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Original Research Article

A Comparative Study on Surgical Management of Intertrochanteric Fractures of the Femur with Dynamic Hip Screw and Proximal Femoral Nail in a Tertiary Care Hospital

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Abstract

Intertrochanteric fractures of the femur are commonly seen in the orthopedic department due to increased life expectancy and sedentary lifestyles. Therefore, these kinds of fractures are commonly seen in the geriatric population. Management is, therefore, challenging due to age and associated medical conditions present in the older patients. We in the present study to compare the outcome of surgical management of inter-trochanteric fractures of the femur with the dynamic hip screw (DHS) and proximal femur nailing fixation (PFN). Methods: This cross-sectional prospective study of surgical management of inter-trochanteric fractures of the femur was conducted in the Department of Orthopedics, Mahatma Gandhi Memorial Hospital, Warangal. Based on the inclusion and exclusion criteria a total of n=30 cases were identified during the study period from August 2016 to October 2018. Out of which n= 15 were treated by PFN fixation and n=15 were treated were treated with DHS method. Standard operative and surgical techniques were utilized and postoperative care is done. Follow up of cases in both categories was at 2, 4, 6 weeks, 3 months, 6 months, and 1 year after the surgery. Results: The total numbers of the male were n=16 (53.33%) and female were n=14 (46.66%). The mode of injury revealed 11 cases were due to Road Traffic Accidents (RTA) and trivial falls were found in n= 19 (63.33%) of the patients. In n=18 (60%) the right side was involved in the fractures and in n=12(40%) left side was involved in the fractures. A total of n=14 (46.65%) complications were seen during the operative procedures n=3 (10%) complications each was seen due to failure to get an anatomical reduction, failure to put derotation screw, and Varus Angulation n=2 (6.66%). Conclusion: it can be concluded that PFN and DHS have similar outcomes for stable intertrochanteric fractures but in cases of unstable intertrochanteric fractures PFN may be considered the best option. PFN generally has the advantage of being useful in weak osteoporotic patients and is biomechanically sound as it is done by closed technique, fracture opened only when closed reduction could not be achieved and it is an intramedullary device.

Keywords: Intertrochanteric fractures, Dynamic Hip Screw, Proximal Femoral Nail.

INTRODUCTION

Inter-trochanteric fractures account for approximately half of the hip fractures in elderly out of this more than 50% fractures are unstable [1]. For many, this fracture is often a terminal event in the geriatric age group resulting in death due to cardiac, pulmonary or renal complications. In the older age group, there are higher incidences of osteoporosis and low energy trauma like falls from standing position accounts of the majority of hip fractures in this group of patients and a higher proportion of the fractures is also seen in women. High-velocity trauma resulting in intertrochanteric fractures is more common in men aged < 40 years [2]. The insatiability of intertrochanteric fractures is not rare, an unstable fracture lacks in the continuity of bone cortex on opposing surfaces of the proximal and distal segments. Such cortical deficit is generally due to communication in the medial aspect of the neck or large and separate posterior trochanteric fragment. A combination of the two is also seen, if the instability is unrecognized and anatomical reduction does not restore stability [3]. The important problem for the orthopedic surgeon treating these kinds fractures is the treatment of the instability apart from the complications of the fixation that result from instability. Intrinsic factors like osteoporosis and comminution of the fracture and extrinsic factors like choice of reduction, choice of implant and technique of insertion, can contribute to the failure of internal fixation [4]. Therefore, the goal of treatment of an intertrochanteric fracture is the restoration of the patient to his or her pre-injury status as early as possible. The dynamic hip

screw (DHS) has gained widespread acceptance in the last two decade and is currently considered as the standard device for comparison of outcomes. The DHS has been shown to produce good results but complications are frequent, particularly in unstable fractures. The advantage of proximal femur nailing (PFN) fixation is that it provides a more biomechanically stable construct by reducing the distance between the hip joint and implant [5]. We in the present study tried to compare the functional outcome of surgical management of inter-trochanteric fractures of the femur with the dynamic hip screw (DHS) and proximal femur nailing fixation (PFN) by estimation of functional outcomes based on Boyd and Griffin classification.

MATERIALS AND METHODS

This cross-sectional prospective study of surgical management of inter-trochanteric fractures of the femur was conducted in the Department of Orthopedics, Mahatma Gandhi Memorial Hospital, Warangal. Institutional ethical committee permission was obtained for the study. Written consent was obtained from all the patients involved in the study. Inclusion criteria were fractures of traumatic etiology admitted to Mahatma Gandhi Memorial Hospital, Warangal from August 2016 to October 2018, patients of closed inter-trochanteric fractures of the femur in both males and females of age group > 20 years. All types of intertrochanteric fractures. Exclusion criteria were: All compound fractures of inter-trochanteric fractures of the femur, Pathological fractures and patients less than 20 years. Based on the inclusion and exclusion criteria a total of n=30 cases were identified during the study period from August 2016 to October 2018. Out of which n= 15 were treated by PFN fixation and n=15 were treated were treated with DHS method. As soon as the patient admitted, a detailed history was taken and meticulous examination of the patient was done. Patient's pelvis with both hips x-ray was taken in anterior-posterior view. The diagnosis was established by clinical and radiological examination. A standard procedure was adopted for the placement of Proximal Femoral Nail and Dynamic Hip screw. In cases where the satisfactory reduction was not possible by closed means, open reduction was done. For PFN patients Foot end elevation was done depending on blood pressure. Antibiotics were continued in the postoperative period. Analgesics were given as per patient's compliance. Blood transfusion was given depending on the requirement. Sutures removed on the 10th postoperative day. Patients were encouraged to sit in the bed after 24 hours after surgery. Patients were taught quadriceps setting exercises and knee mobilization in the immediate postoperative period. For DHS incision closed in layers drain left in situ. Intravenous fluid is given as needed. IV antibiotic is given for 3 days. Oral antibiotic continued for 10 days. Analgesic and tranquilizer were given according to the need of the patient. The operated lower limb is immobilized & kept elevated. Check x-ray was taken to study the alignment of the fracture fragment. Reduction in both AP-Internal rotation & lateral view checked and Neck-Shaft angle noted. The wound was inspected on the 2nd and 6th postoperative day. Suture removal was done on the 10th postoperative day depending on the condition of the wound. Follow up of cases in both categories was at 2, 4, 6 weeks, 3 months, 6 months, and 1 year after the surgery.

RESULTS

In our study, we had n=30 patients involved in intertrochanteric fractures of the femur. The maximum age is 92 years and minimum age is 39 years most of the patients are between 61-80 years n= 16 (53.33%) followed by 41- 60 years having n=11 (36.66%) of the patients given in Table-1. The total numbers of the male were n=16 (53.33%) and female were n=14 (46.66%). The mode of injury revealed 11 cases were due to Road Traffic Accidents (RTA) and trivial falls were found in n= 19 (63.33%) of the patients. In n=18 (60%) the right side was involved in the fractures and in n=12(40%) left side was involved in the fractures.

Table-1: Age distribution of cases involved in the study

Age group [Years]	Number of cases	Percentage
0-20	0	0
21-40	1	3.33
41-60	11	36.66
61-80	16	53.33
81-100	2	6.66
Total	30	100

In the present study the fractures were classified according to Boyd and Griffin classification [ref 3 classification of pdf] the type I fractures were found to be in n=5 cases (16.66%), type II were present in n=10 cases (33.33%), type III were in n=7 (23.33%), type IV were in n=8 cases (26.66%) shown in Table-2.

Table-2: Trochanteric fractures are classified according to Boyd and Griffin classification [6]

Type of fracture	Number of cases	Percentage
I	5	16.66
II	10	33.33
III	7	23.33
IV	8	26.66
Total	30	100

The overall complications in both DHS and PFN group were studied, a total of n=14 (46.65%) complications were seen during the operative procedures n=3 (10%) complications each was seen due to failure to get anatomical reduction, failure to put derotation screw, and Varus Angulation n=2 (6.66%) complication were due to fracture of lateral cortex during triple reaming and failure of distal locking n=1 complication was seen due to breakage of drill bit shown in Table-3.

Table-3: Overall intra-operative complications in both DHS and PFN groups

Complication	Number of cases	Percentage
Fracture of the lateral cortex during triple reaming	2	6.66
Fracture displacement by nail insertion	0	0
Failure to get an anatomical reduction	3	10
Jamming of nail	0	0
Failure to put derotation screw	3	10
Failure of distal locking	2	6.66
Breakage of the guide wire	0	0
Breakage of the drill bit	1	3.33
Varus angulation	3	10

The frequency of delayed complications was noted in DHS group delayed union, shortening of limb, Varus Malunion <100 and implant failure was found in 2 cases each accounting for 13.33% each and a total of n=8 (53.32%) of the patients and in DHS group. In the PFN group, there was one case each with delayed union, shortening, and varus malunion <100, therefore, a total of n=3 cases out of 15 (19.98%) shown in Table-5.

Table-5: Delayed Complications of treatment done in the study

Complication	In cases treated with DHS(out of 15)	Percentage	In cases treated with PFN(out of 15)	Percentage
Hip joint stiffness	0	0	0	0
Knee joint stiffness	0	0	0	0
Delayed union	2	13.33	1	6.66
Nonunion	0	0	0	0
Shortening	2	13.33	1	6.66
Varus malunion <100	2	13.33	1	6.66
Implant failure	2	13.33	0	0%
Total	8	53.32	3	19.98

In our study, the average duration of hospital stay was 19.33 days. All patients enjoyed a good range of hip and knee range of motion. Postoperative mobility was aided in the immediate postoperative period but later all patients were ambulatory independently with or without walker except in 2 patients who suffered implant failure of DHS. All patients were followed at 6 weeks, 6 months and some patients up to one year and further if necessary. Anatomical results were assessed by the presence or absence of deformities, shortening of hip and knee range of motions. In our study one patient had shortening >1cm, three patients had varus malunion <10 degrees Table-6.

Table-6: Functional Results of patients operated with DHS and PFN

Functional results	Number of cases of DHS	Percentage	Number of cases of PFN	Percentage
Excellent	4	26.67	6	40
Good	4	26.67	4	26.67
Fair	4	26.67	4	26.67
Poor	3	20	1	6.67
Total	15	100	15	100

DISCUSSION

The age of the patients in this study ranged from 32 to 86 years with an average of 65.5 years. This is in contrast to higher age groups as reported by western works of literature like Karl Lunsjö *et al*., [7] in their study average age around 80 years. However, our study results are comparable with other Indian studies [8]. In our study, there is a slight male predominance it is comparable to Lin- Siddhu *et al*., Study [9]. The treatments of fractures of the proximal femur are sometimes associated with some failures. The reasons could be the disregard for biomechanics, overestimation of the potentials of new surgical techniques or new implants or poor adherence to established procedures [10]. High-stress concentration is present in cases of femur fractures, and is subjected to multiple deforming forces, results in slow healing time because of the predominance of cortical bone, decreased vascularity, high incidence of complications reported after surgical treatment compels the surgeon to give a second thought regarding the selection of the proper implant [11]. The most common current modes of fixation are Blade plate systems, Sliding hip screw systems and Intramedullary devices. From the mechanical point of view, a combined intramedullary device inserted by means of minimally invasive procedure seems to yield better results in elderly patients [12]. Closed reduction preserves the fracture hematoma, an essential element in the consolidation process [13]. Intramedullary fixation allows the surgeon to minimize soft tissue dissection thereby reducing surgical trauma, blood loss, infection and wound complications [14]. Amongst the various types of intramedullary and extramedullary implants available, the Dynamic Hip Screw (DHS) is most commonly used and still remains the Gold Standard for Stable intertrochanteric fractures. However, according to the study by Saarenpaa *et al*., 34, Sliding Hip Screws used in the treatment of Unstable trochanteric fractures have a very high failure rate with a reoperation rate of 8.2 % which is unacceptable in the present day scenario. PFN is a novel, modern intramedullary implant based on experience with the gamma nail [13]. The currently used gamma nail as an intramedullary device also has a high learning curve with technical and mechanical failure rates of about 10% [6]. The gamma nail is susceptible to fail at its weakest point, the lag screw-implant interface. The Arbeitsgemeinschaft für osteosynthesefragen (AO ASIF) in 1996, therefore, developed the proximal femoral nail with an anti-rotational hip pin together with a smaller distal shaft diameter which reduces stress concentration to avoid these failures. Proximal femoral nail has all advantages of an intramedullary device, such as decreasing the moment arm, can be inserted by closed technique, which retains the fracture hematoma an important consideration in fracture healing, decrease blood loss, infection, minimizes soft tissue dissection and wound complications [15]. Comparing the loadability of osteosynthesis of unstable per and subtrochanteric fractures and found that the PFN could bear the highest loads of all device [16]. In our study, the overall mean Harris Hip Score was 78.4. This was comparable with several other similar international studies such as those by Butt MS *et al.*, [17] Overall, 10 patients (33.3%) had Excellent, 8 patients (26.66%) had Good 8 patients (26.6%) had Fair and another 4(13.3%) patients had poor scores according to the Harris Hip Scoring system. In our study total 15 unstable (type 3 & 4) fractures taken among them 10 operated with PFN and 5 with DHS. We got 3 excellent, 3 good, 3 fair,1 poor results with PFN according to Harris hip score with DHS we got 1 good, 2 fair, 2 poor results. Mean Harris Hip Score in cases treated with PFN was 85.4 and with DHS it is 71.4. As Bakshi *et al*., [18] comparing the fractures treated with DHS and PFN found that Proximal Femoral nail gives better results in intertrochanteric fractures in terms of Amount of blood loss during surgery, Early mobilization, duration of surgery. We in the present study also found PFN performed better in as far as the intraoperative complications are concerned and postoperative functional scores were also found to be better in the PFN group.

CONCLUSION

Within the limitations of the present study it can be concluded that PFN and DHS have similar outcomes for stable intertrochanteric fractures but in cases of unstable intertrochanteric fractures, PFN may be considered the best option. PFN generally has the advantage of being useful in weak osteoporotic patients and is biomechanically sound as it is done by closed technique, fracture opened only when closed reduction could not be achieved and it is an intramedullary device. Another advantage of this device is it prevents excess collapse at fracture site thus maintaining neck length.

Conflict of Interest: None

Source of support: Nil

Ethical Permission: Obtained

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