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Original Research Article

A Comparative Study of Unstable Intertrochanteric Fracture by Proximal Femoral Nail versus Proximal Femoral Nail Anti-Rotation among Adult Patients

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ABSTRACT

Objective: To compare unstable intertrochanteric fracture by proximal femoral nail versus proximal femoral nail anti-rotation among adult patients.
Methods: This was a comparative study. Patients were randomized into 2 groups: Proximal Femoral Nail Anti-rotation (n=30) and Proximal femoral nail group (n=30). Singh's index was used to grade the radiographs for the degree of osteoporosis. Functional evaluation was done at 3 months, 6 months, 9 months and 12 months by using Harris Hip Score.
Results: Majority of patients in both PFN (60%) and PFNA (70%) were between 61-70 years. More than half of patients of PFN (56.7%) and 43.3% of PFNA were males. The operative time was 84.00±9.39 minutes among patients of PFN and 61.03±5.75 minutes among patients of PFNA with significant difference between the groups. Singh's grade III was most common among patients of both PFN (36.7%) and PFNA (36.7%). There was no significant (p>0.05) difference in Harris Hip score between the groups at all the time periods. Excellent outcome was in 63.3% patients of PFNA and in 46.7% patients of PFNA. Good outcome was in 33.3% patients of PFN and in 10% of PFNA.
Conclusion: The study suggests that both PFN and PFNA perform well, showing equally good functional outcomes following fixation of unstable trochanteric fractures. PFNA offers no significant benefits over PFN in terms of post-operative complications.

Key words: Unstable intertrochanteric fracture, Proximal femoral nail, Proximal femoral nail anti-rotation

INTRODUCTION

The most common near-end thighbone fractures are of the thighbone neck, intertrochanteric and subtrochanteric fractures, accounting for approximately 45%, 45%, and 10%, respectively [1]. Among them, intertrochanteric fractures are more common in the elderly, as they often have a poorer physical condition, which is accompanied by osteoporosis, cardiovascular and cerebrovascular diseases, and other comorbidities. Therefore disability and death rates associated with intertrochanteric fractures are high [2,3]. Due to developments in science and technology, the increasing number of motor vehicle traffic accidents the increasing number of vehicles, and the growing aging population, the incidence of intertrochanteric fractures has rapidly increased. Therefore, the treatment and postoperative functional recovery of intertrochanteric fractures have become increasingly discussed by orthopedic surgeons.

Despite marked improvements in implant design, surgical technique and patient care, peritrochanteric fractures continue to consume a substantial proportion of our health care resources and remain a challenge to date [4].

Complications with peritrochanteric fractures arise primarily from fixation rather than union or delayed union because the peritrochanteric area is made up of spongious bones [5]. The strength of the fracture fragment-implant assembly depends upon various factors including (a) bone quality, (b) fragment geometry, (c) reduction, (d) implant design and (e) implant placement. Of these factors, surgeon can only control the quality of the reduction, choice of implant and its placement. In cases of intertrochanteric fractures, the preferred type of fixation device is controversial. The sliding hip screw is a widely used extramedullary implant in the treatment for hip fractures. However, studies have reported that this implant is not appropriate for unstable intertrochanteric fractures, and have supported various alternative modalities of fixation [6,7].

As compared to extramedullary devices, intramedullary nails can be inserted with less exposure of the fracture, less blood loss, although they may require more fluoroscopic exposure. Biomechanically, nails allow for stable anatomical fixation of more comminuted fractures without shortening the abductor moment arm or changing the proximal femoral anatomy. The common IM devices used for unstable intertrochanteric fractures today include proximal femoral nail (PFN) and proximal femoral nail antirotation (PFNA). PFN was introduced by AO/ASIF in 1996 for treatment of trochanteric fractures. It includes an Intramedullary nail through which two screws are inserted into the neck of femur. One is a lag screw that stabilizes the fracture allowing collapse and other is an antirotation screw used to provide rotatory stability to the fracture. PFNA was introduced in 2003 and it utilizes a helical blade instead of the conventionally used two screws. The helical blade is believed to provide stability, compression as well as rotational control of the fracture. Theoretically, it compacts the bone during insertion into the neck and hence has higher cut out strength as compared to other devices. Hence there is less chance of implant failure especially in elderly, osteoporotic bones.

The present study was designed to compare unstable intertrochanteric fracture by proximal femoral nail versus proximal femoral nail anti-rotation among adult patients.

MATERIAL AND METHODS

This was a comparative study conducted in the Department of Orthopedics, Uttar Pradesh Institute of Medical Sciences, Saifai Etawah. The study was approved by the Ethical Committee of the Institute and consent was taken from each participant/attendant before including in the study. Patients aged more than 50 years, unstable intertrochanteric fractures and acute unilateral intertrochanteric fractures belonging to AO 31-A2,AO 31-A3 were included in the study. Patients with pathological fractures, open fracture and any other fracture in same extremity were excluded from the study.

Methods

Singh's index was used to grade the radiographs for the degree of osteoporosis. A bolus dose of antibiotic inj. Ceftriaxone 1gm i/v was given pre-operatively, half an hour before surgery [8].

Proximal Femoral Nail Anti-rotation (n=30):

All patients were administered spinal anaesthesia and positioned supine on a fracture table prior to closed reduction of fracture and will be monitored under C-Arm X-ray. Then reduction of the fracture was performed. After successful reduction, a lateral incision of 2-3 cm was made 2 cm superior to the apex of greater trochanter, then the apex of greater trochanter was exposed by bluntly dissecting gluteus medius. With the guidance of C-arm X-ray, a hole was made on the apex of greater trochanter with hollow pointed cone, a guide pin was inserted, and then a hollow intramedullary drill was used to enlarge the medullary cavity along the pin. After enlarging the cavity, the main nail of PFNA was inserted along the pin. The reduction of fracture will be confirmed with C-arm X-ray and then the pin was driven into the neck of femur from the proximal locking hole with matching guider. Posteroanterior film of C-arm X-ray showed that the pin will be 5 - 10 mm beneath the articular surface of femur, and the lateral film showed that it was located at centre of or slightly posterior to the head of femur. Moreover, the distance between the pin tip and the apex of femur head could be visible in posteroanterior and lateral film, namely Tip-Apex Distance (TAD), which was not over 20 mm. The reamer was used to enlarge the medullary cavity along the pin again. According to the depth measured by guide pin, a helical blade of appropriate length was driven into the bone, and then tightened. Later, distal locking nail and screw cap was installed with the guidance of C-arm X-ray. The reduction of fracture should be satisfactory according to posteroanterior and lateral C-arm X-ray. The wound was washed, sutured and dressed without postoperative drainage. Patient was shifted to the recovery ward.

Proximal femoral nail group (n=30):

Patient was given spinal anaesthesia and shifted to a fracture table in supine position. Operative leg was slightly adducted and put on traction. Opposite limb was put in a full abduction as to give space for the C-arm in between the legs. Reduction was achieved by traction and internal rotation primarily mid adduction or abduction as required. Reduction was checked in a C-arm with anterior - posterior and lateral view.

Entry point was taken with awl/guide pin over a protector sleeve, it was on the tip of the Greater Trochanter antero-posterior and lateral position. 2.8mm guide wire was inserted in to the femoral shaft and across the fracture site in 6 degree of valgus. Its position was checked in the C-arm and the entry was widened with the awl. Reaming of the proximal femur was done up to the proximal part of the nail to be introduced. Nail was fixed on the jig and the alignment was checked. Then the nail was inserted into the femur. The position of the holes for the proximal screws was checked in the C-arm for the depth of the nail.

Guide wires for the screws were inserted via the jig and the drill sleeve. The ideal position of the guide wires was parallel and in the lower half of the neck in AP views, in a single line in the centre of the neck in the lateral views. The guide pins were inserted up to 5mm from the articular surface of the femoral head and size of the lag screw was determined. Reaming and tapping for lag screw was done.

First the 8mm hip screw was inserted after reaming over the distal one and then the 6mm neck screw. The hip screw should be 5mm away from the subchondral bone. One or two static or dynamic 4.9mm interlocking bolts were inserted in to the distal pan of the nail. Out of which one was a static and another was a dynamic hole. It was done after removing the traction along with the tightening of the proximal screws. It was done free hand with the help of Image Intensifier. The jig was removed. The final position of the nail was checked in the C-arm in both views and the wound was closed in layers.

Anteroposterior (AP) and lateral radiograph was taken for all the patients at each follow-up for evaluation of fracture healing and implant position. Clinical and radiological assessment of fracture union/ complications for all the patients was done post-operatively at 3 months, 6 months, 9 months and 12 months.

Functional evaluation was done at 3 months, 6 months, 9 months and 12 months by using Harris Hip Score [9].

Statistical analysis

The categorical variables were compared by Chi-square test. The continuous variables were compared by using unpaired t-test. The p-value<0.05 was considered significant. All the analysis was carried out on SPSS 16.0 version (Chicago, Inc., USA).

RESULTS

Majority of patients in both PFN (60%) and PFNA (70%) were between 61-70 years. The mean age of patients of PFN and PFNA was 71.27±8.09 and 71.53±10.42 years respectively. More than half of patients of PFN (56.7%) and 43.3% of PFNA were males. More than half of patients of both PFN (63.3%) and PFNA (56.7%) had left side injury. There was no significant (p>0.05) difference in age, gender and side of injury between the groups showing comparability of the groups in terms of age and gender. The operative time was 84.00±9.39 minutes among patients of PFN and 61.03±5.75 minutes among patients of PFNA with significant difference between the groups (Table-1).

Singh's grade III was most common among patients of both PFN (36.7%) and PFNA (36.7%). Singh's grade II was in 23.3% patients of PFN and in 30% of PFNA. However, Singh's grade IV was in 26.7% patients of PFN and 6.7% of PFNA (Fig.1).

Table-1: Distribution of patients according to basic profile between the groups

Basic profile	PFN (n=30)		PFNA (n=30)		p-value[1]
	No.	%	No.	%	
Age in years					
61-70	18	60.0	21	70.0	0.23
71-80	8	26.7	3	10.0	
>80	4	13.3	6	20.0	
Mean±SD	71.27±8.09		71.53±10.42		
Gender					
Male	17	56.7	13	43.3	0.30
Female	13	43.3	17	56.7	
Side					
Left	19	63.3	17	56.7	0.59
Right	11	36.7	13	43.3	
Operative time in minutes	84.00±9.39		61.03±5.75		0.0001*

*[1]Chi-square test/Unpaired t-test, *Significant*

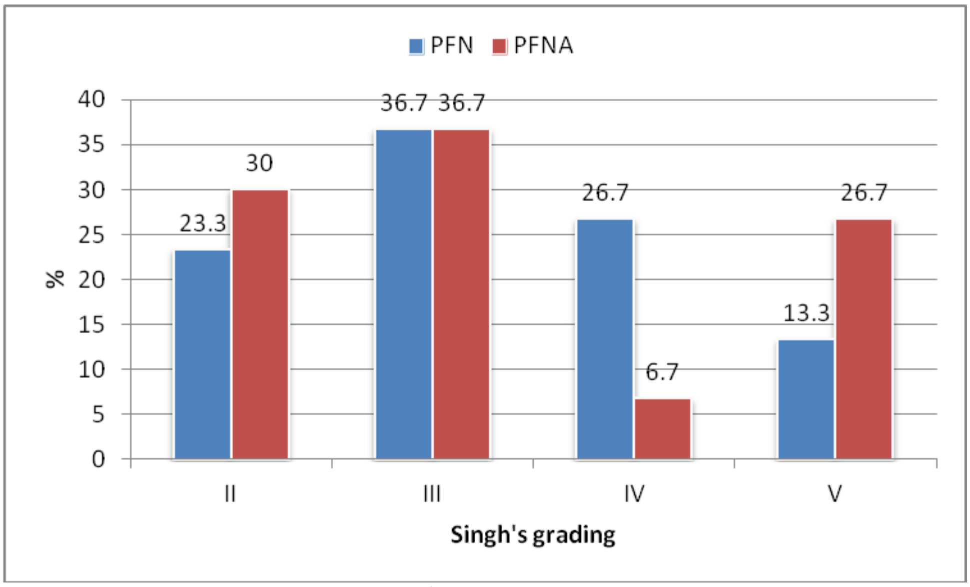

Fig.1: Comparison of Singh Index between the groups

Harris Hip score was 26.53±4.68 and 28.63±5.66 among patients of PFN and PFNA at 3 months of follow-up which respectively became 91.24±8.04 and 90.10±10.55 among patients of PFN and PFNA at 12 months respectively. However, there was no significant (p>0.05) difference in Harris Hip score between the groups at all the time periods (Table-2).

Screw back out was in 3.3% patients in PFN and 6.7% in PFNA. Superficial infection was in 3.3% patients of both PFN and PFNA groups (Fig.2).

Table-2: Comparison of Harris Hip score between the groups across the time periods

Time periods	PFN (n=30)	PFNA (n=30)	p-value[1]
3 months	26.53±4.68	28.63±5.66	0.12
6 months	46.13±5.70	46.60±8.43	0.80
9 months	71.72±7.45	67.83±8.05	0.06
12 months	91.24±8.04	90.10±10.55	0.64

[1]Unpaired t-test

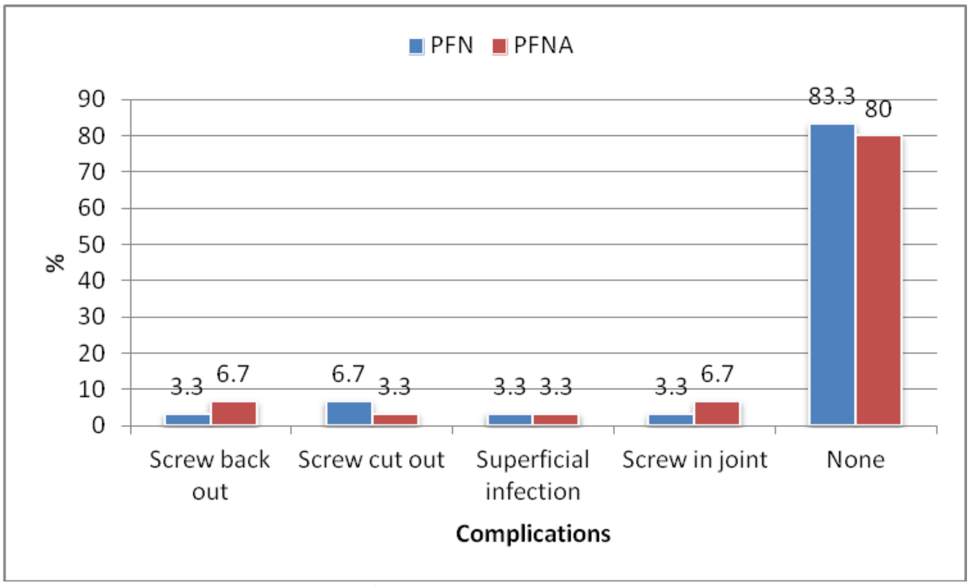

Fig.2: Comparison of complications between the groups

Excellent outcome was in 63.3% patients of PFNA and in 46.7% patients of PFNA. Good outcome was in 33.3% patients of PFN and in 10% of PFNA (Fig.3).

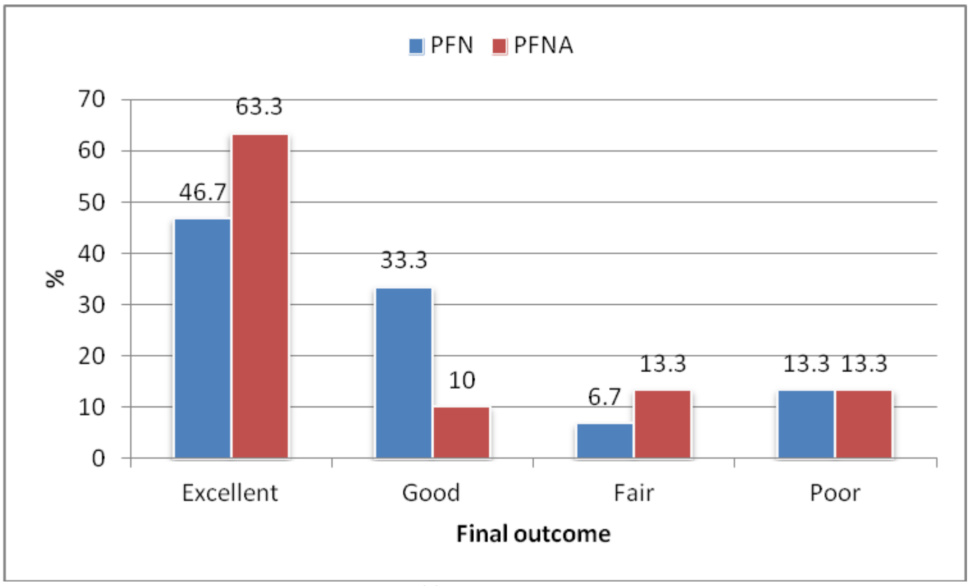

Fig.3: Comparison of final outcome between the groups

DISCUSSION

Unstable intertrochanteric femoral fractures are quite difficult to manage. Various treatment modalities include osteosynthesis with dynamic hip screws or cephalomedullary nail and arthoplasty in selected cases. However, choice of implant for unstable intertrochanteric fracture is still debatable. Closed management of these injuries poses difficulty in obtaining and maintaining a reduction, making operative treatment the ideal treatment. Currently, common modes of fixation devices used are Blade plate systems, Sliding screw systems and Intra-medullary devices. Since its introduction in the 1980s, cephalomedullary fixation for IT fractures in the elderly has gained popularity. Aside from the theoretical advantage of being less invasive and biomechanically superior, these devices have been advocated in cases of unstable fracture patterns such as reverse obliquity, lateral wall incompetence, sub-trochanteric extension, and medial calcar disruption [10,11].

In this study, majority of patients in both PFN (60%) and PFNA (70%) were between 61-70 years. The mean age of patients of PFN and PFNA was 71.27±8.09 and 71.53±10.42 years respectively. More than half of patients of PFN (56.7%) and 43.3% of PFNA were males. There was no significant (p>0.05) difference in age and gender between the groups. Kashid et al [12] reported similar results in regard to age in which The mean age of patients in PFN and PFNA groups was 64.36 ± 8.28 years and 65.36 ± 8.66 years respectively and did not differ significantly (p =0.678). However, a significant (p=0.05) difference in the age was reported between patients treated with PFN (60.78 years) and PFNA (74.12 years) [13]. In the study by Sharma et al [13], there were 69.5% males in PFN group and 40% in PFNA group. Kashid et al [12] reported that the subjects of PFN and PFNA groups were also gender matched as the number of females and males was same in the two groups.

This study observed that Singh's grade III was most common among patients of both PFN (36.7%) and PFNA (36.7%). Singh's grade II was in 23.3% patients of PFN and in 30% of PFNA. However, Singh's grade IV was in 26.7% patients of PFN and 6.7% of PFNA. Sharma et al [13] observed that 8 of 21 patients (38.09%) in PFN group and 13 of 24 patients (54.16%) in PFNA group had a Singh's index of III or less.

There was no significance (p>0.05) in Harris hip score between the groups across the time periods in patients of PFNA than PFN. Sharma et al [13] also reported similar finding in which the average Harris Hip Score obtained at final follow up was identical in the two groups of patients – 75.37 for the PFN group and 78.85 for the PFNA group. Kashid et al [12] found that the mean Harris hip score of PFNA group was relatively higher as compared to PFN group but the difference was not significant (p =0.562) as in the present study.

This study demonstrated that the operative time was 84.00±9.39 minutes among patients of PFN and 61.03±5.75 minutes among patients of PFNA with significant difference between the groups. This finding is in agreement with the study by Mohan et al [14] in which the mean operative time in PFNA was 50 minutes and 80 minutes in PFN group. Kashid et al [12] also reported similar finding with this study in context to operation time in which the mean operative time was significantly lower in PFNA group as compared to PFN group (35.20 ± 6.03 minutes vs. 43.32 ± 8.20 minutes, (p <0.001). Bajpai et al [15] found that the two groups were similar in operation time (screw PFN, 85.91 min; helical blade PFN group 83.91 min; p =0.43).

In this study, screw back out was in 3.3% patients in PFN and 6.7% in PFNA. Superficial infection was in 3.3% patients of both PFN and PFNA groups. Mohan et al (2016) reported that there was 2 cases of superficial infection in PFNA and 2 each of superficial & deep infection in PFN. Sharma et al [13] reported higher complications in both PFN (34.7%) and PFNA (12%) than the present study.

This study showed excellent outcome was in 63.3% patients of PFNA and in 46.7% patients of PFNA. Good outcome was in 33.3% patients of PFN and in 10% of PFNA. In the study by Mohan et al [14], in PFNA group, 45 cases (90%) showed excellent results, 5 cases(10%) showed good results, whereas in PFN group, 37cases (75%) showed excellent results, 8 cases (20%) showed good results and 3 cases (5%) showed poor results.

The prospective nature of the study and randomization of patients strengthened the study. However, the smaller sample size and shorter duration of follow-up are limiting factors.

CONCLUSION

The study suggests that both PFN and PFNA perform well, showing equally good functional outcomes following fixation of unstable trochanteric fractures. PFNA offers no significant benefits over PFN in terms of post-operative complications.

REFERENCES

1. Kani KK, Porrino JA, Mulcahy H, et al. Fragility fractures of the proximal femur: review and update for radiologists. Skeletal Radiol.2019;48(1):29-45.
2. Zhao F, Wang X, Dou Y, et al. Analysis of risk factors for perioperative mortality in elderly patients with intertrochanteric fracture. Eur J Orthop Surg Traumatol. 2019;29(1):59-63.
3. Zhang J, Chen X, Wang J, et al. Poor prognosis after surgery for intertrochanteric fracture in elderly patients with clopidogrel treatment: A cohort study. Medicine (Baltimore).2017;96(39):e8169.
4. Halder SC. The Gamma nail for peritrochanteric fractures. J Bone Joint Surg Br. 1992;74(3):340-4
5. 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. Acta Orthop Traumatol Turc. 2010;44(6):443–51.
6. 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, randomized study. J Bone Joint Surg Am. 2002;84(3):372–81
7. 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.
8. Singh M, Nagrath AR, Maini PS. Changes in trabecular pattern in the upper end of the femur as an index of osteoporosis. J Bone Joint Surg Am. 1970; 52(1):457–67.
9. Harris WH. Traumatic arthritis of hip after dislocation and acetabular fractures: Treatment by mold arthroplasty. An end-result study using a new method of result evaluation. J Bone Joint Surg Am. 1969;51-A: 737-755.
10. Matre K, Vinje T, Havelin LI, Gjertsen JE, Furnes O, Espehaug B, Kjellevold SH, Fevang JM. TRIGEN INTERTAN intramedullary nail versus sliding hip screw: a prospective, randomized multicenter study on pain, function, and complications in 684 patients with an intertrochanteric or sub-trochanteric fracture and one year of follow-up. JBJS. 2013;95(3):200-8.
11. Okcu G, Ozkayin N, Okta C, Topcu I, Aktuglu K. Which implant is better for treating reverse obliquity fractures of the proximal femur: a standard or long nail? Clinical Orthopaedics and Related Research. 2013;471(9):2768-75.
12. Kashid MR, Gogia T, Prabhakara A, Jafri MA, Shaktawat DS, Shinde G. Comparative study between proximal femoral nail and proximal femoral nail antirotation in management of unstable trochanteric fractures. Int J Res Orthop 2016;2:354-8.
13. Sharma A, Mahajan A, John B. A Comparison of the Clinico-Radiological Outcomes with Proximal Femoral Nail (PFN) and Proximal Femoral Nail Antirotation (PFNA) in Fixation of Unstable Intertrochanteric Fractures. Journal of Clinical and Diagnostic Research. 2017; 11(7).
14. Mohan NS, Chandrashekhar, Reddy R, Santoshbabu M. Comparative Study Between PFN Vs PFNA in The Treatment of Unstable Intertrochanteric Fracture. IJAR 2016; 6 (6).
15. Bajpai J, Maheshwari R, Bajpai A, Saini S. Treatment options for unstable trochanteric fractures: Screw or helical proximal femoral nail. Chinese Journal of Traumatology 2015; 18: 342-346.

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