±7.71	77.20±7.31	0.639
Harris Hip Score at 12 Months	87.64±6.45	87.84±6.02	0.882

Table–IV: Association of Complications between Group-A and Group-B (n=94)

	Group-A (n=45)	Group-B (n= 49)	*p*–value
Infection			
Yes No	1(1.1) 44(46.8)	6(6.4) 43(45.7)	0.064
Varus collapse			
Yes No	2(2.1) 43(45.7)	5(5.3) 44(46.8)	0.438
Screw cut out			
Yes No	1(1.1) 44(46.8)	3(3.2) 46(48.9)	0.349
Implant failure			
Yes No	1(1.1) 44(46.8)	3(3.2) 46(48.9)	0.349
Implant removal			
yes No	3(3.2) 42(44.7)	9(9.6) 40(42.6)	0.089

DISCUSSION

Intertrochanteric fracture accounts for more than half of the hip fractures in the ageing population.[11] In the older generation, this fracture is challenging for the orthopaedic surgeon. Older people harbour many medical illnesses like diabetes mellitus, hypertension, ischaemic heart disease, chronic kidney disease, etc., that require regulation before surgery.[11] An additional dilemma with increasing age and declining bone density is inadequate fracture fixation, which may arise in iatrogenic fractures during surgery.[6] Complications with prolonged lying-down like bedsores, hypostatic pneumonia, deep vein thrombosis and eventual death need to be dissuaded by mobilization as early as probable by geriatric patients. Thus, an implant that not only withstands deforming forces but also supports the reduction should be used. Besides, it should permit early weight-bearing. Traditionally dynamic hip screw was employed for such fractures, with weight-bearing lag screw descent on the barrel plate and reducing the fracture in a restrained way.[12] This implant accomplishes a miracle in stable intertrochanteric fractures, with an unscathed posteromedial fragment. Unstable intertrochanteric fracture is a sizeable posteromedial fragment, and deficient lateral wall dynamic hip screw has elevated re-operation rates.[13] It is because there is no control collapse at the fracture site; instead, the collapse consequence in varus malunion (Demin Hosten Fracture Pattern) is derived in screw cut-out and implant failure by dynamic hip screw.

An inter-medullary implant was founded to overcome this varus collapse malunion and screw cut out. Initially, this implant similarly possessed a high failure percentage as screw pull-out, especially in the Asian population with poor bone quality. This implant was revised over the years and panned out in the shape of proximal femoral nail anti-rotation (PFNA). It possesses a spiral blade formulated to compress the cancellous bone and may be exceptionally beneficial in osteoporotic hip fractures. It has a substantial advantage over the dynamic hip screw in unstable fracture patterns referred to in multiple studies.[14,15] A local research demonstrated an exemplary outcome of the proximal femoral nail over the dynamic hip screw in unstable intertrochanteric fracture.[16] Due to its benefit in delivering rotational and angular resilience in the osteoporotic community with early weight-bearing, its use has potentiated.[17] However, it is not

solely for unstable fractures but also for stable fracture patterns.

In our study, no clinically significant association of complications prevailed in the proximal nail and dynamic hip screw group. Our infection rate was only slightly higher than the research by Harrison *et al*.[18] A local study exhibited an identical conclusion of infection in DHS.[8]

In our study, the collapse in the DHS faction is more remarkable than in the PFNA. The fundamental reason for varus collapse in our analysis in both groups was commination and osteoporosis. A similar consequence was established in a Chinese study, resulting in higher varus collapse in DHS.[19] Italian research showed more or less same complications as our study.[20] Additional more crew cut-out occurred in DHS than in PFNA. Osteoporosis caused a screw cut-out in two cases in the DHS faction, while the screw's position in the middle-upper zone of the head resulted in screw cut out in one case. The French study,[21] found a comparable outcome. A local study showed slightly greater screw cut-out in DHS than PFNA. In one patient in the PFNA group, the spiral blade permeated the hip joint as it relinquished its purchase in the bone.

We observed 18.4% implants removed in the DHS and 6.7% implants in PFNA. In DHS, three patients had the implant removed due to a screw cut-out, one had the implant removed because of infection, and five had the implant removed because of hardware irritation. In PFNA, one patient had an implant removed because of screw penetration of the hip joint, and two patients had the prominent lateral end of spiral blade compelling implant removal. We removed implants after fracture union. This was in contrast to an Indian study, which revealed a greater re-operation rate in the PFNA group.[23] It is because surgery of PFNA is technically tricky and employs additional outstanding mastery. Different studies have revealed supplementary re-operation in DHS as exhibited by our research.[20,21]

We did not find any difference in function between the two groups as gauged by Harris's hip score at 3,6, and 12 months. A study by Sharma *et al*.[23] indicated a better Harris hip score at three months in DHS because the PFNA faction possessed abductor lurch while walking; however, both groups retained related functional scores at one year, which is in line with different studies.[19,20]

There was no significant clinical time disparity in the union between DHS and PFNA. However, DHS showed 15.55±7.72 weeks compared to PFNA 14.18±3.97 weeks to union. A Korean study revealed the mean fracture union time was 21.5 weeks for the DHS group and 23.1 weeks for the PFNA group.[24]

Ou study showed the operating time for DHS group was 33.04±5.78 minutes, which is considerably longer than the PFNA group's 19.31±4.46 minutes. The operating blood loss in the DHS group of 30.41±8.82 millilitre is significantly more than the PFNA group, 16.09±5.51 millilitre. This may be explained by a larger incision and extended dissection in DHS group. Several international,[19-21,23,24] and national studies,[22] established similar findings.

LIMITATIONS OF STUDY

There are certain limitations of our study. The research period should be extended so patient rehabilitation to pre-injury ambulatory position and probability of developing secondary arthritis of hip and knee can be more accurately acquired. The sample size was also small, which limits generalizability of the study.

CONCLUSION

We inferred that both DHS and PFNA could be used in stable intertrochanteric fractures in the elderly with proportional effectiveness. However, in the elderly with comorbidities and employing shorter anesthesia time and blood loss, PFNA should be given preference.

Conflict of interest: None.

Funding Source: None.

Authors Contribution

Following authors have made substantial contributions to the manuscript as under:

EAM: Conception, study design, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

REFERENCES

1. Yu X, Wang H, Duan X, Liu M, Xiang Z. Intramedullary versus extramedullary internal fixation for unstable intertrochanteric fracture, a meta-analysis. Acta Orthop Traumatol Turc 2018; 52(4): 299-307. https://doi.org/10.1016/j.aott.2018.02.009
2. Pirwani M, Memon A, Memon SA. Dynamic Hip Screw (DHS): Evaluation Of Stable And Unstable Intertrochanteric Fracture Of Femur Fixed. Professional Med J 2016; 23(1): 076-80. https://doi.org/10.17957/TPMJ/16.3056
3. Memon K, Siddiqui AM, Khan ZA, Zahoor A. Dynamic Hip Screw Fixation Vs. Proximal Femur Nail For Unstable Per-Trochanteric Fractures: A Comparative Analysis Of Outcomes And Complications. J Ayub Med Coll Abbottabad 2021; 33(1): 34-38.

4. Jacob J, Desai A, Trompeter A. Decision making in the management of extracapsular fractures of the proximal femur - is the dynamic hip screw the prevailing gold standard? Open Orthop J 2017; 11: 1213–1217. https://doi.org/10.2174/1874325001711011213
5. Xu YZ, Geng DC, Mao HQ, Zhu XS, Yang HL. A comparison of the proximal femoral nail antirotation device and dynamic hip screw in the treatment of unstable pertrochanteric fracture. J Int Med Res 2010; 38(4): 1266–1275. https://doi.org/10.1177/147323001003800408
6. Liu W, Liu J, Ji G. Comparison of clinical outcomes with proximal femoral nail anti-rotation versus InterTAN nail for intertrochanteric femoral fractures: a meta-analysis. J Orthop Surg Res 2020; 15(1): 500. https://doi.org/10.1186/s13018-020-02031-8
7. Shah SW, Aslam MZ. Early outcomes of proximal femoral nail antirotation (PFNA) for unstable intertrochanteric femoral fractures. Pak Armed Forces Med J 2020; (3): 711-714.
8. Noor SS, Hussain N, Karim MT, Gabol I. Outcome of Dynamic Hip Screw in patients with Intertrochanteris femur fractures. J Pak Orthop Assoc 2011; 23(1): 40-43.
9. Nawaz N, Fareed H, Shah S, Nawaz IS, Fareed H, Shah S, et al. Comparison of Dynamic Hip Screw (DHS) And Proximal Femoral Nail (PFN) Fixation For Unstable Intertrochanteric Femoral Fractures On Basis Of Collapse. J Rawalpindi Med Coll 2019; 23(3).
10. Nadeem U, Bashir MF, Ahmad S, Ahmad A, Akram R, Javed S, et al. Retrograde intramedullary nailing of femoral fractures with SIGN FIN Nail: an experience at Ghurki Trust Teaching Hospital. Pak J Surg 2019; 35(2): 142.
11. Lindskog DM, Baumgaertner MR. Unstable intertrochanteric hip fractures in the elderly. J Am Acad Orthop Surg 2004; 12(3): 179-190. https://doi.org/10.5435/00124635-200405000-00006
12. Soni A, Munshi S, Radhamony NG, Nair R, Sreenivasan S. Dynamic Hip Screw Plate Length in Stable Intertrochanteric Fracture Neck of Femur: A Systematic Review. Cureus 2022; 14(3): e23138. https://doi.org/10.7759/cureus.23138
13. Lakho MT, Jatoi AA, Azfar MK, Ali A, Javed S, Bhatti A, et al. Functional and Radiological Outcome of Unstable Intertrochanteric Fracture Post Dynamic Hip Screw Fixation. Cureus 2019; 11(4): e4360. https://doi.org/10.7759/cureus.4360
14. Kristek D, Lovrić I, Kristek J, Biljan M, Kristek G, Sakić K. The proximal femoral nail antirotation (PFNA) in the treatment of proximal femoral fractures. Coll Antropol 2010; 34(3): 937-940. https://doi.org/10.5455/medarh.2014.68.173-177
15. Duymus TM, Aydogmus S, Ulusoy İ, Kececi T, Adiyeke L, Dernek B, et al. Comparison of Intra- and Extramedullary Implants in Treatment of Unstable Intertrochanteric Fractures. J Clin Orthop Trauma 2019; 10(2): 290-295. https://doi.org/10.1016/j.jcot.2018.04.003
16. Muhammad S, Masroor A. Comparison of unstable inter-trochanteric femur fracture treated with Dynamic Hip Screw and Proximal Femur Nail. Rawal Med J 2020; 45(3): 648-651.
17. Ozturan B, Erinc S, Oz TT, Ozkan K. New generation nail vs. Plate in the treatment of unstable intertrochanteric femoral fracture. Acta Ortop Bras 2020; 28(6): 311-315. https://doi.org/10.1590/1413-785220202806234631
18. Harrison T, Robinson P, Cook A, Parker MJ. Factors affecting the incidence of deep wound infection after hip fracture surgery. J Bone Joint Surg Br 2012; 94(2): 237-240. https://doi.org/10.1302/0301-620X.94B1.27683
19. Cho HM, Lee K. Clinical and Functional Outcomes of Treatment for Type A1 Intertrochanteric Femoral Fracture in Elderly Patients: Comparison of Dynamic Hip Screw and Proximal Femoral Nail Antirotation. Hip Pelvis 2016; 28(4): 232-242. http://dx.doi.org/10.5371/hp.2016.28.4.232
20. Carulli C, Piacentini F, Paoli T, Civinini R, Innocenti M. A comparison of two fixation methods for femoral trochanteric fractures: a new generation intramedullary system vs sliding hip screw. Clin Cases Miner Bone Metab 2017; 14(1): 40-47. https://doi.org/10.11138/ccmbm/2017.14.1.040
21. Morvan A, Boddaert J, Cohen-Bittan J, Picard H, Pascal-Mousselard H, Khiami F, et al. Risk factors for cut-out after internal fixation of trochanteric fractures in elderly subjects. Orthop Traumatol Surg Res 2018; 104(8): 1183-1187. https://doi.org/10.1016/j.otsr.2018.06.021
22. Sajid Akhtar, Shahab-ud Din, Faiz Ali Shah, Wali Mohammad, Abdur Rehman. Frequency of Lag Screw Cutout After Dynamic Hip Screw Fixation of Stable Intertrochanteric Femur Fracture by Keeping Tip Apex Distance Less Than 25 millimeter Pak J Med Health Sci 2018; 12(2): 844.
23. Sharma A, Sethi A, Sharma S. Treatment of stable intertrochanteric fractures of the femur with proximal femoral nail versus dynamic hip screw: a comparative study. Rev Bras Ortop 2017; 53(4): 477-481. https://doi.org/10.1016/j.rboe.2017.07.008
24. Tian RH, Zhang QM, Chu FL, Li XY, Jiang Z, Han L, et al. Comparison of two methods of locating proximal femoral nail anti-rotation in the treatment of femoral intertrochanteric fractures. J Orthop Surg Res 2020; 15:1-8. https://doi.org/10.1186/s13018-020-01614-9