

Comparison of dynamic hip screw and proximal femoral nail in the treatment of Intertrochanteric fracture of femur

Samant P.D.¹, Kale S.Y.², Singh S.D.³, Chaudhary P.⁴, Dhar S.B.⁵, Gohain N.K.⁶

¹Dr Prakash D Samant, Professor and Head, ²Dr Sachin Y Kale, Professor, ³Dr Shikhar D Singh, Senior Registrar, ⁴Dr Prasad Chaudhari, Associate Professor, ⁵Dr Sanjay B Dhar, Professor, ⁶Dr Nabakrishna Gohain, Registrar, all authors are affiliated with Department of Orthopaedics, Padmashree, Dr DY Patil Medical College, Navi Mumbai, India.

Address for Correspondence: Dr. Shikhar D Singh, Senior Registrar, Department of Orthopaedics, Padmashree Dr DY Patil Medical College, Navi Mumbai. Email: drsinghshikhar@gmail.com

Abstract

Introduction: As the elderly population grows, the number of hip fractures continues to increase. This study aims to compare the clinical outcomes of DHS and PFN in the fixation of intertrochanteric fracture of femur. **Methodology:** After obtaining approval of the ethics committee, a prospective study was conducted in the Department of Orthopedics, DY Patil School of Medicine from January 2014 till December 2015. Informed consent was taken from patients who fulfilled the inclusion/exclusion criteria and relevant clinical information was collected, including intra and post-operative details. The patients were called for followup to check for complications. **Results:** During the study period, 50 patients with intertrochanteric fracture were included in the study, of which 23 were treated with PFN and 27 with DHS. 76% of the PFN patients needed no blood transfusion, while 41% of DHS patients needed 2 units of blood transfusions. Post operative fever and deep vein thrombosis was more common in DHS patients. 79% of PFN patients started mobilizing on the first postoperative day as compared to 68% of DHS patients who started mobilizing on third postoperative day. Similarly post operative weight, full weight bearing and return to activity of daily living was seen to be better in PFN patients. **Conclusions:** Our study showed that PFN is a superior method of osteosynthesis as compared to DHS in the treatment of intertrochanteric fractures. Future research should focus on studying the economic and rehabilitative impact of PFN on patients with intertrochanteric fractures.

Keywords: Complications, Dynamic hip screw, Intertrochanteric fracture

Introduction

As the elderly population grows, the number of hip fractures continues to increase. Worldwide, the total number of hip fractures is expected to surpass 6 million by the year 2050 [1]. The elderly have weaker bone and are more likely to fall due to poorer balance, medication side effects, and difficulty maneuvering around environmental hazards and hip fractures substantially increase the risk of death and major morbidity in this age group.

These risks are also high among nursing home residents, particularly men, patients over age 90, those with cognitive impairment and other comorbidities, individuals treated nonoperatively, and those who cannot ambulate independently. A large review of hip fractures in the United States found that femoral neck and intertrochanteric fractures occur with approximately the

same frequency in patients between the ages of 65 and 99 years [2]. However, isolated trochanteric fractures occur more often in young, active adults between the ages of 14 and 25 [2].

In order for a patient with an intertrochanteric fracture to return to activity as soon as possible and to avoid the complications associated with non-ambulatory treatment, internal fixation of these fractures has been accepted as the standard procedure. To achieve this goal a variety of implants for internal fixation have been employed with variable success. Among these Dynamic hip screws (DHS) and Proximal Femoral Nail (PFN) are one of the most successful fixation devices employed in stabilizing these fractures [3]. These implants provide secured fixation and controlled impaction of the fracture with lower rate of complications. Using DHS & PFN, excellent results have been achieved with majority of patients having simple intertrochanteric fractures. However there

remained many unsolved problems in the acceptability of these implants in unstable intertrochanteric fractures. Failure rates are higher up to 8% to 25% with unstable fracture patterns [4] and as high as 50% in most unstable fractures [5].

This study aims to compare the results of DHS and PFN in the fixation of intertrochanteric fracture of femur in terms of radiological union, early mobility and weight bearing and complications. We also wanted to evaluate functional outcome in both the groups using the Modified Harris Hip Score.

Methodology

Study design and setting- We designed a prospective study at the Department of Orthopedics, DY Patil School of Medicine from January 2014 till December 2015. We included patients who were aged 21 years or more, had closed intertrochanteric fractures with other joints of lower limbs in functionally good state. We excluded patients who were not medically fit to undergo surgery, had a previous surgery for fracture fixation in the lower limbs, had an open fracture or severe comminuted fractures or refused to give consent to be included in the study. We also excluded patients who had ipsilateral or contralateral major limb injury affecting the treatment or rehabilitation process.

Data collection and analysis- After giving first aid to patients arriving at the trauma center, routine investigations were performed. Basic radiological investigations pertaining to that of fracture sustained were done in addition to the standard trauma series of investigations. After the initial management, all patients were assessed for any medical ailment and patients were managed accordingly. Informed consent was taken from all patients. All patients were explained about the perceived advantages of proximal femoral nail and the additional cost of the implant. Stable patients were taken up for surgery at the earliest after the pre anaesthetic evaluation. Mobilization of patients was started on or after

Results

During the study period, 50 patients with intertrochanteric fracture were included in the study, of which 23 were treated with PFN and 27 with DHS. 52% of PFN and 27% of DHS patients were males (Table 1). Majority of the patients had fall as the mode of injury. 41% of PFN belonged to Boyde & Griffin Classification III and 68% of DHS belonged to Boyde & Griffin Classification II. All DHS patients belonged to AO classification 31 A1 (Table 2). 28% of the patients who underwent PFN had blood loss less than 100 ml, while 18% of the patients who had DHS had blood loss between 100-300 ml. 76% of the PFN patients needed no blood transfusion, while 41% of DHS patients needed 2 units of blood transfusions. Post operative fever and deep vein thrombosis was more common in DHS patients (Table 2). 79% of PFN patients started mobilizing on the first postoperative day as compared to 68% of DHS patients who starting mobilizing on third postoperative day. Similarly post operative weight, full weight bearing and return to activity of daily living was seen to be better in PFN patients (Table 2). Modified Hip scores of patients of both categories is given in Table 3.

second post operative day depending upon the pain and general condition of the patient. Exercises in the form of static quadriceps, knee bending were started. Intra venous antibiotics were administered for 72 hours post surgery and oral antibiotics were continued until 3 days post removal of sutures.

Patients were sent home after suture removal. Patients were followed up in the out patients department monthly for up to six months then three monthly. On every visit local site was examined for any signs of local inflammation or infection, range of motion at the hip joint was assessed, and both anteroposterior and lateral radiographs were taken of the hip joint to look for the progress of union.

Partial weight bearing walking with walker was started (toe touch walking) once patient had regained quadriceps control and straight leg raising and radiographic signs of callus formation were seen. Full weight bearing walking was started once radiographic signs of union have occurred.

During the course of treatment, clinical information of the patient regarding age, gender, mode of injury, previous medical history, amount of blood loss, complications were collected. We classified the patients according to Boyd and Griffin Classification and AO Classification [6] [7].

AO Classification categorizes injuries according to their location and severity. After the start of rehabilitative process, appearance of late complications, information regarding physiotherapy and overall clinical outcome using Modified Hip Score was noted for each patient [8].

This score rates the clinical outcome in terms of pain, gait and functional activities. The data were compiled in Microsoft Excel sheets and analysed using appropriate statistical analysis. The descriptive variables were tabulated and both the techniques for managing intertrochanteric fractures were compared.

Table-1: Characteristics of patients included in the study.

Patient variable	Proximal Femoral Nail	Dynamic Hip Screw
<i>n</i>	23	27
Age distribution (in years)		
40-50	10	3
51-60	5	3
61-70	5	13
71-80	8	4
81-90	3	4
Gender distribution		
Male	12	9
Mode of injury		
Fall	21	22
Road traffic accident	2	5
Associated medical history		
Hypertension/Diabetes	12	16
None	11	11

Table-2: Pre- and post-operative details of the patients.

Patient variable	Proximal Femoral Nail	Dynamic Hip Screw
<i>n</i>	23	27
Boyd & Griffin Classification		
I	0	9
II	6	18
III	10	0
IV	7	0
AO Classification		
31A1	0	27
31A2	8	0
31A3	15	0
Blood loss		
10-49 ml	3	0
50-100 ml	2	0
101-200 ml	0	3
201-300 ml	1	3
More than 300 ml	0	2
Blood transfusion		
0 unit	17	0
1 unit	5	2
2 units	0	11
3 units	1	8
4 units	0	5
Intraoperative hypotension	1	2
Postoperative complication		
Fever	2	6
Deep vein thrombosis	1	5
Time required to mobilize		
1 st post operative day	18	0
2 nd post operative day	5	1
3 rd post operative day	0	19
4 th post operative day	0	7
Post operative weight bearing		
1 week	20	0
2 weeks	3	20
3 week	0	7
Post operative full weight bearing		
2 weeks	17	0
3 weeks	4	1
4 weeks	2	15
5 weeks	0	9
6 weeks	0	2
Return to activity of daily living		
6 months	10	3
8 months	8	7
10 months	3	12
1 year	2	5

Table-3: Modified Hip Score evaluation.

SCORE (OUT OF 91)	Proximal Femoral Nail	Dynamic Hip Screw
79	0	10
80	0	6
81	0	2
82	0	5
83	0	2
84	0	2
85	3	0
86	6	0
87	4	0
88	5	0
89	5	0

Discussion

Intertrochanteric fractures are extracapsular, and thus have a lower propensity to cause interruption of blood supply, but are at risk for displacement. In the elderly population, most of the intertrochanteric fractures occur as the result of a fall. Although these fractures are relatively rare in younger individuals, but may occur in younger age groups due to fall from a height or a motor vehicle collision [9]. Ambulatory patients should be treated aggressively, usually with surgical intervention, with the goal of restoring their level of activity to earlier state as quickly as possible. For nonambulatory patients nonoperative management with good pain control may be the best form of management.

However, conservative management has been seen to be associated with pressure sores, aspiration pneumonia, and many others related to prolonged recumbency & bed-rest. Making the matters worst were the lost wages, dependency on quality nursing care & psychosocial impact on the patient. Moreover, patients sustaining intertrochanteric fractures are typically elderly, who are more prone to above mentioned complications. Therefore, we are witnessing a shift from conservative to surgical line of management, which enables early mobilization and return to daily activities of living.

Research over the years led to many refinements in the evolution of implant for osteosynthesis of intertrochanteric fractures. DHS has been in the popular usage since last three decades. Fixation of DHS requires wide surgical exposure as well as involves appreciable blood loss. Complications such as varus collapse, implant cut-out are commonly associated with it. With the passage of time, Gamma nailing gave way to increasing focus on the designing of a nailing construct to address unstable

fracture patterns as well. Over the recent times, PFN is gaining popularity as it involves minimal surgical exposure & blood loss. It is also not alien to complications, such as Z effect (lateral migration of caudal screw, varus collapse and perforation of femoral head by superior screw) & reverse Z effect (lateral migration of cephalic screw, varus collapse and femoral head cut-out by inferior screw). Bhakat et al in their study stated less complications in PFN group in comparison to DHS group [10]. In the case series of 400 intertrochanteric fracture patients carried out by Gupta et al, it was found that PFN has better functional outcome with unstable fractures & requires shorter operation time [11].

The theoretical benefits of intramedullary nails over side-plate devices include improved biomechanics (shortened lever arm), decreased blood loss, smaller incisions, and decreased femoral neck shortening. The largest meta-analysis comparing intramedullary nails with side-plate devices from the Cochrane database concluded that side plates are superior to intramedullary nails in the treatment of intertrochanteric femoral fractures [12]. This meta-analysis, however, included older versions of cephalomedullary nails, which had problems with fracture at the distal tip of the nail. Although this complication does still occur, it is much less frequent with newer nail designs.

There is some evidence in the literature that the functional outcomes in patients with certain fracture types may be influenced by the choice of implant. In a randomized trial by Utrilla et al., there was no overall difference in functional outcomes in patients 65 years of age or older with an intertrochanteric femoral fracture treated with

either a Gamma nail or a compression hip screw; however, when patients with unstable fracture patterns were analyzed, those with an intramedullary nail had better walking ability at 12 months than those treated with a compression hip screw [13].

Pajarinen et al. compared outcomes of proximal femoral nailing with compression hip screw fixation in the treatment of intertrochanteric fractures [14]. At 4 months after surgery a much larger percentage of patients (76%) treated with intramedullary nail fixation had returned to their preinjury walking ability than patients treated with compression hip screws (54%). The mean shortening of the femoral neck also was much less in patients treated with intramedullary nail fixation (1.3 mm) than in those with compression hip screws (6.1 mm).

Proponents of intramedullary devices contend that the most advantageous aspect of the device is the intramedullary location, which creates a mechanical intramedullary buttress to prevent excessive collapse, making the competence of the lateral cortex nearly irrelevant. In addition, the intramedullary position confers a theoretical biomechanical benefit with a shortened lever arm, which may decrease the fatigue failure rate, especially valuable in fractures with subtrochanteric extension.

Biological and rehabilitation advantages, such as less operative blood loss and decreased injury to the musculature surrounding the hip, are alleged owing to the way these mechanically superior implants can be inserted. Although there is sparse validated information about this advantage, there is equally nothing to refute it.

A limited incision with a starting point at or slightly medial to the tip of the greater trochanter allows sparing of the abductors, facilitates improved rehabilitation, and may cause less postoperative pain.

Conclusion

Several fixation modalities have been suggested to improve upon the clinical outcome of treatment of intertrochanteric fractures. The minimally-invasive surgical approach without exposing the fracture region causes a minimal soft tissue injury, and decreases the risks of infection; moreover, the advantages of primary haematoma are retained. Therefore, we conclude that PFN is a superior method of osteosynthesis as compared to DHS in the treatment of intertrochanteric fractures.

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