e-ISSN: 0975-1556, p-ISSN:2820-2643
Available online on www.ijpcr.com
International Journal of Pharmaceutical and Clinical Research 2024; 16(3); 934-940

Original Research Article

A Randomized Prospective study on Comparison between functional and radiological outcome of AO Type 31A1 – A2.1 intertrochanteric fracture fixation by dynamic Hip Screw & PFNA2

Priyesh Parmar[1], Ashish Kaushal[2]

[1]PG Resident, Dept. of Orthopaedics, GRMC, Gwalior, M.P.
[2]Professor, Dept. of Orthopaedics, GRMC, Gwalior, M.P.

Received: 06-02-2024 / Revised: 20-02-2024 / Accepted: 11-03-2024
Corresponding Author: Dr. Priyesh Parmar
Conflict of interest: Nil

Abstract:

Introduction: Intertrochanteric fracture is one of the most common fracture in elderly population. In a randomized prospective study to compare the functional and radiological outcome of Proximal Femoral Nail anti-rotation-Asia(PFNA-II) and Dynamic Hip screw (DHS) used in fixation of stable (AO type 31 A1-A2.1) intertrochanteric fractures .

Methods: 30 patients with stable intertrochanteric fractures treated with DHS and PFNA-II in last 1 year were enrolled in the study. Intraoperative variables-surgical time, blood loss, fluoroscopy time and post-operative variables-union rate, change in neck shaft angle, functional outcome in terms of Modified Harris Hip Score(HHS) & Radiological findings were studied and compared between both the groups.

Results: The average age of the patients was 60 years .Out of 30 patients 18 males and 12 females patients were there In our series we found that patients with DHS had increased intraoperative blood loss, longer duration of surgery, and required longer time for mobilization while patients who underwent PFNAII had lower intraoperative blood loss, shorter duration of surgery, and allowed early mobilization. The patients treated with PFNAII started early ambulation as they had better Harris Hip Score in the early post-op period. At the end of 12th month, there was not much difference in the functional outcome between the two groups.

Conclusions: PFNAII is better than DHS in stable intertrochanteric fractures in terms of decreased blood loss, reduced duration of surgery, early weight bearing and mobilization, reduced hospital stay, decreased risk of infection and decreased complications

Keywords: Radiological, Outcome, Intertrochanteric, Fracture, Fixation, Hip Screw & PFNAII

Introduction

One of the most grievous injuries in the elderly is an intertrochanteric fracture. These Fractures become more common as people get older [1]. These individuals are restricted to home ambulation and rely on others for basic and instrumental daily activities. Trochanteric fractures account for 50% of hip fractures in the elderly; 50% of these fractures are unstable varieties of trochanteric fractures. These patients have comorbid conditions such as osteoporosis, diabetes, hypertension, and renal failure. Anatomical reduction and stable fixation with an internal device to allow patients to be mobilised earliest so as to avoid issues associated with extended recumbency. Intertrochanteric fractures have a significant portion of health care and resources but remain a challenge to date, even with significant improvements in the implant design, surgical technique, and patient care [2].

Intertrochanteric fractures are extracapsular fractures of the proximal femur that occur in between the greater and lesser trochanter. Intertrochanteric area of the femur is located between the greater and lesser trochanters and is composed of dense trabecular bone. The greater trochanter has an insertion site for the gluteus medius, gluteus minimus, obturatorinternus, piriformis, and site of origin for the vastuslateralis. The lesser trochanter provides insertion for iliacus and psoas major, known as the iliopsoas. The calcarfemorale is the vertical wall of dense bone that extends from thé posteromedial aspect of the femur shaft to the posterior portion of the femoral neck. Calcarfemorale is important as it acts as an important structure that decides the stability of the fracture. The vast metaphyseal region has a more abundant blood supply, contributing to a higher union rate and less osteonecrosis as compared to femoral neck fractures. [3]

The major know cause of these fracture is due to simple fall on ground from standing height in osteoporotic elderly population. Stability of the

fracture type plays a very important role in guiding the operative plan and in determining the prognsis. Stable fractures have an intact posteromedial cortex that resist all compressive loads once reduced. Unstable intertrochanteric fractures consists of comminution of the posteromedial cortex, a thin lateral wall, displaced lesser trochanter fracture, subtrochanteric extension and reverse obliquity fractures. The goal of treatment of allthe intertrochanteric fracture is to restore mobility safely and efficiently at the same time minimizing the risk of medical complications and restore the patient to his/her pre-operative status [4].

For Intertrochanteric(IT) fractures numerous comparative studies; comparing extramedullary and intramedullary implants in IT fracture fixation; have been published in literature till date. However majority of published literature compared DHS with the previous design of intramedullary nail like Gamma nail, proximal femoral nail(PFN),enrolling both stable and unstable IT fracture type. Clinical advantage of PFNA over DHS in fixation of unstable intertrochanteric fractures have been supported and recommended by many published literature. However, recently over few years many orthopedic surgeons prefer newer implant PFNA-II over DHS to fix stable intertrochanteric fractures in elderly. Superiority and clinical benefits of these newer implant, while using in stable intertrochanteric fractures, have not been clearly established because of lack of adequate comparative studies-enrolling only stable fractures. So, We conducted this prospective randomized trial to compare the radiological and functional outcome of DHS and PFNA-II in management of stable intertrochanteric fractures in elderly. [5]

The dynamic hip screw (DHS) in recent scenario has gained popularity and has become as standard tool for the treatment of certain hip frctures. The DHS is known to produce good results but complications are frequent, particularly in unstable inter-trochanteric fracture. Proximal Femur Nailing fixation is advantageous by the virtue that it provides a more biomechanically stable construct by reducing the distance between hip joint and implant [6].

The primary outcome measures were mobility assessed by Modified Harris Hip Score; and Secondary outcome measures were bony union, mortality, and complications.

Material and Methods

30 patients with stable intertrochanteric fractures treated with DHS and PFNA-II in last 1 year were enrolled in the study. Intraoperative variables-surgical time, blood loss, fluoroscopy time and post-operative variables-union rate, change in neck shaft angle, functional outcome in terms of Modified Harris Hip Score(HHS) & Radiological findings were studied and compared between both the groups.

This study will be done prospectively in the Trauma Department of Orthopaedics in J. A. Group of Hospitals, Gwalior (M. P.).The cases will be selected on random basis from those having intertrochanteric femur fracture.

A Total number of 30 patients will be selected

Fracture pattern included for study will be intertrochanteric fracture of femur Selection based on some inclusion and exclusion criteria.

Inclusion Criteria

1. All skeletally mature patients presenting with Stable intertrochanteric femur fractures AO type 31 A1-A2.1
2. Age > 18 Years
3. Patients who have given consent to this study.
4.Patients with complete clinical records.
5. Medically and surgically fit for surgery.
6. Preoperative ambulatory patient.

Exclusion Criteria

1. Patients age less than 18 years.
2. Fractures associated with neuro vascular deficits.
3. Medically unfit patients.
4. Refusal to consent
5. Preexisting hip pathology
6. Significant cognitive impairment.

Methodology: Cases will be operated in routine hours and emergency as per admission and availability of operation theatre. Most of the cases can be operated between 2d to 10thday of admission.

After preoperative assessment cases will be prepared for surgery. Under aseptic precaution and prophylactic antibiotic coverage, cases will be operated with DHS & PFNAII for intertrochanteric femur fracture, in randomised group.

Data collection procedure will include detailed study variable like preoperative and post-operative clinical, radiological, surgical and functional status of involved extremity. Data collection tools will be patient proforma and questioners table. to show patients detail of examination, preoperative workup and surgical methods and post-operative follow up.

Follow-up visits were scheduled at two weeks, six weeks, three months, six months and one year after surgery and fresh radiographs: antero-posterior and lateral view of operated hip was assessed for the union, varus collapse, cut out, implant failure etc. at each visit. Tip apex distance and neck shaft angle were also measured and recorded at every visit. Patients with minimum follow up of one year were included in the final analysis. In our study, cut out was defined as varus collapse of the fracture, with a

femoral neck-shaft angle of >10° and with extrusion of the screw from the femoral head exceeding 1 mm. Fractures were regarded as healed only when bridging callus in three or more cortices on AP and lateral radiographs with ability to bear full weight on the extremity.

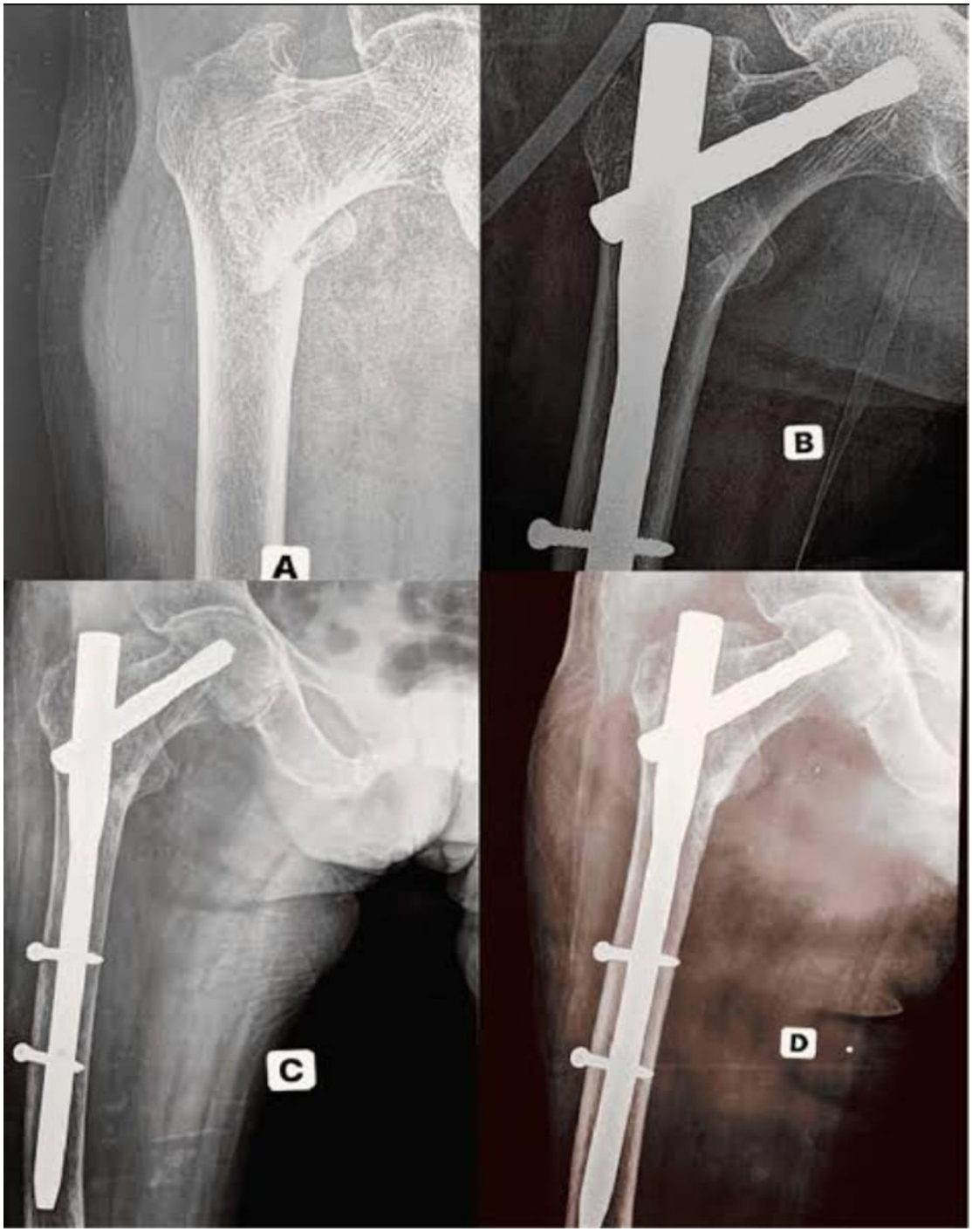

Figure 1: A 63 y old male with type 31A1.1 Intertrochanteric fracture fixed with PFNAII (A) - Preoperative x ray (B) X Ray on Day 1 of Surgery (C) Union after 3 months (D) Union after 6 months.

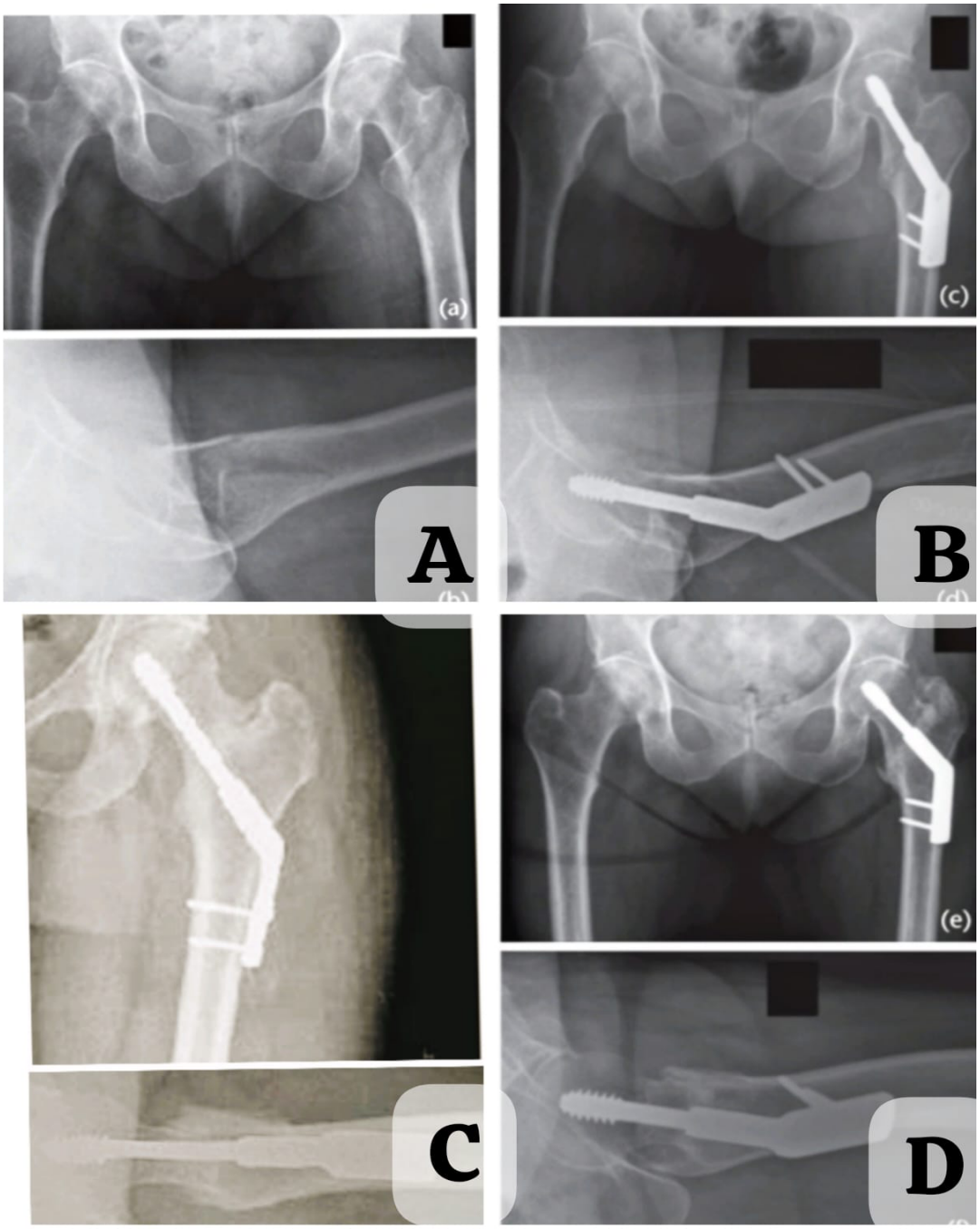

Figure 2: A 61 year old female patient with AO31A1.1 Intertrochanteric fracture fixed with DHS (A) Preoperative x ray (B) X ray at day 1 after fixation (C) X ray after 3 months of fixation (D) Union at 6 months

Result

The average age of the patients was 60 years. Out of 30 patients 18 males and 12 females patients were there .Baseline characteristics in both the groups were comparable (Table 1). The mean time taken for surgery from skin incision to skin closure; and the mean total blood loss was significantly higher in DHS group compared to PFNA II group. In our series we found that patients with DHS had increased intraoperative blood loss, longer duration of surgery , and required longer time for mobilization while patients who underwent PFNA2 had lower intraoperative blood loss, shorter duration of surgery, and allowed early mobilization.

The outcome of PFNA II was, Mean duration of surgery which was 93.7 minutes from anaesthesia to finish time ranging from 70-150 minutes. Mean hospital stay was 5.9 days ranging from 3 days to 14 days till suture removal. The average blood loss was about 110ml, while the outcome of DHS group was mean duration of surgery wich was 95.7 minutes and mean hospital stay was 7.4 days and the average blood loss was about 121 ml

Neck shaft angle was observed to look for varus collapse at the fracture site in both study groups at each follow-up. The mean neck-shaft angle at post-surgery day 1 was 131.6 ± 0.88° and 130.44 ± 0.53° in DHS group and PFNA-II group respectively. The mean neck-shaft angle at one year follow-up was 127.37 ± 0.65° and 126.61 ± 0.12° in DHS group and PFNA-II group respectively. The loss of neck shaft angle over one year, compared to immediate post surgery was statistically significant (P value = 0.047) in both the groups.

The mean tip apex distance at immediate post-surgery in DHS and PFNA-II group was 19.33 ± 1.18 mm and 25.13 ± 1.37 mm. The difference in mean TAD between these two groups was 5.80 mm (95% C.I. 2.24,9.36) and the association was statistically significant(P = 0.001). Thus, during surgery significantly higher TAD was achieved in PFNA-II group compared to DHS group. The mean tip apex distance at final follow-up (one year) was 20.16 ± 1.15 mm and 26.36 ± 1.27 mm in DHS and PFNA-II group respectively and the association between these two group was statistically significant(P = 0.001).This significantly higher value of TAD may be because of the higher value of TAD intraoperatively in PFNA-II group, compared to DHS group. At one year of follow-up, we found increase in the value of TAD in both the groups, this may be due to the superior migration of tip of screw/blade in femoral head.

We found no statistical difference in terms of mortality and survival rate at one year follow-up between two groups (P-value = 0.424).

All the patients in both the groups; except one patient in DHS group; had successful union at the end of six month follow-up. One patient in DHS group; developed varus collapse; and was re-operated with bipolar hemiarthroplasty. Two patient in PFNA-II group was re-operated: one for fracture shaft of femur due to fall at three months post surgery; and the other for removal of laterally migrated PFNA blade.

Table 1: Demographic Parameters

Parameter	PFNA II	DHS
Age (Mean)	59.83±5.7	61.34±9.8
Gender		
Male	09	09
Female	07	05
Mode of Injury		
Fall	11	12
RTA	05	02

Association among Gender & Mod of Injury - P Value = (0.031)

Table 2: Comparison of NSA in both the groups

Parameter	NSA1	NSA2	P Value
PFNA II	130.44 ± 0.53	126.61 ± 0.12	0.047
DHS	131.69 ± 0.88	127.37 ± 0.65	

Chi Square Test P Value among NSA1 & NSA2 is significantly associated i.e. 0.047.

Table 3: Outcome Measure

Parameter	PFNA II	DHS
Mean duration of surgery	93.7mins	95.7 mins
Mean Hospital Stay	5.9 days	7.4 days
Average Blood Loss	110 ml	121 ml

Table 4: Comparison of TAD in both the groups

Implant	TAD 1(Mean ± SE)	TAD 2(Mean ± SE)	P-value
PFNA II	25.13 ± 1.37	26.36± 1.27	0.037
DHS	19.33± 1.18	20.16 ± 1.15	

TAD 1-Tip Apex distance at immediate post-surgery.TAD 2-Tip Apex distance at final follow-up of one year.

Table 5: Distribution of patients according to Harris Hip Score in both the groups (1month)

HARRIS HIP SCORE	Groups				Total	
	DHS		PFNAII			
	NO.	%	NO.	%	NO.	%
Poor	9	30.0%	2	6.67%	11	18.33%
Fair	21	70.0%	18	60.0%	39	65.0%
Good	0	0.0%	10	33.33%	10	16.67%
total	30	100.0%	30	100%	60	100%

Table 6: Distribution of patients according to Harris Hip Score in both the groups (3 months)

HARRIS HIP SCORE	Groups				Total	
	DHS		PFNAII			
	NO.	%	NO.	%	NO.	%
Poor	10	33.3%	02	06.67%	12	20.00%
Fair	20	66.7%	13	43.33%	33	55.00%
Good	00	0.0%	11	36.66	11	18.33%
Excellent	00	0.0%	04	13.33%	04	6.66%
total	30	100%	30	100%	60	100%

Table 7: Distribution of patients according to Harris Hip Score in both the groups(6 months)

HARRIS HIP SCORE	Groups				Total	
	DHS		PFNAII			
	NO.	%	NO.	%	NO.	%
Poor	11	36.70	02	6.60%	13	21.70%
Fair	18	60.0%	14	46.70%	32	53.33%
Good	01	3.30%	09	30.00%	10	16.70%
Excellent	00	00%	05	16.70	5	08.33%
total	30	100%	30	100%	60	100 %

Table 8: Distribution of patients according to Harris Hip Score in both the groups(1 year)

HARRIS HIP SCORE	Groups				Total	
	DHS		PFNAII			
	NO.	%	NO.	%	NO.	%
Poor	13	43.33%	03	01.0%	16	26.70%
Fair	16	53.33%	13	43.30%	29	48.30%
Good	01	33.33%	08	26.77%	09	15.00%
Excellent	00	00%	06	20%	06	10
total	30	100%	30	100%	60	100%

The average age of the patients was 60 years. Out of 30 patients 18 males and 12 females patients were there In our series we found that patients with DHS had increased intraoperative blood loss, longer duration of surgery , and required longer time for mobilization while patients who underwent PFNA2 had lower intraoperative blood loss , shorter duration of surgery , and allowed early mobilization. The patients treated with PFNA2 started early ambulation as they had better Harris Hip Score in the early post-op period. At the end of 12th month

Discussion

This study shows that stable type fractures had better clinical and functional outcomes which was statistically significant. Urgent surgical intervention is necessary for all geriatric hip fractures, as it not only avoids the development of many known complications such as hypostatic pneumonia, catheter sepsis, cardiorespiratory failure, bedsores but also allows early rehabilitation and mobilisation [9]. Most patients in this series were operated within eight days following admission in the hospital (85.7%). But in some patients operative procedure was delayed due to medical co-morbidities. In this study, patients with delay in surgery had poor HHS which was statistically significant. Delay in surgery prolongs the immobilisation period thereby, deteriorating the patient's condition physically, physiologically, and psychologically.

The RUSH score have been used for the RUSH score for the assessment of union based on the presence of bridging callus at the fracture site and the average time of union in majority of our patients was about 14 weeks.

In this study, patients with good fracture reduction, i.e., neck-shaft angle difference less than 5 degrees with normal side had better functional outcomes. Quality of fixation was assessed using TAD [11] and there was a significant association between TAD and functional outcome.

Present study shows a linear relationship between functional outcome and age, where younger patients had better clinical and functional scores. Here, fixation of intertrochanteric fractures in elderly with PFNA-2 provides a good outcome with very few complications, high union rate, and early postoperative mobilisation. The complication rates were comparable to another study [12]. There was only one patient of superficial wound infection.

Conclusion

PFNA2 is better than DHS in stable intertrochanteric fractures in terms of decreased blood loss, reduced duration of surgery, early weight bearing and mobilization, reduced hospital stay, decreased risk of infection and decreased complications.

However, more prospective randomized controlled trial with large sample size including patients with stable intertrochanteric fractures need to be conducted to find the answer to this complex issue.

References

1. Halder SC. The Gamma nail for peritrochanteric fractures. J Bone Joint Surg Br. 1992;74 (3):340-4.
2. Akıncı O, Akalın Y, Reisog˘lu A, Kayalı C. Comparison of long-term results of dynamic hip screw and AO 130 degrees blade plate in adult trochanteric region fractures. ActaOrthopTraumatolTurc. 2010;44(6):443-51.
3. Sadowski C, Lu¨bbeke A, Saudan M, Riand N, Stern R, Hoffmeyer P. Treatment of reverse oblique and transverse intertrochanteric fractures with use of an intramedullary nail or a 95 degrees screw-plate: a prospective, randomised study. J Bone Joint Surg Am. 2002;84(3):372-81.
4. Haidukewych G, Israel A, Berry D. Reverse obliquity fractures of the intertrochanteric region of the femur. J Bone Joint Surg Am. 2001;83:643-50. Kashid MR *et al*. Int J Res Orthop. 2016 Dec;2(4):354-3.
5. Cooper, Campion, G. Campion, and LJ 3rd Melton. Hip fractures in the elderly: a world-wide projection. Osteoporosis international a: Simmermacher RK, Bosch AM, Van der Werken C., 285-289.
6. Kashid MR, Gogia T, Prabhakara A, Jafri MA, Shaktawat DS, et al. Comparative study between proximal femoral nail and proximal femoral nail antirotation in management of unstable trochanteric fractures. Int J Res Orthop. 2016;2(4):354-358.
7. Lv C, Fang Y, Liu L, Wang G, Yang T, Zhang H, Song Y. The new proximal femoral [7] nail antirotation-Asia: Early results. Orthopedics. 2011;34(5):e18-23.
8. Zeng C, Wang YR, Wei J, Gao SG, Zhang FJ, Sun ZQ, et al. Treatment of [8] trochanteric fractures with proximal femoral nail antirotation or dynamic hip screw systems: A meta-analysis. Journal of International Medical Re-search. 2012;40(3):839-51.
9. Schipper IB, Steyerberg EW, Castelein RM, Vugt AB. Reliability of the AO/ [9] ASIF classification for pertrochanteric femoral fractures. ActaOrthopaedicaScandinavica. 2001;72(1):36 -41.
10. Baumgaertner M, Curtin S, Lindskog D, Keggi JM. The value of the tip-apex distance [10] in predicting failure of fixation of. J Bone Joint Surg Am. 1995;77:1058-64.
11. Karapinar L, Kumbaraci M, Kaya A, Imerci A, Incesu M. Proximal femoral nail anti-[11] rotation (PFNA) to treat peritrochanteric fractures in elderly patients. European Journal of Orthopaedic Surgery & Traumatology. 2012;22(3): 237-43.
12. Singh M, Nagrath A, Maini PS. Changes in trabecular pattern of the upper end of [12] the femur as an index of os-teoporosis. JBJS. 1970 ;52(3):457-67.
13. Vishwanathan K, Akbari K, Patel AJ. Is the modified Harris hip score valid and [13] responsive instrument for out-come assessment in the Indian population with pertrochanteric fractures? Journal of Orthopaedics. 2018;15 (1):40-46.
14. Simmermacher RK, Ljungqvist J, Bail H, Hockertz T, Vochteloo AJ, Ochs U, et al. [14] The new proximal femoral nail antirotation (PFNA®) in daily practice: Results of a multicentre clinical study. Injury. 2008;39(8):932-39.