https://doi.org/10.29309/TPMJ/2024.31.11.8353

The Professional Medical Journal
www.theprofesional.com
2024, Volume, 31 Issue, 11

ORIGINAL ARTICLE

Comparison of the outcome of dynamic hip screw versus proximal femoral nail for treatment of intertrochanteric femoral fractures among elderly patients.

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Article Citation: Saleem MT, Shah SWA, Abdul Shakoor M, Khan SAR. Comparison of the outcome of dynamic hip screw versus proximal femoral nail for treatment of intertrochanteric femoral fractures among elderly patients. Professional Med J 2024; 31(11):1625-1630. https://doi.org/10.29309/TPMJ/2024.31.11.8353

ABSTRACT… Objective: To compare the outcome of DHS versus PFNA for treatment of intertrochanteric femoral fractures (IFFs) among elderly patients. **Study Design:** Randomized Clinical Trial. **Setting:** Sheikh Zayed Hospital, Lahore. **Period:** 2-03-2022 to 2-09-2022. **Methods:** In total 90 patients fulfilling inclusion criteria were registered after approval from the ethical review committee of the hospital. Every patient provided written informed consent. Patients were allotted to each group (Group A = PFNA, Group B = DHS) using lottery method. Patients were operated upon by a single surgical team. Data was obtained VIA questionnaires designed for pre- operative period, immediate post-operative period, 1 and 3 months follow up. Patients were interviewed and evaluated by blind researchers at each stage. Harris hip score was used to assess the functional outcomes. **Results:** In 90 patients (45 in each), 36.2% (n=17) were male in PFNA group and 63.8% (n=30) in DHS group and 65.1% (n=28) were female in PFNA and 34.9% (n=15) in DHS group, p=0.011. Mean age of PFNA group was calculated as 66.00± 3.41 years and mean age of DHS group was 66.80±3.71 years (p=0.714). Distribution of BMI was 28.14+6.20kg/m2 in PFNA group and 27.47+6.24kg/m2 in DHS group, p=0.612. Distribution of Harris hip score at 1 month was 31.11+4.08 in PFNA group and 30.11+4.18 in DHS group, p=0.254 and Harris hip score at 3 months was 88.68+1.23 in PFNA group and 81.68+0.95 in DHS group, p=0.000. **Conclusion:** We concluded that PFN is superior to DHS in treating Boyd and Griffin type II intertrochanteric fractures of femur. It's only a matter of time that PFN becomes the new gold standard for these fractures.

Key words: Dynamic Hip Screw, Interochanteric Fracture of Femur, Proximal Femoral Nailing.

INTRODUCTION

Intertrochanteric fractures of femur (IFFs) are the most common fractures of hip, especially occurring in osteoporotic bones of geriatric population secondary to minimal or no trauma. Due to rising numbers of geriatric population, incidence of IFFs is rising by the day.[1] IFFs cause significant morbidity and mortality mainly because they occur in osteoporotic bones of geriatric population. Not only the co morbid conditions like diabetes, hypertension, cardiac, renal and pulmonary problems add to the insult but also IFFs entail life threatening complications like pneumonia, urosepsis secondary to catheter, decubitus ulcers, deep venous thrombosis and cardio respiratory failure. Hence, swift surgical solution aiming for earliest possible mobilization and rehabilitation of patient is imperative.[2] Conservative treatment, however, led to varus deformity, shortening with external rotation, vicious callus formation, limping gait and ultimately contributes to high mortality rate due to prolonged immobilization.

In surgical treatment, dynamic hip screw is, to date, the favored implant by most surgeons, however the device may have a tendency to pierce or retract through the head of femur if weight bearing is initiated too soon, particularly in the case of compound and comminuted fractures. The endeavor for a perfect surgical solution aiming at lower complication rates and earlier recovery has led to the advent of many new implants. Proximal femoral nail (an intramedullary device)

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Article received on: 10/07/2024
Accepted for publication: 16/09/2024

is now being favored by many in IFFs and its role is being increasingly supported by the literature of recent past[3], because of its positioning near the body's mechanical axis, which lowers the implant's lever arm aspect. They also enable early weight-bearing activity and require relatively little time to insert with minimal blood loss.

Ranjeetesh Kumar Et al. compared DHS with PFNA in a prospective study and found out that Harris hip scores at 1 month, 3 months and 6 months follow up for PFNA were 33 +/-0.4, 58 +/-5.6, and 88+/-2.5 respectively, while for DHS were 24.4+/-3.3, 53 +/-3.0 and 85 +/-1.6 respectively, concluding that PFN had better functional outcomes in patient with osteoporotic bones and unstable fracture patterns.[4]

DHS VS PFN is still under debate with the proponents of intramedullary devices claiming lower operative complication rates and earlier recovery with PFNA[5-6], while others still considering DHS the first line treatment due to it being cost effective, reliable and readily available.[7] The area needs more research and backing of literature if PFNA is to truly replaces DHS in our population.

METHODS

A randomized clinical trial was conducted in the Orthopedic Department of Sheikh Zayed Hospital, Lahore, from 2-03-2022 to 2-09-2022. Non probability consecutive sampling technique was used and sample size was calculated by taking 80% power of test, 95 confidence level and taking expected mean Harris hip score of PFNA as 58 +/- 5.6 and 53 +/- 3.0 of DHS.[4] After approval from hospital's ethical committee CPSP/REU/OSG-2020-072-2358) date: 10-04-23, 90 patients were enrolled from amongst the patients with IFFs coming to sheikh Zayed hospital meeting the inclusion criteria. Patients of both male and female gender, aged 60-80 yrs, unilateral IFFs (Boyd and Griffin I and II), presenting within 2 weeks and preoperative WHO performance status of 2 or less were included while patients with pathological fractures, ipsilateral or contra lateral lower limb fractures and those with contra lateral IFFs were excluded from study. Informed consent was obtained from each participant. Patients were allotted to each group (Group A = PFNA, Group B = DHS) using lottery method. Patients were operated upon by a single surgical team.

An 8 cm incision is made over lateral side distal to the greater trochanter, to execute DHS surgery. It is necessary to raise the vastus lateralis muscle and open the fascia lata in order to insert a DHS. The dynamic hip screw (DHS) consists of side plate with four holes and a barrel with angulation of 135 degrees. Both the lateral and anterior-posterior views of the head should show the central placement of a cervical lag screw. Afterwards, the side plate is applied on lateral shaft of femur using a minimum of two to four cortical 4.5mm screws.

For PFN, an incision is made 3-5 cm above greater trochanter and awl was used to make an entry at the medial sloping edge of the greater trochanter, and this entry was verified in AP and lateral views in the C-arm. With the use of a fossa finder, a 2.8 mm guide wire was passed into the femoral canal. Using the reamer that came with the set in the sizes 8–9–10–11–12, the femur was reamed. The measurement on a true-size radiograph served as preoperative confirmation of the nail diameter. Before inserting the nail with a insertion sleeve over the lateral cortex, 15mm reamer being used for proximal reaming. A guide wire was then inserted up to the subchondral bone in center of femoral head and finally where a helical blade of the appropriate size was impacted in an unlocked state. After final positioning and releasing the traction, a 5 mm compression was achieved. 4.9 mm locking screws were used for distal locking.

Data was obtained VIA questionnaires designed for pre-operative period, immediate post-operative period, 1, 3 months follow up. Patients were interviewed and evaluated by blinded researchers at each stage. Harris hip score was used to assess functional outcomes. Data was entered and analyzed using SPSS V.22. Qualitative variables like gender and lateral side were expressed using frequency charts and percentages. Quantitative variables like age, BMI, Harris hip score at 1 & 3 months, duration of

fracture were expressed using mean and standard deviation. Post stratification t-test was applied taking p value<0.05 as significant. Outcome in the form of mean Harris hip screw was compared between the groups using independent sample t-test considering p value <0.05 as significant.

Figure-1. DHS Fixation of Left Inter-trochanteric Fracture

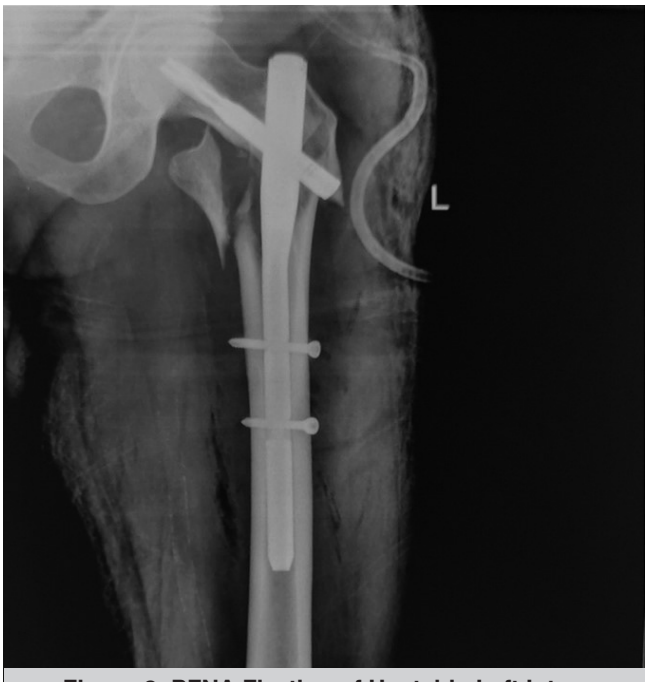

Figure-2. PFNA Fixation of Unstable Left Inter-trochanteric Fracture

RESULTS

90 (45 in each) patients fulfilling inclusion were selected to compare the outcome of DHS versus PFNA for treatment of intertrochanteric femoral fractures (IFFs) among elderly patients. Gender distribution of the patients was done, its showed that out of 90 patients (45in each), 36.2% (n=17) were male in PFNA group and 63.8% (n=30) in DHS group and 65.1% (n=28) were female in PFNA and 34.9% (n=15) in DHS group, p=0.011. Distribution of the side was done, it showed that out of 90 patients (45 in each), 56.9% (n=33) had right side affected in PFNA group and 43.1% (n=25) in DHS group and 37.5% (n=12) left side in PFNA group and 62.5% (n=20) in DHS group p=0.123. Age distribution of the patients was done, it showed that out of 90 patients (45 in each), 51.2% (n=42) were in age group of 60-70 years in PFNA group and 48.8% (n=40) were in age group of 60-70 years were in DHS group and 37.5% (n=3) were in age group of 71-80 years and 62.5% (n=5) were in age group of 71-80 years were in DHS group, mean age of PFNA group was calculated as 66.00± 3.41 years and mean age of DHS group was 66.80±3.71 years (p=0.714). Distribution of BMI was 28.14+6.20kg/m2 in PFNA group and 27.47+6.24kg/m2 in DHS group. p=0.612. Distribution of Harris hip score at 1month was 31.11+4.08 in PFNA group and 30.11+4.18 in DHS group. p=0.254. Distribution of Harris hip score at 3 months was 88.68+1.23 in PFNA group and 81.68+0.95 in DHS group, p=0.000. Distribution of duration of fracture was 4.55+2.23 days in PFNA group and 4.24+1.95 days in DHS group, p=0.484.

Variables	PFNA mean±SD	DHS mean±SD	P-Value
Harris hip score at1 month	31.11+4.08	30.11+4.18	0.254

Figure-1. Distribution of Harris Hip Score at 1 Month

Variables	PFNA Mean±SD	DHS Mean±SD	P-Value
Harris hip score at 3 months	88.68+1.23	81.68+0.95	0.000

Table-II. Distribution of Harris Hip Score at 3 Months

DISCUSSION

Intertrochanteric femoral fractures are commonly treated with dynamic hip screw or proximal

femoral nail antirotation fixation.[8-9] Literature indicates that complication rate after closed reduction and internal fixation or open reduction and internal fixation of IFFs [AO/OTA type 3.1 A1.1-1.3] is far lower than what is observed with other kinds of implants. Low postoperative Harris hip score (HHS), migration and cut out of the femoral neck screw do occasionally occur, regardless of whether DHS or PFNA fixation was used. Elderly patients with osteoporosis are primarily associated with a high risk of radiographic complications and low postoperative Harris hip score after AO type 31-A1 intertrochanteric fractures fixed with PFNA or DHS.[10-11] Furthermore, no long-term trials have evaluated whether device is better suited for treating type 31-A1 IFFs in older osteoporosis patients. Several randomized clinical trials comparing these two devices in management of intertrochateric fractures (AO/OTA type 3.1 A1.1-3.3) have not revealed a statistically significant difference in short-term radiographic and functional outcomes.[12-13]

Historically, Jewet and Smith Peterson nails were first released in the 1930s. Dynamic hip screws (DHS) and modified sliding devices by Pugh and Massie were developed in the 1950s and 1960s. Intramedullary nail (IMN) with sliding hip screws were created by Grosse, Kempf, Zickle, Kuntscher, Taylor and Russell.[14-16] Modern Intramedullary implants were created in the early 1990s to treat intertrochanteric fractures. Compared to the traditional dynamic hip screw, these devices offered several advantages in terms of biomechanics and biology. Numerous previous investigations have established the benefits and drawbacks of the Gamma nail's original design, typically by contrasting the outcomes with those of the dynamic hip screw (DHS).[17-19]

A significant difference was observed in radiographic complications between the two groups involving 206 geriatric patients with AO type 31-A1 intertrochanteric fractures stabilized with either PFNA or DHS fixation, according to a prospective research conducted by Saudan et al.[20-21] But in a retrospective analysis of 7643 procedures to stabilize OTA type A1 intertrochanteric fractures, Mavrogenis et al.[22] used either a PFNA implant (n=1288) or a DHS (n=6355), and they found that the PFNA implant led to worse HHS and more radiographic sequelae. In 1276 elderly osteoporotic patients with IFFs (AO/OTA type 3.1 A1.1-1.3), PFNA and DHS fixation were evaluated in 8 randomized clinical studies that were meta-analyzed.[23]

Five trials concluded that the Proximal femoral anti rotation was the best device for fixation; two trials found DHS performed better; and one did not demonstrate that one implant was better than the other. However, the study by Mereddy et al[24] evaluated the Proximal Femoral Nail Antirotation (PFNA) versus the Dynamic Hip Screw (DHS) fixation methods in intertrochanteric fractures of osteoporotic geriatric population. The key finding was that the PFNA implant was associated with a higher revision surgery rate of 7.2 % while revision rate was 5.5 for DHS group. This randomized study involved a large cohort of 43,659 patients with type 31-A1 IFFs, which provided a substantial sample to assess these results. Furthermore, Zou et al. evaluated DHS fixation and PFNA for the management of osteoporotic stable intertrochanteric fractures and found no discernible difference in the postoperative HHS or implant-related problems.

A PFNA implant had 23% radiographic complication rate with and 30% with a DHS implant were confirmed by Ozkayin et al.[25] 14 patients who had PFNA fixation had a radiographic complication rate of 22%, according to Radcliff et al.[26] In a comparison of 35 patients undergoing DHS fixation and 32 patients undergoing PFNA fixation, Sahin et al.[27] found that the rates of radiographic complications were, respectively, 24% and 15%. According to Kanakaris et al.[28], DHS fixation was more likely than PFNA to cause radiographic problems in individuals with osteoporosis who had type 31-A1 IFFs. Radiographic complications during DHS fixation have been reported to range from 10% to 25% in previously published research.[29]

We found that Harris hip score at1 month was 31.11+4.08 in PFNA group and 30.11+4.18 in DHS group. p=0.254 and Harris hip score at

3months was 88.68+1.23 in PFNA group and 81.68+0.95 in DHS group, p=0.000.Limitation of our study as that only functional outcome was assessed. Radiological outcome and complication were not assessed.

CONCLUSION

We concluded that PFN provides better functional outcome than DHS in Type II intertrochanteric fractures of femur. It is just a matter of time that PFN supersedes over DHS and becomes new gold standard treatment modality for Type II intertrochanteric fractures of femur.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

SOURCE OF FUNDING

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

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1	Muhammad Tabish Saleem	Concept, Data analysis, Conclusion.	
2	Syed Wasif Ali Shah	Proof reading and procedure supervision.	
3	Muhammad Abdul Shakoor	Manuscript writing.	
4	Shafqat Abbas Raza Khan	Data collection.	