

THE COMPARATIVE STUDY BETWEEN THE DYNAMIC HIP SCREW AND THE PROXIMAL FEMORAL NAIL IN THE TREATMENT OF INTERTROCHANTERIC FRACTURE

Dr Mahesh Kumar Navadaya¹, Dr Bhavesh Kumar Prajapati², Dr Abhishek Singh bhadauriya³, Dr Rajesh Kumar Arya⁴

1. Dr. Mahesh Kumar Navadaya, Assistant Professor, Department of Orthopaedics, MLB Medical College, Jhansi, Uttar Pradesh, India
2. Dr. Bhavesh Kumar Prajapati, Senior Resident, Department of Orthopaedics, MLB Medical College Jhansi, Uttar Pradesh, India, dr.bkp91@gmail.com
3. Dr. Abhishek Singh Bhadauriya, Senior Resident, Department of Orthopaedics, MLB Medical College, Jhansi, Uttar Pradesh, India, abhishekbhadauriaofficial@gmail.com
4. Dr. Rajesh Kumar Arya, Associate Professor, Department of General Medicine, ASMC, Lalitpur, Uttar Pradesh, India, rajarya@gmail.com

Corresponding Author

Dr. Abhishek Singh Bhadauriya, Senior Resident, Department of Orthopaedics, MLB Medical College Jhansi, Uttar Pradesh, India, abhishekbhadauriaofficial@gmail.com

Abstract

Introduction: As the elderly population grows, the number of hip fractures continues to increase. **Aim and Objective:** To compare the clinical outcomes of DHS and PFN in the fixation of intertrochanteric fractures of the femur. **Material and Method:** A comparative study was conducted in the Department of Orthopaedics, MLB Medical College, Jhansi, Uttar Pradesh. 90 inter-trochanteric hip fractures were surgically treated between January 2023 and January 2024 at our institution. **Result:** A total of 50 patients were included in the study. The mean age in Group DHS was 63 and in Group PFN was 64. In the group of DHS, 13 out of 25 patients were male, and 12 out of 25 patients were female. In a group of PFN, 14 out of 25 patients were male and 11 out of 25 patients were female. The mean six-week score in Group DHS was 34.38 ± 3.27 out of 50, and in Group PFN it was 32.64 ± 2.99 out of 50. The mean Harris hip score in Group DHS was 90.68 ± 5.22 out of 50. The mean Harris hip score in Group PFN was 93.68 ± 3.76 out of 50. In Group DHS, 56% had injuries on the left side and 44% on the right side. In Group PFN, 20% had injuries on the left side and 80% on the right side. In Group DHS, results were excellent in 36% (9 patients), good in 44% (10 patients), fair in 16% (four patients out of 23 patients), and poor in 4% (one patient). In Group PFN, results were excellent in 48 (12 patients), good in 40% (10 patients), and fair in 12% (3 patients). **Conclusion:** From the study, it can be

concluded that PFN had a better outcome in intertrochanteric fractures compared to DHS. The highest percentage of subjects in the PFN group had excellent to good outcomes, and none of them had poor outcomes when compared to the DHS group.

Keywords: complications, dynamic hip screw, intertrochanteric fracture

Introduction

Intertrochanteric fractures are very common in the old age group but infrequent in the younger age group. In intertrochanteric fractures treated conservatively that healed with a vicious callus, coxa-vara deformity is frequently observed, resulting in lower limb shortening and limb flaccidity [1]. Multiple surgical procedures with multiple different implants have been described in the literature and used for the treatment of intertrochanteric fractures. Little possible attention has been paid to these kinds of fractures in the past because they arise from porous bone with an excellent and rich blood supply and can heal without active intervention. Conservative treatment, however, resulted in a vicious callus with varus, external rotation with shortening, resulting in the short, limp gait of walking, and a high mortality rate due to the complications when lying down and prolonged immobilization. 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 bones and are more likely to fall due to poorer balance, medication side effects, and difficulty maneuvering around environmental hazards. 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 the age of 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 [3]. 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 two of the most successful fixation devices employed in stabilizing these fractures [4]. These implants provide secure fixation and controlled impaction of the fracture with a lower rate of complications. Using DHS and PFN, excellent results have been achieved, with the majority of patients having simple intertrochanteric fractures. However, there remained many unsolved problems with the acceptability of these implants in unstable intertrochanteric fractures. Failure rates are higher, up to 8% to

25%, with unstable fracture patterns [5] and as high as 50% in most unstable fractures [6]. The main aim of this proposed study was to compare the functional outcomes of two available fixation devices for intertrochanteric fracture and determine if any device can have an advantage over the other in terms of the patient's ultimate functional outcome using Harris hip scoring.

Method and Material

Study design

We designed a prospective study at the Department of Orthopedics, MLB Medical College, Jhansi, Uttar Pradesh. We included patients who were aged 21 years or more and had closed intertrochanteric fractures with other joints of the lower limbs in a 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 an 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 the 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 obtained from all patients. All patients were explained the perceived advantages of proximal femoral nailing and the additional cost of the implant. Stable patients were taken up for surgery at the earliest possible time after the pre-anesthesia evaluation. Mobilization of patients was started on or after the second postoperative day, depending on the pain and general condition of the patient. Exercises in the form of static quadriceps and knee bending were started. Intravenous antibiotics were administered for 72 hours post-surgery, and oral antibiotics were continued until 3 days post-surgery.

Patients were sent home after suture removal. Patients were followed up in the outpatients department monthly for up to six months, then three monthly. On every visit, the 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 the union. Partial weight-bearing walking with a walker was started (toe-touch walking) once the 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 had occurred.

During the course of treatment, clinical information about the patient regarding age, gender, mode of injury, previous medical history, amount of blood loss, and complications was collected. We classified the patients according to Boyd and Griffin classification and AO classification [7–8]. AO classification categorizes injuries according to their location and severity. After the start of the rehabilitative process, the appearance of late complications, information regarding physiotherapy, and the overall clinical outcome using the Modified Hip Score were noted for each patient [9]. This score rates the clinical outcome in terms of pain, gait, and functional activities. . The HHS score gives a maximum of 100 points. Pain receives 44 points, function 47 points, range of motion 5 points, and deformity 4 points. A function is subdivided into activities of daily living (14 points) and gait (33 points). The higher the HHS, the less dysfunction. A total score of <70 is considered a poor result; 70–80 is considered fair, 80–90 is good, and 90–100 is excellent.

Statistics

Data were entered into a Microsoft Excel datasheet and analyzed using SPSS 16 version software. Categorical data was represented in the form of frequencies and proportions. The Chi-square test was used as a test of significance for qualitative data. Continuous data were represented as the mean and standard deviation. An independent t-test was used as a test of significance to identify the mean difference between two quantitative variables and two qualitative variables, respectively. A P-value (probability that the result is true) of <0.05 was considered statistically significant after assuming all the rules of statistical tests.

Observation and Results

Table-1: Sociodemographic data

Characteristics	DHS group		PFN group		
	N(25)	%	N(25)	%	
Mean age	63		64		
Gender	male	13	52	14	56
	Female	12	48	11	44
Side	Left	14	56	10	40
	Right	11	44	15	60
Mode of injury	RTA	1	4	5	20
	Self-fall	6	24	20	80

	Others	18	72		
Boyd and Griffin classification	Type-1	5	20	10	40
	Type-2	12	48	8	32
	Type-3	2	8	5	20
	Type-4	6	24	2	8

There was no significant difference in gender distribution between the two groups (Table 1). There was a significant difference in the mode of injury distribution between the two groups (Table 1). There was not a significant difference in the Boyd and Griffin classification distribution between the two groups (Table 1).

Table 2: Mean score comparison between the DHS and PFN groups at the six-, 12-, and 24-week follow-up

weeks	DHS (Mean±SD)	PFN (Mean±SD)	P-value
6 weeks	33.88±3.27	32.64±2.99	0.168
12 weeks	54.64±6.77	61.92±4.65	0.000047
24 weeks	90.68±5.23	93.68±3.76	0.024

The mean six-week score in Group DHS was 33.88 ± 3.27 out of 25 and in Group PFN was 32.64 ± 2.99 out of 25. There was not much of a significant difference in the mean six-week comparison between the two groups. The mean 12-week score in Group DHS was 54.64 ± 6.77 out of 25 and in Group PFN was 61.92 ± 4.65 out of 25. There was a significant difference in the mean 12-week comparison between the two groups. The mean 24-week score in Group DHS was 68 ± 5.23 out of 25 and in Group PFN was 93.68 ± 3.76 out of 25. There was a significant difference in the mean 24-week comparison between the two groups (Table 2). The mean HHS in Group DHS was 90.68 ± 5.23 out of 25. The mean HHS in Group PFN was 93.68 ± 3.76 out of 25. There was a significant difference in the mean HHS (50) comparison between the two groups (Table 2).

Table 3: Functional outcome distribution between the DHS and PFN groups

Result	DHS group		PFN group	
	N(25)	%	N(25)	%
Excellent	9	36	12	48
Good	11	44	10	40
Fair	4	16	3	12
Poor	1	4		

In Group DHS, results were excellent in 36% (nine patients out of 25 patients), good in 44% (11 patients out of 25 patients), fair in 16% (four patients out of 25 patients), and poor in 4% (one patient out of 25 patients). In Group PFN, results were excellent in 48% (12 patients out of 25 patients), good in 40% (eight patients out of 25 patients), and fair in 12% (two patients out of 25 patients). There was not a significant difference in the results distribution between the two groups (Table 3). Functional outcome is interpreted based on HHS at the end of 24 weeks: <70 = poor result; 70–80 = fair; 80–90 = good; and 90–100 = excellent.

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, they may occur in younger age groups due to a fall from a height or a motor vehicle collision [10]. Ambulatory patients should be treated aggressively, usually with surgical intervention, with the goal of restoring their level of activity to an 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 and bed rest. Making matters worse were the lost wages, dependency on quality nursing care, and psychosocial impact on the patient. Moreover, patients sustaining intertrochanteric fractures are typically elderly and more susceptible to the above-mentioned complications.

In the present study, there was no significant difference in gender distribution between the two groups (Table 1). There was a significant difference in the mode of injury distribution between the two groups (Table 1). There was not a significant difference in the Boyd and Griffin classification distribution between the two groups (Table 1).

The mean six-week score in Group DHS was 33.88 ± 3.27 out of 25 and in Group PFN was 32.64 ± 2.99 out of 25. There was not much of a significant difference in the mean six-week comparison between the two groups. The mean 12-week score in Group DHS was 54.64 ± 6.77 out of 25 and in Group PFN was 61.92 ± 4.65 out of 25. There was a significant difference in the mean 12-week comparison between the two groups. The mean 24-week score in Group DHS was 68 ± 5.23 out of 25 and in Group PFN was 93.68 ± 3.76 out of 25. There was a significant difference in the mean 24-week comparison between the two groups (Table 2). The mean HHS in Group DHS was 90.68 ± 5.23 out of 25. The mean HHS in Group PFN was 93.68 ± 3.76 out of 25. There was a significant difference in the mean HHS (50) comparison between the two groups (Table 2).

In Group DHS, results were excellent in 36% (nine patients out of 25 patients), good in 44% (11 patients out of 25 patients), fair in 16% (four patients out of 25 patients), and poor in 4% (one patient out of 25 patients). In Group PFN, results were excellent in 48% (12 patients out of 25 patients), good in 40% (eight patients out of 25 patients), and fair in 12% (two patients out of 25 patients). There was not a significant difference in the results distribution between the two groups (Table 3).

In a similar study, the range of movements, namely flexion, extension, and external and internal rotation, was good in most cases and excellent in a few. Very few had fair results. The fair result was attributed to other associated factors, namely a long interval between trauma and surgery and the development of postoperative infection. Kushal et al. [11] in the study of 52 patients noted that in the DHS group, excellent results were seen in six (23%), good results seen in five (19%), fair results seen in 13 (50%), and poor results seen in two (8%). In the PFN group, excellent results were seen in four (15%), good results were seen in 14 (54%), fair results were seen in seven (27%), and poor results were seen in one (4%). Harish et al. [12] in the study of 30 patients noted that in the DHS group, excellent results were seen in six (50%), good results were seen in two (13.33%), fair results were seen in two (13.33%), and no poor results were seen. In the PFN group, excellent results were seen in eight (72.73%), good results were seen in one (9.1%), fair results were seen in one (9.1%), and no poor results were seen. Gill et al. [13], in their comparative study of 80 patients using the Locking DHS and PFN, noted that in the DHS group, excellent results were seen in six (15%), good results were seen in 14 (35.0%), fair results were seen in 12 (30.0%), and poor results were seen in eight (20.0%). In the PFN group, excellent results were seen in eight (20.0%), good results were seen in 130 (75.0%), fair results were seen in two (5.0%), and no poor results were seen.

In the present study in both groups, two cases of superficial surgical site infection in the DHS group might have been because of the longer incision exposure to open pathogens during surgery. Shakeel et al. [14] and Gill et al. [13] noted a high incidence of superficial infection in the DHS group, which they attributed to the longer incision associated with DHS. This is similar to the findings of our study. A

limb length discrepancy of 1-2 cm was noted in three patients (two patients in the DHS group and one patient in the PFN group), which is also similar to the study conducted by Amandeep et al. [15].

Conclusions

The functional outcome derived from the Harris Hip Score, it can be concluded that PFN had a better outcome in intertrochanteric fractures compared to DHS fixation. This was concluded based on the final outcome, range of movements, and HHS. The highest percentage of subjects in the PFN group had excellent to good outcomes, and none of them had poor outcomes when compared to the DHS group. The PFN group had higher HHS scores at 12 weeks, 24 weeks, and at the end of follow-up. PFN has a faster recovery and better functional outcome in all types of intertrochanteric fractures with fewer

Reference

1. 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 randomized study comparing post-operative rehabilitation. *J Bone Joint Surg Br.* 2005, 87:76–81.
2. Kannus P, Parkkari J, Sievänen H, Heinonen A, Vuori I, and Järvinen M. Epidemiology of hip fractures. *Bone.* 1996;18(1):S57–63.
3. Waters PM, Millis MB. Hip and pelvic injuries in the young athlete. *Clinics in Sports Medicine.* 1988;7(3): 513-26.
4. Radford P., Needoff M., and Webb JK. A prospective randomized comparison of the dynamic hip screw and the gamma locking nail. *Bone & Joint Journal.* 1993; 75 (5): 789–93.
5. Bogosavljević M, Stokić D, Friščić Ž, Ristić BM. Unstable intertrochanteric fractures: how to prevent uncontrolled impaction and shortening of the femur. *Vojnosanitetski pregled.* 2011;68(5):399–404.
6. Streubel PN, Moustoukas MJ, and Obremskey WT. Mechanical failure after locking plate fixation of unstable intertrochanteric femur fractures. *Journal of orthopaedic trauma.* 2013;27(1):22–8.
7. Boyd HB, Griffin LL. Classification and treatment of trochanteric fractures. *Archives of Surgery.* 1949;58(6):853-66.
8. Broos PL, Bisschop AP. Operative treatment of ankle fractures in adults: correlation between types of fracture and final results. *Injury.* 1991;22(5):403-6.
9. Modified Hip Score. Available at: <http://www.losangelessportssurgeon.com/pdf/modified-harris-hip-score.pdf> Accessed February 15, 2017.
10. Friedman RJ, Wyman Jr. ET. Ipsilateral hip and femoral shaft fractures. *Clinical orthopaedics and related research.* 1986;208:188–94.

11. Parikh KN, Parmar C, Patel M, et al.: Functional and radiological outcome of proximal femoral nailing versus dynamic hip screw in unstable intertrochanteric femur fractures. *Int J Res Orthop*. 2018, 4:10–18203.
12. Harish K, Paleti ST, and Kumar RN: A comparative study between DHS and PFN for the treatment of IT fractures. *Nat J Clin Orthop*. 2019, 3:01–7.
13. Gill SPS, Mittal A, Raj M, Singh P, Kumar S, Kumar D: Dynamic hip screw with locked plate VRS proximal femoral nail for the management of intertrochanteric fracture: a comparative study. *Int J Orthop Sci*. 2017, 3:173–80.
14. Qidwai SA, Singh R, Mishra AN, et al.: Comparative study of functional outcome of the intertrochanteric fracture of the femur managed by a dynamic hip screw and proximal femoral nail. *Nat J Clin Orthop*. 2019, 3:26–30.
15. Bakshi AS, Kumar P, and Brar BS: Comparative study between DHS and PFN in intertrochanteric fractures, *Int J Orthop Sci*. 2018, 4:259–62.
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