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A comparative analysis between the proximal femoral nail and dynamic hip screw in the management of unstable trochanter fracture of the femur

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ABSTRACT

Background: Trochanteric fractures are a growing public health concern, particularly as the population ages. This study aims to assess recovery and functional outcomes following treatment of trochanteric femoral fractures using either PFN or DHS. The aim of this study was to compare the effectiveness of proximal femoral nail (PFN) and dynamic hip screw (DHS) in managing unstable trochanteric fractures of the femur.
Methods: This quasi-experimental study at the emergency and outpatient department of the National Institute of Traumatology and Orthopedic Rehabilitation (NITOR), Dhaka (July 2005-June 2007), included 30 patients with unstable trochanteric fractures, treated with proximal femoral nail (n=14) or dynamic hip screw (n=16). Surgeries were performed under spinal anesthesia, and outcomes, including union rate, complications, and functional results, were assessed and analyzed using SPSS ($p<0.05$).
Results: Out of the 33 patients initially included, 2 died and 1 were lost to follow-up, leaving 14 patients in the PFN group and 16 in the DHS group. The mean operation time was significantly longer for PFN (117.4 minutes) compared to DHS (72.3 minutes). A higher percentage of DHS patients required blood transfusions. Follow-up results showed that PFN patients experienced less pain, better hip movement, and higher Harris hip scores, with statistical significance in pain relief and functional outcomes.
Conclusions: The proximal femoral nail (PFN) is an effective treatment for unstable trochanteric femoral fractures, offering biomechanical stability, early weight-bearing, and a lower risk of wound infection compared to traditional methods.

Keywords: Comparative analysis, Femur, Dynamic hip screw, Proximal femoral nail, Unstable trochanteric fracture

INTRODUCTION

The trochanteric region of the femur is the part that connects the neck and shaft of the femur at an angle of approximately 125 degrees.[1] The neck is about 5 cm long. The head, neck, and trochanter facilitate movement at the hip joint, allowing the limbs to swing clear of the pelvis. The term trochanteric fracture may be used to describe any fracture in the region between the greater and lesser trochanters. Intertrochanteric fractures are classified into stable and unstable varieties. Unstable fractures are those where there is poor contact between the fracture fragments, as seen in four-part intertrochanteric fractures, or where the fracture pattern allows weight-bearing forces to displace the fracture further. Instability may also arise if the posteromedial cortex is shattered, displacing a large fragment that includes the lesser trochanter. These fractures are particularly difficult to stabilize with internal

fixation.[2] Intertrochanteric femoral fractures are estimated to occur in more than 200,000 patients each year in the United States, with reported mortality rates ranging from 15% to 20%. Most intertrochanteric femoral fractures occur in patients over 70 years of age. Hip fractures (intertrochanteric and femoral neck fractures) account for 30% of all hospitalized patients in the United States, with an estimated annual treatment cost of approximately $8 billion.[3]

The worldwide prevalence of fractures of the proximal femur is increasing as the global population ages. Historically, Intertrochanteric fractures have been recognized for centuries, with Ambroise Paré documenting hip fractures as early as the 16th century and Sir Astley Cooper differentiating femoral neck from intertrochanteric fractures in the 19th century.[2,4] Proper management of proximal femur fractures is crucial not only for maintaining the health and vitality of the population but also for reducing healthcare costs. Fractures of the proximal femur predominantly occur as low-energy injuries in the elderly and as high-energy injuries in younger patients. In elderly patients, proximal femur fractures are generally caused by a single fall and are more common in women than in men. Patients with intertrochanteric fractures tend to be slightly older and have higher rates of morbidity and mortality compared to those with femoral neck fractures.[2] An estimated 1.66 million hip fractures happened globally in 1990. Epidemiological projections suggest that this number will rise to 6.26 million by 2050, primarily due to the increasing elderly population.[5]

Historically, intertrochanteric fractures were treated with prolonged bed rest or traction, which, while aiding fracture alignment, was associated with high morbidity and mortality, reported as 44% by Evans in 1951 and 34.6% by Horowitz in 1966.[6-8] These earlier treatment approaches, though effective in alignment, often came with significant challenges for patients, emphasizing the need for more advanced methods of treatment.

Trochanteric fractures are an increasing public health concern, as their relative number rises progressively with age after 60 years. Studies suggest that trochanteric fractures result in higher morbidity, mortality, and healthcare costs compared to cervical fractures. The increased incidence of trochanteric fractures has been linked to age-related bone density reduction.[5] The incidence of trochanteric fractures has increased significantly in recent decades, and this trend is expected to continue due to the rising elderly population. The primary goal of treatment is to achieve stable fixation to allow early mobilization of the patient. To achieve this, various intramedullary nails have been developed.

These nails may challenge the previous role of the dynamic hip screw (DHS) as the standard fixation method. The advantages and disadvantages of the original gamma nail have been well documented in prior studies, often in comparison with the DHS. However, less data is available on the proximal femoral nail (PFN), as most previous studies have been retrospective and lacked control groups. Furthermore, past controlled studies have primarily focused on surgical techniques, clinical outcomes, and rehabilitation, rather than differences in postoperative recovery and long-term patient outcomes based on the type of implant used.[9] The purpose of this study is to assess patient recovery and functional outcomes following operative treatment of trochanteric femoral fractures using either the PFN or DHS.

Objective

The aim of this study was to compare the effectiveness of proximal femoral nail (PFN) and dynamic hip screw (DHS) in managing unstable trochanteric fractures of the femur.

METHODS

This quasi-experimental study was conducted at the emergency and outpatient department of National Institute of Traumatology and Orthopedic Rehabilitation (NITOR), Dhaka, between July 2005 and June 2007, focusing on patients diagnosed with unstable trochanteric fractures of the femur. The study included 30 patients, with 14 treated using proximal femoral nail (PFN) and 16 treated using dynamic hip screw (DHS), for final analysis after follow-up adjustments.

Inclusion criteria

Age 40 years or older. Both male and female patients. Clinically and radiologically confirmed unstable trochanteric fracture of the femur. Fracture of any duration.

Exclusion criteria

Inability to comply with follow-up for at least 12 weeks. Open or pathological fractures. Presence of active infection. Contraindications to anesthesia or major surgical procedures

Informed written consent was obtained from all participants or their legal guardians after explaining the treatment protocol, risks, and benefits. The study was approved by the ethical review board of NITOR, ensuring compliance with ethical guidelines and patient confidentiality. Patients were divided into two groups: the PFN group, treated with proximal femoral nail, and the DHS group, treated with dynamic hip screw. All surgeries were performed under spinal anesthesia, with intraoperative imaging using a portable x-ray or C-arm. Data were collected using a pre-designed proforma, including demographic variables (age, sex, occupation), clinical variables (mechanism of injury, side involved, operative time, blood transfusion), and outcome variables (union rate, time to union, postoperative hospital stay,

infection, functional outcomes, and overall results). Primary outcomes measured included union rate, time to union, and postoperative complications, while secondary outcomes were assessed using the Harris hip score. Postoperative management involved immediate care with limb elevation, antibiotics, analgesics, and early mobilization, followed by gradual progression from non-weight-bearing to partial and full weight-bearing based on radiological evidence of union. Follow-up assessments were conducted at 6, 12, 18, 24, 36, and 48 weeks postoperatively. Data were analyzed using SPSS software, with continuous variables presented as means with standard deviations and categorical variables as counts with percentages. Comparisons between PFN and DHS groups were performed using t-tests or chi-square tests, with a significance level set at $p<0.05$.

RESULTS

A total of 33 patients with unstable trochanteric fractures of the femur were included in this study to evaluate the comparative outcomes of treatment using proximal femoral nail (PFN) and dynamic hip screw (DHS). The patients were purposively assigned to treatment groups, with 15 patients in the PFN group and 18 in the DHS group. Of the 33 patients, 2 died during the study period, while 1 patient lost to follow-up. Ultimately, the PFN group comprised 14 patients, and the DHS group included 16 patients.

The demographic characteristics of the study population reveal that nearly 63.3% of the subjects were 65 years or older, while 10.0% were below 50 years of age. The age groups 50-55 years, 55-60 years, and 60-65 years accounted for 13.3%, 6.7%, and 6.7% of the subjects, respectively. Males constituted 60.0% of the study population, while females made up the remaining 40.0%. In terms of occupation, housewives formed the largest group (40.0%), followed by service holders (13.3%), businessmen (13.3%), farmers (10.0%), and day laborers (3.3%). The remaining 20.0% were engaged in various other jobs.

Table 1: Demographic characteristics of the study population (n=30).

Variables		Frequency	Percentage
Age (years)	<50	3	10.0
	50-55	4	13.3
	55-60	2	6.7
	60-65	2	6.7
	≥65	19	63.3
Gender	Male	18	60.0
	Female	12	40.0
Occupation	Service	4	13.3
	Business	4	13.3
	Housewife	12	40.0
	Farmer	3	10.0
	Day-labour	1	3.3
	Other odd jobs	6	20.0

Table 2: Comparison of operation time and immediate postoperative outcomes between groups (n=30).

Variables		PFN (n=14) (%)	DHS (n=16) (%)	P value
Duration of operation (minutes)	<60	0	3 (18.7)	
	60-80	0	8 (50.0)	
	80-100	2 (14.3)	5 (31.3)	
	100-120	5 (35.7)	0.0	
	>120	7 (50.0)	0.0	
	Mean±SD	117.4±15.6	72.3±12.4	<0.001s
	Range	82-130	55-94	
Immediate outcome	Infection	2 (14.3)	3 (18.8)	0.567
	Cut-out of the screw loosened	1 (7.1)	1 (6.3)	0.724
	Implant Failure	0 (0)	1 (6.3)	0.724
	Blood transfusion needed	1 (7.1)	11 (68.8)	0.001s
	Need for further operation	0 (0)	1 (6.7)	0.536
	Hospital stay (mean±SD days)	3.85±1.46	3.56±0.72	0.502

In the PFN group, 50.0% of the patients required more than 120 minutes for surgery, followed by 35.7% who needed 100-120 minutes, and 14.3% who required 80-100 minutes. In contrast, in the DHS group, half (50.0%) of the surgeries took 60-80 minutes, 31.3% took 80-100 minutes, and the remaining 18.7% took less than 60 minutes. The mean operation time was significantly longer in the PFN group (117.4±15.6 minutes) compared to the DHS group (72.3±12.4 minutes) ($p<0.001$). The immediate postoperative outcomes between the two groups, including infection, screw cutout, implant failure, need for further surgery, and hospital stay, showed no statistically

significant differences (p>0.001), except for blood transfusion. A significantly higher proportion of patients in the DHS group (68.8%) required a blood transfusion compared to only 7.1% in the PFN group (p=0.001).

Table 3: Comparison of first follow-up findings between PFN and DHS groups (n=30).

Findings		PFN (n=14) (%)	DHS (n=16) (%)	P value
Infection		2 (14.3)	0 (0.0)	0.209
Pain	No pain	5 (35.7)	0 (0.0)	0.006s
	Mild	8 (57.1)	6 (37.5)	
	Moderate	1 (7.1)	9 (56.3)	
	Severe	0 (0.0)	1 (6.3)	
X-ray findings	Fracture alignment intact	14 (100.0)	16 (100.0)	0.150
	Visible callus	8 (57.1)	13 (81.3)	
	Screws in position	14 (100.0)	16 (100.0)	
Complications		2 (15.4)	0 (0.0)	0.206

S: significant

Table 4: Comparison of second follow-up findings between PFN and DHS groups (n=30).

Findings		PFN (n=14) (%)	DHS (n=16) (%)	P value
Infection		1 (7.1)	0 (0.0)	0.467
Pain	No pain	11 (78.6)	5 (31.3)	0.031s
	Mild	3 (21.4)	10 (62.5)	
	Moderate	0 (0.0)	1 (6.3)	
X-ray findings	Fracture alignment intact	13 (92.9)	13 (81.3)	0.352
	Visible callus	12 (85.7)	13 (81.3)	0.567
	Screws in position	13 (92.9)	13 (81.3)	0.352
State of union	Uniting	0 (0.0)	3 (18.7)	0.143
	United	13 (92.9)	13 (81.3)	
	Not united	1 (7.1)	0 (0.0)	
Complications		1 (7.1)	3 (18.7)	0.527

S: significant

Table 5: Comparison of third follow-up findings between PFN and DHS groups (n=30).

Findings		PFN (n=14) (%)	DHS (n=16) (%)	P value
Infection		1 (7.1)	0 (0.0)	0.467
Pain	No pain	11 (78.6)	5 (31.3)	0.031s
	Mild	3 (21.4)	10 (62.5)	
	Moderate	0 (0.0)	1 (6.3)	
X-ray findings	Fracture alignment intact	13 (92.9)	13 (81.3)	0.352
	Visible callus	12 (85.7)	13 (81.3)	0.567
	Screws in position	13 (92.9)	13 (81.3)	0.352
State of union	Uniting	0 (0.0)	3 (18.7)	0.143
	United	13 (92.9)	13 (81.3)	
	Not united	1 (7.1)	0 (0.0)	
Complications		1 (7.1)	2 (12.5)	0.552

S: significant

A comparison of the first follow-up findings between the PFN and DHS groups revealed that 35.7% of PFN patients reported no pain, with the majority (57.1%) experiencing mild pain. In contrast, most DHS patients (56.3%) reported moderate pain, with the difference between the groups being statistically significant (p=0.006). Other factors such as infection rates, fracture alignment, visible callus formation, and screw positioning showed no significant difference between the groups (p=0.209, p=0.15, and p=0.206, respectively). The complication rates were also similar between the two groups.

The second follow-up evaluation at 12 weeks assessed the same variables as the first follow-up, with the addition of fracture union status. Pain remained the only significantly different factor between groups (p=0.031). In the PFN

group, 78.6% of patients reported no pain, compared to only 31.3% in the DHS group, indicating better pain relief in the PFN group. Other parameters, including infection rates, fracture alignment, visible callus formation, screw positioning, complication rates, and fracture union, showed no statistically significant differences between the groups.

Table 6: Comparison of hip movement between PFN and DHS groups at 12 and 18 weeks (n=30).

Findings		PFN (n=14)	DHS (n=16)	P value
Hip movement at 12 weeks	Flexion	125.0±7.6	103.1±21.5	0.001s
	Internal rotation	25.7±4.7	19.4±4.4	0.001s
	External rotation	29.6±1.3	23.1±7.0	0.002s
	Adduction	26.4±5.0	19.0±5.8	0.001s
	Abduction	33.6±5.0	26.9±8.7	0.017s
Hip movement at 18 weeks	Flexion	126.4±5.0	122.5±21.1	0.023s
	Internal rotation	29.3±2.7	23.1±7.0	0.005s
	External rotation	33.9±5.6	26.9±7.9	0.010s
	Adduction	33.6±8.4	23.7±7.8	0.003s
	Abduction	37.8±4.2	32.5±8.5	0.043s

S: significant

Table 7: Comparison of Harris hip score between PFN and DHS groups (n=30).

Harris hip score	PFN (n=14) (%)	DHS (n=16) (%)	P value
100-90 (excellent)	12 (85.7)	6 (37.5)	0.038s
89-80 (good)	1 (7.1)	7 (43.8)	
79-70 (fair)	1 (7.1)	1 (6.3)	
<70 (poor)	0 (0)	2 (12.5)	

S: significant

The third follow-up at 18 weeks showed no significant changes in outcome, except those complications in the DHS group decreased from 18.3% to 12.5%.

Functional evaluation at 12 and 18 weeks assessed hip movements, including flexion, internal rotation, external rotation, adduction, and abduction. At 12 weeks, all hip movements were significantly better in the PFN group compared to the DHS group (p values ranging from 0.001 to 0.017). By 18 weeks, both groups showed improvement, with a notable recovery in the DHS group. However, the PFN group continued to demonstrate superior hip movement in all parameters, maintaining statistical significance (p values ranging from 0.003 to 0.043).

The comparison of the Harris hip score between the PFN and DHS groups revealed that a greater proportion of the PFN group achieved excellent scores (85.7%) compared to the DHS group (37.5%). Additionally, a notable percentage of the DHS group had good scores (43.8%). The difference in the proportion of patients with excellent Harris hip scores between the two groups was statistically significant (p=0.038).

DISCUSSION

A total of 33 patients with unstable trochanteric fractures of the femur were included in the study to evaluate the comparative outcomes of treatment options between the proximal femoral nail (PFN) and the dynamic hip screw (DHS). The patients were purposively assigned to treatment groups: the PFN group with 15 patients and the DHS group with 18 patients. Of the 33 patients, 2 died during the study period, and 1 patient was lost to follow-up. Ultimately, the PFN group comprised 14 patients, and the DHS group included 16 patients. The average age was 64 years (range 45-95), with 18 males and 12 females. The most common occupation was housewives (40%), and the most common causes of injury were road traffic accidents (RTA), falls from height (FFH), and falls on the ground. Two-thirds of the patients (66.7%) had right-sided injuries, and 90% of the patients had not received any treatment prior to hospital admission. Furthermore, 53.3% of the patients were operated on within 7 days of the incident.

More than two-thirds (68.8%) of the DHS group required blood transfusion, compared to only 7.1% of the PFN group (p=0.001). A comparison of Harris hip scores between groups showed that the majority (85.7%) of the PFN group exhibited an excellent score (100-90), compared to 37.5% of the DHS group.

In this study, three cases of infection were identified in patients treated with DHS. Two of these cases involved superficial skin infections, which were treated with antibiotics based on culture and sensitivity. One case involved a deep-seated infection that was treated with antibiotics and regular dressing for up to 6 months. After

6 months, the fracture was found to be united, and the implant was removed, with debridement and surgical toileting performed.

Ecker et al treated 104 patients with DHS. Despite some deaths and lack of follow-up, the late results in 62 cases of fractures were analyzed.[10] Two patients had definite infections.

In this study, it was found that patients treated within one week had fewer infections, less morbidity, and better functional outcomes.

Parker et al prospectively studied a consecutive series of 765 patients with proximal femoral fractures to determine if the time interval between injury and surgery influenced the outcome. They found that morbidity increased with delay.[11]

During the study, after a follow-up period of at least 4 months, technical failure was seen in just one (6.3%) of the cases. The mean duration of surgery was 117.4 minutes in the PFN group, compared to 72.3 minutes in the DHS group. In the PFN group, two patients had postoperative superficial infections, and three in the DHS group. All infections were treated with the appropriate antibiotics, except for one in the PFN group.

Simmermacher et al treated 191 proximal femoral fracture patients with the PFN within one year. After a follow-up period of at least 4 months, technical failure was seen in just 4.6% of the cases. The mean duration of surgery was 68.7 minutes (range 25-240 minutes).[12]

Domingo et al prospectively followed 295 patients with trochanteric fractures treated with the PFN.[13] The average age of the patients was 80 years. On average, 12 weeks were needed for consolidation. The most frequent complication was seroma and hematoma of the surgical wound, which resolved satisfactorily in all cases. Superficial and deep infections also evolved favorably once appropriate treatment was instituted. No breakage or failures due to implant fatigue were observed. The patients' recovery, including the restoration of previous walking ability, was evaluated, with 71% recovering their previous walking ability.

Most surgeons at this institute, as well as in our country, are very familiar with the DHS implant and are skilled in its use. However, the PFN is a relatively new implant and presents some challenges, especially with positioning the neck screw and difficulties in distal locking. These issues have been gradually overcome as expertise with the implant has developed. In the PFN group, two patients had postoperative superficial infections, and three in the DHS group. All infections were treated with the appropriate antibiotics, except for one in the PFN group. There were no further operations required in the DHS group, but one was needed in the PFN group.

Herrera et al presented a prospective randomized study of 125 pertrochanteric femoral fractures treated with PFN and 125 with Gamma nail.[14] They found that the PFN was a more dynamic system with a lower incidence of local or late complications. However, correctly placing the two screws in the femoral neck presented challenges, particularly for their short women patients with small femoral necks. This necessitated adjustments during surgery and occasionally led to the need to reposition the nail, which resulted in some loss of the initial reduction.

Al-Yassari et al treated 70 patients (17 males and 53 females, average age 84 years) with unstable trochanteric femoral fractures using the PFN.[15] They experienced complications such as difficulty in distal locking in three patients and screw cut-out through the femoral head in four patients. A fall at home was the most common mode of injury.

In this study, the mean age was 64 years, with 12 females and 18 males. Two patients died, and one was lost to final follow-up. Postoperatively, a good union rate was observed at 18 weeks: 92.9% in the PFN group and 81.3% in the DHS group.

Banan et al reported their experience of stabilizing 60 consecutive proximal femoral fractures with PFN.[16] The mean age was 79 years, with 12 males and 48 females. The patients were followed for at least 4 months. During the follow-up, there were 12 deaths, and two patients were lost to follow-up. They reported a good union rate at 4 months (85%) and a relatively low cut-out rate (8.7%) for unstable fractures.

Boldin et al prospectively treated 55 patients with proximal femoral fractures using PFN from 1997 to 2000.[17] The mean age was 73 years, with 39 females. Fifty fractures were reduced by closed means, and 5 required open reduction. The mean duration of surgery was 68 minutes (range 22-205). They observed two cases of screw cut-out. Although the DHS is the most commonly used method for proximal femoral fractures, the PFN was more effective in managing more distal and uncommon trochanteric fractures. The PFN is considered a good minimally invasive implant for unstable proximal femoral fractures when closed reduction is possible. The study suggests that modifications to the PFN and careful surgical technique should help reduce the high complication rates observed.

Pajarinen et al treated 108 patients with pertrochanteric femoral fractures using either DHS or PFN in this prospective randomized series.[18] Patients treated with the PFN (n=42) had regained their preoperative walking ability significantly more often by the four-month review compared to those treated with DHS (n=41) (p=0.04). The operation time for the PFN was generally more time-consuming, but patients required less blood (mean 400cc/unit of red blood cells transfused). Patients were discharged after a mean of 6 days postoperatively.

Restoration of walking ability was achieved more often in the PFN group (76.2%) compared to the DHS group (53.7%) (p=0.04). They also observed complications during the 4-month follow-up, including two cases of displacement and 19 patients who did not attend the final review.

The optimal treatment for unstable trochanteric femoral fractures is still a topic of debate. Intramedullary devices, like the PFN, offer both mechanical and biological benefits for managing these fractures. The PFN was specifically developed to address challenges associated with earlier versions of intramedullary proximal femoral nails. The main design differences between the PFN and other similar devices are the introduction of an anti-rotation 6.5 mm neck screw, fluting of the nail tip to decrease stress, and the positioning of the distal locking screws more proximally to avoid abrupt changes in stiffness. In this series, the high incidence of perioperative femoral fractures, which has been previously reported with other similar devices, was not observed.[15]

This study had some limitations. The sample size was inadequate to represent the actual situation. There was a wide range of variation in the sample size. The study was conducted in a selected hospital in Dhaka city, meaning the results may not accurately reflect the situation in Bangladesh as a whole. There was a sex variation in the sample size, which may have influenced the results due to differences in bone quality between the two sex groups. The focus of the study was limited to a defined group due to the time constraints.

CONCLUSION

The PFN is a useful device for the treatment of unstable trochanteric femoral fractures. It provides a biomechanically stable construct, allowing for early weight-bearing. The procedure is relatively straightforward, with femoral neck screw positioning being critical for optimal results. Additionally, the incidence of wound infection is low, as the PFN avoids the long incision required for a long plate hip screw device.

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REFERENCES

1. Andrew W. Hip and Femur. In: Bannister LH, Collins P, Day Son M, eds. Gray's Anatomy: the anatomical basis of clinical practice. 38th edn. Churchill Livingstone; 2005:1431-1436.
2. Kyle RF. Fractures of the proximal part of the femur. J Bone Joint Surg Am. 1994;76(6):924-50.
3. Lavelle DG. Fractures of hip. In: Canale S, edr. Campbells operative Orthopedics. 10th edn. Mosby Year Book; St. Louis, London; 1998:2873-2938.
4. Rockwood CA, Green DP. Rockwood and Green's Fractures in Adults. 4th edn. Philadelphia, PA: Lippincott Williams and Wilkins; 1996.
5. Kannus P, Parkkari J, Sievänen H, Heinonen A, Vuori I, Järvinen M. Epidemiology of hip fractures. Bone. 1996;18(1):S57-63.
6. Evans EM, Wales SS. Trochanteric fractures. J Bone Joint Surg Br Vol. 1951;33(2):192-204.
7. Ganz R, Thomas RJ, Hammerle CP. Trochanteric fractures of the femur: treatment and results. Clin Orthopaed Rel Res (1976-2007). 1979;138:30-40.
8. Hornby R, Evans JG, Vardon V. Operative or conservative treatment for trochanteric fractures of the femur. A randomised epidemiological trial in elderly patients. J Bone Joint Surg Br Vol. 1989;71(4):619-23.
9. Pajarinen J, Lindahl J, Michelsson O, Savolainen V, Hirvensalo E. Pertrochanteric femoral fractures treated with a dynamic hip screw or a proximal femoral nail: a randomised study comparing post-operative rehabilitation. J Bone Joint Surg Br Vol. 2005;87(1):76-81.
10. Ecker ML. The treatment of trochanteric hip fractures. Using a compression screw. J Bone Joint Surg A. 1975;57(1):23-7.
11. Parker MJ, Pryor GA. The timing of surgery for proximal femoral fractures. J Bone Joint Surg Br Vol. 1992;74(2):203-5.
12. Simmermacher RK, Bosch AM, Van der Werken CH. The AO/ASIF-proximal femoral nail (PFN): a new device for the treatment of unstable proximal femoral fractures. Injury. 1999;30(5):327-32.
13. Domingo L, Cecilia D, Herrera A, Resines C. Trochanteric fractures treated with a proximal femoral nail. International orthopaedics. 2001;25:298-301.
14. Herrera A, Domingo L, Calvo A, Martinez A, Cuenca J. A comparative study of trochanteric fractures treated with the Gamma nail or the proximal femoral nail. International orthopaedics. 2002;26:365-9.
15. Al-Yassari G, Langstaff RJ, Jones JW, Al-Lami M. The AO/ASIF proximal femoral nail (PFN) for the treatment of unstable trochanteric femoral fracture. Injury. 2002;33(5):395-9.
16. Banan H, Al-Sabti A, Jimulia T, Hart AJ. The treatment of unstable, extracapsular hip fractures with the AO/ASIF proximal femoral nail (PFN)- our first 60 cases. Injury. 2002;33(5):401-5.
17. Boldin C, Seibert FJ, Fankhauser F, Peicha G, Grechenig W, Szyszkowitz R. The proximal femoral nail (PFN)-a minimal invasive treatment of unstable proximal femoral fractures: a prospective study of 55 patients with a follow-up of 15 months. Acta Orthopaed Scand. 2003;74(1):53-8.
18. Pajarinen J, Lindahl J, Michelsson O, Savolainen V, Hirvensalo E. Pertrochanteric femoral fractures treated with a dynamic hip screw or a proximal femoral nail: a randomised study comparing post-operative rehabilitation. J Bone Joint Surg Br Vol. 2005;87(1):76-81.

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