International Journal of Orthopaedics Sciences

E-ISSN: 2395-1958
P-ISSN: 2706-6630
IJOS 2021; 7(1): 356-360

www.orthopaper.com
Received: 21-11-2020
Accepted: 26-12-2020

Dr. Rahul Kadam
Professor and Head of Unit, Department of Orthopedics, MGM Medical College and Hospital, Navi Mumbai, Maharashtra, India

Dr. Kshitij Z Badade
Department of Orthopedics, MGM Medical College and Hospital, Navi Mumbai, Maharashtra, India

Dr. KR Salgotra
Professor and Head of Unit, Department of Orthopedics MGM Medical College and Hospital, Navi Mumbai, Maharashtra, India

Dr. Abhay Chhallani
Department of Orthopedics, MGM Medical College and Hospital, Navi Mumbai, Maharashtra, India

Dr. Akshay Shah
Department of Orthopedics, MGM Medical College and Hospital, Navi Mumbai, Maharashtra, India

Dr. Gaurav Sharma
Department of Orthopedics, MGM Medical College and Hospital, Navi Mumbai, Maharashtra, India

Corresponding Author:
Dr. Kshitij Z Badade
Department of Orthopedics, MGM Medical College and Hospital, Navi Mumbai, Maharashtra, India

Clinical, functional and radiological outcomes of proximal femoral nailing antirotation Asia (pfna2) with dynamic hip screw (DHS) in treatment of intertrochanteric femur fractures

Dr. Rahul Kadam, Dr. Kshitij Z Badade, Dr. KR Salgotra, Dr. Abhay Chhallani, Dr. Akshay Shah and Dr. Gaurav Sharma

DOI: https://doi.org/10.22271/ortho.2021.v7.i1f.2512

Abstract
Background: Internal fixation is appropriate for most intertrochanteric fractures. Optimal fixation is based on the stability of fracture. The mainstay of treatment of intertrochanteric fracture is fixation with a screw slide plate device or intramedullary device. So, it is a matter of debate that which one is the best treatment, dynamic hip screw or proximal femoral nailing.
Method: A prospective randomized and comparative study of 2 years duration was conducted on 60 patients admitted in the Department of Orthopedics in MGM Medical College and Hospital, Navi Mumbai with intertrochanteric femur fracture. They were treated by a dynamic hip screw and proximal femoral nail antirotation Asia. Patients were operated under image intensifier control. The parameters studied were functional outcome of Harris hip score, total duration of operation, rate of union, amount of collapse. These values were statistically evaluated and two tailed p-values were calculated and both groups were statistically compared.
Result: The average age of our patient is 67.8 years. Among the fracture, 31% were stable, 58% were unstable, 11% were reverse oblique fracture. The average blood loss was 100 and 250 ml in PFNA2 and DHS group, respectively. In PFNA2 there was more no. of radiation exposure intra-operatively. The average operating time for the patients treated with PFNA2 was 45 min as compared to 70 min in patients treated with DHS. The patients treated with PFNA2 started early ambulation as they had better Harris Hip Score in the early period (at 1 and 3 months). In the long term both the implants had almost similar functional outcomes.
Conclusion: In our study we have found that the unstable pattern was more common in old aged patients with higher grade of osteoporosis and PFN group has a better outcome in this unstable and osteoporotic fracture. PFNA2 group has less blood loss and less operating time compared to DHS group. In PFNA2 group patients have started early ambulation compared to DHS group.

Keywords: Intertrochanteric fracture, dynamic hip screw (DHS), proximal femoral nail antirotation Asia (PFNA2); P Value

Introduction
Extracapsular fractures (intertrochanteric and sub-trochanteric fractures) primarily involve cortical and compact cancellous bone. Because of the complex stress con- figuration in this region and its nonhomogeneous osseous structure and geometry, fractures occur along the path of least resistance through the proximal femur [1]. Gulberg *et al*. has predicted that the total number of hip fractures will reach 2.6 million by 2025 and 4.5 mil- lion by 2050 [2]. In 1990 26% of all hip fractures occurred in Asia whereas this figure could rise to 37% in 2025 and 45% in 2050 [3]. The various treatment options for intertrochanteric fractures are operative and non-operative. The non-operative method was used to be a treatment of choice in early 19th century when the operative technique was not evolved enough to do stable fixation. Non-operative treatment should only be considered in non-ambulatory or chronic dementia patients with pain that is controllable with analgesics and rest, terminal diseases with less than 6 weeks of life expectancy, unresolved medical comorbidities that preclude surgical treatment, active infectious disease that itself is a contraindication for insertion of a surgical implant and

incomplete pertrochanteric fractures diagnosed by MRI. Intertrochanteric fractures can be treated by either DHS or PFN. The intramedullary devices offer certain distinct advantages:

1. The implant itself serves as a buttress against lateral translation of the proximal fragment.
2. The intramedullary location of the junction between the nail and lag screw makes the implant stronger at resisting the binding force.
3. The intramedullary device has a reduced distance between the weight bearing axis and the implant that is a shorter lever arm.
4. An intramedullary device bears the bending load which is transferred to the intramedullary nail and is resisted by its contact against the medullary canal (load sharing device).
5. The intramedullary hip screw is a more biological method of fixation.

Hence, we conducted a study in our rural set up to compare the result of treatment of these fractures by either of those two methods that is proximal femoral nailing and dynamic hip screw.

Materials and Methods

A prospective randomized and comparative study was conducted on the patients admitted in the Department of Orthopedics of MGM Medical College and Hospital, Navi Mumbai. Our study population mainly consisted 60 patients (30 in each group) with more than 50 years of age. The study period was about 2 year from Jan 2019 to Dec 2020. Eligibility criteria for the patients included in the study were as follows:

1. Patients who were in the age group of more than 50 years of either sex,
2. Intertrochanteric fracture type 31-A2, 31-A3 (OTA classification) without any systemic or psychiatric illness,
3. patients fit for anesthesia.

The exclusion criteria were

1. Patients unfit for the surgery,
2. with compound or pathological fractures,
3. admitted for re-operation
4. those who have not given written consent for surgery.

The present study was undertaken in patients more than 50 years of age with the following objectives

1. To compare the Dynamic Hip Screw and the Proximal Femoral Nail method of fixation in intertrochanteric fracture of femur in the adults with respect to intra operative parameters (total duration of surgery, intraoperative blood loss and intraoperative complication).
2. To compare the functional outcome with respect to union of the fracture, functional return, and complications in the two groups.
3. To determine which implant would be ideal for which fracture type so as to provide the best results with the least complications.
4. To study the long-term, follow up of the two groups with respect to any residual impairment of function, chronic infection and overall tolerability of implant.

The important parameters assessed were

- **Clinical**

1. Wound condition
2. Shortening
3. Harris hip score

Radiological

1. Union
2. Amount of collapse
3. Complication like screw cut out

After obtaining ethical clearance from the institutional Ethics committee, study was conducted among the study populations after obtaining written informed consent in accordance with the Ethical standards of the 1964 Declaration of Helsinki as revised in 2000. The relevant in- formation collected from all patients including history, general and systemic examination findings. Initial radio-graph of the hip joint was conducted besides routine pre anesthetic investigations. The 60 patients were divided in to two groups, 30 in each. The patients under group A were treated by proximal femoral nailing Antirotation II-PFNA2 (Figures 1 and 2) and patient under group B were treated by Dynamic hip screw- DHS (Figures 3 and 4).

Fig 1: Pre-operative x ray of group A (PFNA2).

Fig 2: Post-operative x ray of group A (PFNA2).

Fig 3: Pre-operative x ray of group B (D.H.S).

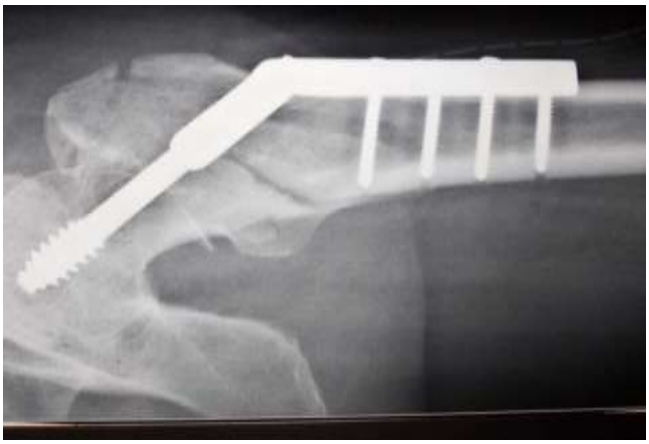

Fig 4: Post-operative x ray of group B (D.H.S).

Implant either DHS or PFNA2 was randomly selected by operating surgeon. All the cases included in our study were operated as soon as possible. The average delay of surgery in our study was 3 days.

For PFNA2 Nail diameter was determined by measuring diameter of the femur at the level of isthmus on an AP X-ray, Neck shaft angle was measured in unaffected side in AP X-ray using goniometer and a standard length PFN (250 mm) was used in all our cases.

For DHS Length of compression screw was measured from tip of the head to the base of greater trochanter on AP view X-ray subtracting magnification. Neck shaft angle was determined using goniometer on X-ray AP view on unaffected side and length of side plate length of the side plate was determined to allow purchase of at least 8 cortices to the shaft distal to the fracture.

All patients in our study were treated with physical methods such as early mobilization, manual compression of the calf and elastic stockings. Patients were encouraged ankle and calf exercises from day one and mobilized non weight bearing from the second post-operative day depending upon the physical condition of the patient. All drains were removed by 24 h. The wounds were inspected on the 3rd and 6th post-operative day. Stitches were removed on the 11th day. Patients were followed up at one monthly interval till fracture union and then at 6 monthly intervals for 1 year and then at yearly interval.

Results

The study involved 60 confirmed cases of intertrochanteric femur fracture of either sex from July 2011 to June 2013. Out of 60 cases, 30 were treated by proximal femoral nailing (group A) (Figures 1 and 2) and 30 were treated by dynamic hip screw (group B) (Figures 3 and 4).

In our study maximum age was 79 years and minimum were 51 years. The average age was 67.8 years. In both groups A and B 13 were male and 17 were female patients.

In either group, 17 were OTA 31-A2 and 13 were 31- A3. The results were statistically analyzed and the two tailed p values were evaluated.

The Singh's index for osteoporosis showed that there were 26 patients with grade 4 and above (43.33%) (Table 1 and Chart 1).

Table 1: Singh's index.

Grade	No of Patient
I	8(13.33%)
II	14(23.33%)
III	12(20%)
IV	12(20%)
V	8(13.33%)
VI	6(10%)

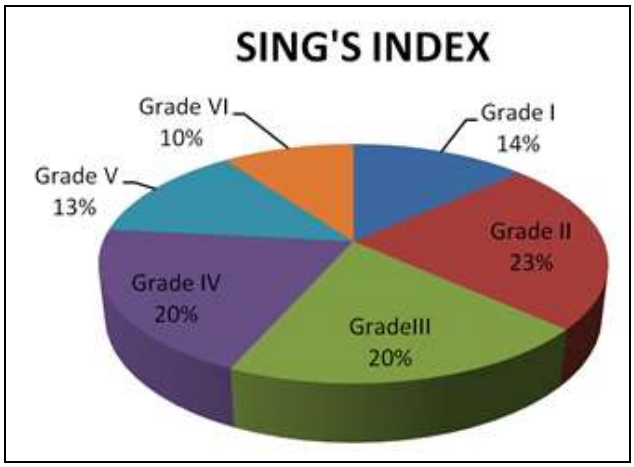

Chart 1: Singh's index for osteoporosis

Intraoperative Details

Duration of Surgery

Duration of surgery was more for DHS compared to PFNA2. The duration of surgery as calculated from the time of incision to skin closure was counted in each case. The average duration of surgery for the PFNA2 (Avg. time 48.73 min) was significantly shorter than DHS (Avg. time 69.03 min), p value < 0.0001 (Table 2).

Blood Loss during Surgery

Blood loss was measured by mop count and collection in suction drain. The average blood loss in the P.F.N group was 116 ml and, in the DHS, group was 213 ml. blood loss is less in PFNA2 which is statistically significant, p value < 0.0001 (Table 2).

Intraoperative Complications PFNA2

There was no failure to achieve close reduction among all 30 patients. There was no iatrogenic fracture of lateral cortex among all 30 patients. We had no difficulties in distal locking. There were no instances of drill bit

breakage or jamming of nail (Table 3).

Intraoperative Complications DHS

In 2 of 30 cases there was improper placement of Richard's screw. Difficulties were encountered in reverse oblique fractures as the fracture site extended to entry point. There was varus angulation in 2 of 30 patients. On table surgeon had to switch to PFNA2 in 2 cases in reverse oblique fracture. These cases were considered with PFNA2 group (Table 4).

Infection

There were 2 cases of infection seen in the D.H.S group. They were seen within 13 days of surgery and were treated by local debridement and antibiotic and did not require implant removal (Table 2).

Sliding

The sliding of both groups was compared at the end of 1 year on the X-rays as described by Hardy *et al*. [3], there was an average of 5.53 mm of sliding in the P.F.N.A2 group as compared to 8.10 mm in the D.H.S group ($p < 0.0001$). [Table 2]

Shortening

The average shortening in the P.F.N.A2 group was 5.35 mm as compared to 9.62 mm in the D.H.S group. So, shortening is less in PFNA2 group which is statistically significant. p value < 0.0001 (Table 2).

Implant Failure

There was no case of implant failure in PFNA2 group and revision surgery was not required for any.

In the D.H.S group there were 2 of 30 cases of implant failure one was due to screw cut out and other was due to plate breakage. In both the cases revision surgery was required (Table 2).

Greater Trochanter Splintering

The greater trochanter splintering was seen in 2 (6.67%) patients but it did not cause any complication later and healed well. Greater Trochanter was either fixed with Ethibond suture.

Harris Hip Score

In the D.H.S group the 1-month hip score (mean = 24.5) was less than that of the P.F.N.A2 group (mean = 35.23), $p < 0.0001$, in 6-month hip score in DHS (mean = 78.8) was also less than that of PFNA2 (mean = 82.8), p value = 0.021. However, this difference disappeared with the two group after 1 year follow up being same (D.H.S- 92.1 and P.F.N.A2- 92.57). p value = 0.467 (Table 2 and Chart 2).

Table 2: Comparison between PFN and DHS.

	PFNA2	DHS	p value
Surgery time (in minute)	Mean = 48.73 SD = 2.99	Mean = 69.03 SD = 7.34	<0.0001
Blood loss (in ml)	Mean = 116 SD = 19.9	Mean = 213 SD = 46.4	<0.0001
Infection	0	2(6.66%)	
Sliding (in mm)	Mean = 5.53 SD = 1.22	Mean = 8.1 SD = 0.84	<0.0001
Shortening (in mm)	Mean = 5.35 SD = 1.4	Mean = 9.62 SD = 2.1	<0.0001
Harris hip score at 1 month	Mean = 35.23 SD = 5.8	Mean = 24.5 SD = 3.99	<0.0001
Harris hip score at 6 months	Mean = 82.8 SD = 5.13	Mean = 78.8 SD = 7.66	0.021
Harris hip score at 1 year	Mean = 92.57 SD = 3.58	Mean = 92.1 SD = 3.12	0.467
Implant failure	0	2(6.66%)	

Table 3: Intraoperative complication of PFNA2.

Complications	No of Patient	Percentage
Failure to achieve closed reduction	0	0
Fracture of lateral cortex	0	0
Fracture displacement by nail insertion	0	0

Table 4: Intraoperative complications DHS

Intraoperative complication	No of patient	Percentage
Improper insertion of compression screw	2	6.66%
varus angulation	2	6.66%

Discussion

The development of the dynamic hip screw in the 1960's saw a revolution in the management of unstable fractures. The device allowed compression of the fracture site without complications of screw cut-out and implant breakage associated with a nail plate. However, the extensive surgical dissection, blood loss and surgical time required for this procedure often made it a contraindication in the elderly with co-morbidities. The implant also failed to give good results in extremely unstable and the reverse oblique fracture.

In the early 90s intramedullary devices were developed for fixation of Intertrochanteric fractures. These devices.

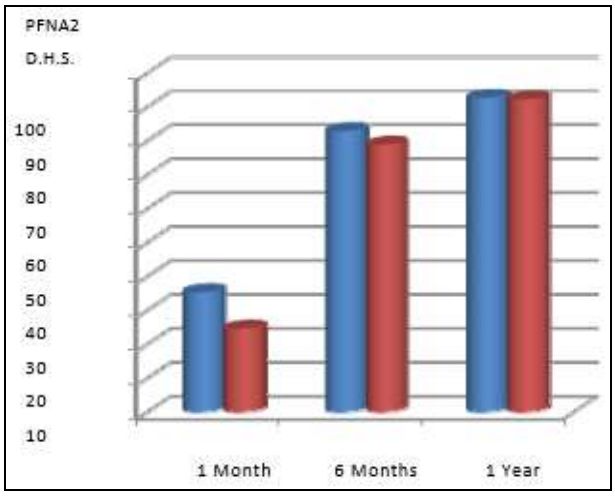

Chart 2: Harris Hip Score

The development of the dynamic hip screw in the 1960's saw a revolution in the management of unstable fractures. The device allowed compression of the fracture site without complications of screw cut-out and implant breakage associated with a nail plate. However, the extensive surgical dissection, blood loss and surgical time required for this procedure often made it a contraindication in the elderly with co-morbidities. The implant also failed to give good results in extremely unstable and the reverse oblique fracture.

In the early 90s intramedullary devices were developed for fixation of Intertrochanteric fractures. These devices had numerous biomechanical and biological advantages over the conventional dynamic hip screw [4-6]. Long term studies, however, revealed that the use of these de- vices was associated with higher intra operative and late complication often requiring revision surgery. This has led to modifications in the device and technique of the intramedullary devices.

In our study we found

- Less operative time in PFNA2 group
- Less operative blood loss in PFNA2 group

Early union in PFNA2 group

- Early return to daily activities in PFNA2 group
- Less complication in PFNA2 group like less infection, less sliding, less limb length discrepancy compared to DHS group.

The plate and screw device will weaken the bone mechanically. The common causes of fixation failure are instability of the fractures, osteoporosis, and the lack of anatomical reduction, failure of fixation device and in- correct placement of the screw.

We found the proximal femoral nail anti-rotation II to be more useful in unstable and reverse oblique patterns.

Hence PFNA2 is much superior to DHS in management of fracture intertrochanteric femur.

References

1. Carter D, Hayes W. The Compressive Behavior of Bone as a Two-Phase Porous Structure. The Journal of Bone & Joint Surgery 1977;59A(7):954- 962.
2. Gullberg B, Johnell O, Kanis JA. World Wide Projection for Hip Fracture, Osteoporosis International 1997;7(5):407-413. http://dx.doi.org/10.1007/PL00004148
3. Melton LJ, Kearns AE, Atkinson EJ. *et al.*, Secular Trends in Hip Fracture Incidence and Recurrence, Osteoporosis International 2009;20(5):687-694. http://dx.doi.org/10.1007/s00198-008-0742-8
4. Hardy D, Descamps P, Krallis P *et al.*, Use of an Intramedullary Hip Screw Compared with a Compression Hip Screw with a Plate for Intertrochanteric Femoral Fractures. A Prospective Randomized Study of One Hundred Patients. The Journal of Bone & Joint Surgery 1998;80:618-630.s
5. Spivak JM, Zuckerman JD, Kumme FJ. Fatigue Failure of Sliding Hip Screw in Hip Fractures. A Report of Three Cases. Journal of Orthopaedic Trauma 1991;3:325-331. http://dx.doi.org/10.1097/00005131-199109000-00012
6. Leung KS, So WS, Shen WY, Hui PW. Gam-ma Nails and Dynamic Hip Screws for Pertrochanteric Fractures. A Randomized Prospective Study in Elderly Patients, The Bone & Joint Journal 1992;74:345-351.