Journal of Cardiovascular Disease Research

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 01, 2024

Prospective follow-up study on study of outcomes of Proximal Femoral Nail Antirotation II in the treatment of Trochanteric Fracture in Elderly Patients

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ABSTRACT

Introduction: Intertrochanteric fractures are very common fractures among the elderly. In young adults, it is due to high velocity trauma, while elderly adults sustain injury secondary to osteoporosis. Annual incidence and health care cost is expected to increase significantly due to aging and increased life expectancy in the coming years. The goal of surgery is to provide a painless, mobile, and stable hip with normal abductor lever arm function. Biomechanically, intramedullary implants provide posteromedial cortex support and prevent the collapse of the fracture site.

Objective of the Study: The Objective was to study the outcomes of PFNA2 in the treatment of trochanteric fractures in elderly patients.

Results & Discussion: In the present study, we included a total of 40 elderly patients, of which 32 were males and 8 were females respectively. The mean ± SD age in years is 68.9 ± 6.78. Table 2 shows that 38 patients had HHS 70-80, 2 had 80-90 & none had 90-100 at three months. Similarly at 6 months 8 patients had HHS 70-80, 26 had 80-90 & 6 had 90-100. The mean ± SD scores were 72.56±4.68 & 78.56±7.22 respectively. Table 3 shows functional evaluation using HHS, it is found that 12 patients, 26 patients and 2 patients had good, fair and poor scores at one month follow up. 22 patients, 18 patients had good and fair scores at three months of follow up. Similarly 4 patients, 30 patients, and 6 patients had excellent, good and fair scores at six months follow up. Table 4 shows that 28 patients had blood loss <200 ml, 8 had 200-300 ml and 4 had >300 ml and the mean score is 198±46.67 mL. The operating time was <60 minutes in 16 patients, <90 minutes in 12 patients and 60-90 minutes in 12 patients. The next parameter studied was fracture union, it is found that in 19 patients fracture union time was 12-13 weeks, in 17 patients 14-15 weeks and in 4 patients it is 16-18

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 01, 2024

weeks. Complications were evaluated, it is found that three patients had varus positioning, one patient had DVT, 2 had SSI, 3 had abductor lurch and one had LLD.
Conclusion: We come to the conclusion that the PFN-A2 offers the advantages of closed reduction, quick surgery, reduced blood loss, biological preservation, less soft tissue damage, and early rehabilitation. In terms of healing and fixation, it offers sufficient functional outcomes. Good preoperative planning, appropriate entry point technique, precise implant placement with the helical blade in both AP and lateral view, distal locking, and non-acceptance of reduction in varus can all help to further improve this.

Key-words: Intertrochanteric fractures, elderly patients, Proximal Femoral Nail Antirotation II, surgical outcomes and complications.

INTRODUCTION: Intertrochanteric fractures are very common fractures among the elderly. In young adults, it is due to high velocity trauma, while elderly adults sustain injury secondary to osteoporosis [1]. Annual incidence and health care cost is expected to increase significantly due to aging and increased life expectancy in the coming years. The goal of surgery is to provide a painless, mobile, and stable hip with normal abductor lever arm function. Biomechanically, intramedullary implants provide posteromedial cortex support and prevent the collapse of the fracture site [2]. They do not usually require the exposure of the fracture site with an exception of limited open reduction used sometimes in difficult, unstable fractures along with the assistance of X-ray fluoroscopy. Closed reduction consequently leads to less infection rate and a higher rate of union with the slightest soft tissue damage. The patient is allowed an early range of motion, thus decreasing the morbidity. Proximal Femoral Nail Antirotation II (PFN-A2) utilizes a single helical blade instead of the routinely used two screws. The helical blade is believed to provide stability, compression as well as rotational control of the fracture [3]. In a manner, it condenses the cancellous bone during insertion into the neck, providing additional anchoring, and hence has higher cut-out strength compared to other devices. The helical blade cannot hold out against fracture pressure as ordinary lag screws because of which surgeons should give priority to good fracture reduction [3]. The PFN-A2 implant may be a more biomechanically acceptable implant for trochanteric fractures. Hence, the purpose of this study was to evaluate the outcome of PFNA2 in the treatment of trochanteric fractures in elderly patients.

OBJECTIVES

The objective was to study the outcomes of PFNA2 in the treatment of trochanteric fractures in elderly patients.

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 01, 2024

METHODOLOGY

The present study included a total of 40 elderly patients suffering from trochanteric fractures presenting to the outpatient and emergency department at our tertiary care hospital. A complete general & physical examination was conducted on admission together with routine investigations and X-rays of the hip, thigh, and knee in orthogonal views. The fracture was classified according to the Boyd and Griffin classification [4] and the Association for Osteosynthesis/Association for the Study of Internal Fixation (AO/ASIF) classification [5].

Inclusion Criteria: All patients aged ≥60 with trochanter fractures of both sexes that occurred due to a fall or trauma. Fractures with subtrochanteric extension, inflammatory arthritis, severe complex injuries were included in the study.

Exclusion Criteria: Fractures due to tumour were excluded.

Surgical Intervention: The patients were placed in the supine position on the fracture table. The fracture was reduced under fluoroscopy guidance. After reduction of the fracture it was temporarily fixed with two Kirchner wires of 2 mm diameter each in the neck of the femur placed anteriorly in lateral view so that they do not block the passage of the nail or the neck screw. The aim was to achieve absolute anatomical reduction and fixation. The limb was adducted to facilitate the entry point. The trochanter was palpated and approximately 5 cm proximal, a longitudinal incision was made through the fascia and gluteus to expose the greater trochanter area. Appropriate entry for guidewire was made in the piriformis fossa, which shall be in the center of the medullary canal in both anteroposterior (AP) and lateral views. The proximal canal was then control reamed by applying a fair force to avoid a break of the greater trochanter. An appropriate size of nail (PFN-A2) was selected and passed in the canal with a neck locking zig assembled. The correct PFN-A2 insertion depth is reached as soon as the projected PFN-A2 blade is positioned in the center of the femoral head. For the neck screw, the guidewire was advanced centrally in both AP and lateral view til 5 mm from the subchondral bone. The tip of the guidewire was placed at the planned blade tip position. Lateral cortex was drilled, and the appropriate size of neck screw was selected and fixed with a screwdriver, passed by gentle hammering, and confirmed fluoroscopically.

Postoperative care & evaluation: Third-generation intravenous cephalosporins and aminoglycosides were administered to patients for five days, followed by one week of oral antibiotics. Postoperative dressing was changed on the third day to evaluate wound condition. Patients were discharged to home after stitches were removed, and adequate wound healing

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 01, 2024

was achieved. A protein diet with adequate calories and vitamin D is important for successful recovery [6]. All patients were regularly followed up for six months. Partial weight bearing was started around six weeks. In patients with severe osteoporosis, weight bearing was delayed. Postoperative results with respect to clinical, radiological, and functional assessment using the Harris Hip Score were done at two weeks, six weeks, three months, and six months [7]. The score was graded as poor (<70), fair (70-80), good (80-90), and excellent (90-100). Radiological union and complications were recorded. The level of significance was assessed with a p-value (significant when $p<0.05$). SPSS version 21 was used for all measurements.

RESULTS AND DISCUSSION: In the present study, we included a total of 40 elderly patients, of which 32 were males and 8 were females respectively. The mean ± SD age in years is 68.9 ± 6.78.

Table 1:Shows demographic profile of the patients included in the study

Age	68.9 ± 6.78
Male/Female	32/8

Table 2: Shows the distribution as per Harris Hip Scoring and Surgical outcomes at three and six months

HHS	Three months	Six months
70-80	38	8
80-90	2	26
90-100	0	6
Mean score	72.56±4.68	78.56±7.22
Total	0	0

Table 2 shows that 38 patients had HHS 70-80, 2 had 80-90 & none had 90-100 at three months. Similarly at 6 months 8 patients had HHS 70-80, 26 had 80-90 & 6 had 90-100. The mean ± SD scores were 72.56±4.68 & 78.56±7.22 respectively.

Table 3: Functional results evaluation using Harris Hip Score

At 1st month follow up	Excellent	0
	Good	12

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 01, 2024

	Fair	26
	Poor	2
At 3rd month follow up	Excellent	0
	Good	22
	Fair	18
	Poor	0
At 6th month follow up	Excellent	4
	Good	30
	Fair	6
	Poor	0

Table 3 shows functional evaluation using HHS, it is found that 12 patients, 26 patients and 2 patients had good, fair and poor scores at one month follow up. 22 patients, 18 patients had good and fair scores at three months of follow up. Similarly 4 patients, 30 patients, and 6 patients had excellent, good and fair scores at six months follow up.

Table 4: Shows operative parameters and complications

	Number	Percentage
Blood loss		
<200 mL	28	70
200-300 mL	8	20
>300 mL	4	10
Mean score	198±46.67	
Operating time		
<60 minutes	16	40
<90 minutes	12	30
60-90 minutes	12	30
Mean operating time	86.4±21.44	
Fracture union in weeks		

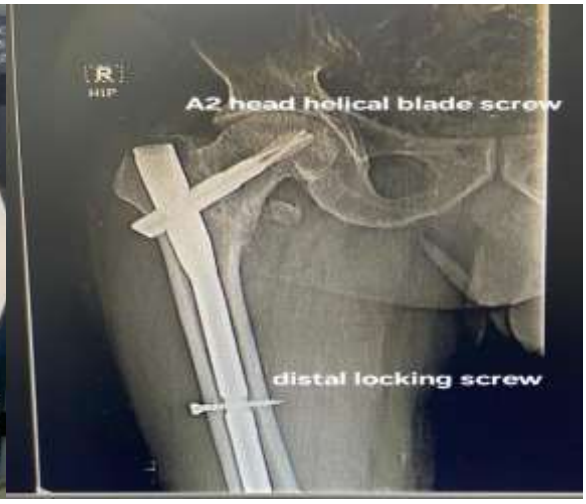
ISSN: 0975-3583,0976-2833 VOL15, ISSUE 01, 2024

12-13	19	47.5
14-15	17	42.5
16-18	4	10
Mean score	13.89±1.98	
Complications		
Improper placement of nail splitting of the entry site	0	-
Varus positioning	3	7.5
Screw cut out	0	-
Implant breakage	0	-
DVT	1	2.5
SSI	2	5
Abductor lurch	3	7.5
LLD	1	2.5

Table 4 shows that 28 patients had blood loss <200 ml, 8 had 200-300 ml and 4 had >300 ml and the mean score is 198±46.67 mL. The operating time was <60 minutes in 16 patients, <90 minutes in 12 patients and 60-90 minutes in 12 patients. The next parameter studied was fracture union, it is found that in 19 patients fracture union time was 12-13 weeks, in 17 patients 14-15 weeks and in 4 patients it is 16-18 weeks. Complications were evaluated, it is found that three patients had varus positioning, one patient had DVT, 2 had SSI, 3 had abductor lurch and one had LLD.

Figure 1-12: Shows the intraoperative and post operative images

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 01, 2024



ISSN: 0975-3583,0976-2833 VOL15, ISSUE 01, 2024

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DISCUSSION:

In the present study, we included a total of 40 elderly patients, of which 32 were males and 8 were females respectively. The mean ± SD age in years is 68.9 ± 6.78. Table 2 shows that 38 patients had HHS 70-80, 2 had 80-90 & none had 90-100 at three months. Similarly at 6 months 8 patients had HHS 70-80, 26 had 80-90 & 6 had 90-100. The mean ± SD scores were 72.56±4.68 & 78.56±7.22 respectively. Table 3 shows functional evaluation using HHS, it is found that 12 patients, 26 patients and 2 patients had good, fair and poor scores at one month follow up. 22 patients, 18 patients had good and fair scores at three months of follow up. Similarly 4 patients, 30 patients, and 6 patients had excellent, good and fair scores at six months follow up. Table 4 shows that 28 patients had blood loss <200 ml, 8 had 200-300 ml and 4 had >300 ml and the mean score is 198±46.67 mL. The operating time was <60 minutes in 16 patients, <90 minutes in 12 patients and 60-90 minutes in 12 patients. The next parameter studied was fracture union, it is found that in 19 patients fracture union time was 12-13 weeks, in 17 patients 14-15 weeks and in 4 patients it is 16-18 weeks. Complications were evaluated, it is found that three patients had varus positioning, one patient had DVT, 2 had SSI, 3 had abductor lurch and one had LLD.

Fractures from high-energy trauma are often associated with comminution, posing a risk for significant damage to the soft tissues (even in closed injuries) as well as devascularisation of the fracture fragments [8]. In addition to bending forces, muscle forces at the hip create torsional effects that lead to significant rotational shear force. Up to six times the body weight is transmitted across the proximal region of then femur in normal activities of daily living [9]. The cephalomedullary nail is currently the preferred implant for the majority of proximal femoral fractures. In terms of biomechanical strength, intramedullary devices outperform extramedullary devices. Intramedullary fixation offers mechanical, technological, and biological advantages over the plate and screw method [10]. By introducing intramedullary devices through a closed operation that involves indirect fracture reduction, the fracture zone's vascularity is preserved with minimal disturbance to the fracture hematoma. At the fracture site, reaming produces debris that acts as autogenous graft material and induces periosteal response [11]. Implant implantation using intramedullary means is a technically complex process. When treating complex and unstable fractures, a limited open reduction is occasionally employed in conjunction with X-ray fluoroscopy guidance. As a result, closed reduction raises the rate of union with less infection and less infection and slight injury to soft tissue. Early range of motion is granted to the patient, hence reducing the patient's morbidity.

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 01, 2024

The biomechanical characteristics of these devices also allow for weight bearing, which is an additional benefit. Early range of motion of the extremity is desirable.

CONCLUSION: We come to the conclusion that the PFN-A2 offers the advantages of closed reduction, quick surgery, reduced blood loss, biological preservation, less soft tissue damage, and early rehabilitation. In terms of healing and fixation, it offers sufficient functional outcomes. Good preoperative planning, appropriate entry point technique, precise implant placement with the helical blade in both AP and lateral view, distal locking, and non-acceptance of reduction in varus can all help to further improve this.

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