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Comparison of Clinical Outcomes of Dynamic Hip Screw and Proximal Femoral Nailing for Operative Treatment of Intertrochanteric Femur Fractures

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ABSTRACT

Background and Aim: Intertrochanteric fracture is one of the most common cases that orthopedic surgeons are interfered during practice .Mortality and morbidity of the fracture is high because of multiple underlying factors. The quality and results of the fixation of the fracture has been not satisfactory progressed despite advances in methods and equipment.

Method: This study has been performed during April 2015 to April 2017. The participant's fractures were type one and two intertrochanteric fracture referred to Emam Hossein Hospital in Tehran, Iran. The patients were divided into two PFN and DHS groups randomly then followed one year and finally compared with each variable that included in our study.

Result: In our study, 200 subjects were divided into two groups. There was no difference between two groups in regard to functional outcome and intra and postoperative complications.

Conclusion: There is no clear superiority in terms of functional outcome and complications in treatment of type one and two intertrochanteric fracture between dynamic hip screw (DHS) and proximal femoral nailing. Therefore, it is recommended decisions making is better based on device cost, availability and surgeon experience.

KEYWORDS

Femoral Intertrochanteric Fracture, Dynamic Hip Screw, Proximal Femoral Nailing.

Introduction

Intertrochanteric fractures is one of the most common hip fractures that occur especially in the elderly persons with osteoporosis and usually occurs with the slightest impact such as a simple fall [1, 2]. The incidence of intertrochanteric femoral fractures has increased significantly in recent decades, due to the increase in the elderly population and the increasing incidence of osteoporosis [2, 3]. The incidence of this fracture varies from country to country. Gulberg et al. predicted that the total number of hip fractures will reach 2.6 million by 2025 and 4.5 million by 2050 [4].

The underlying cause of intertrochanteric fractures are combination of increased bone fragility and weakened lower limb tonicity of the muscles and other aging-related processes. [5, 6]. Currently, the common treatment for intertrochanteric fractures is surgical intervention [7]. Although non-surgical treatments have an acceptable improvement, they have become obsolete due to prolonged immobility [8]. Various stabilization tools are used for aiming stable anatomic fixation, which allows early mobilization [9].

In general, treatment methods for intertrochanteric fractures include intra-medullary and extra-medullary methods [10]. The dynamic hip screw (DHS) is the gold standard as an extra-

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medullary device [11]. This procedure usually be considered for fractures that occur outside the hip capsule (extra-capsular), often stable fractures [12] However, dynamic hip screw (DHS) does not have the required clinical efficacy in some types of intertrochanteric fractures [13]. Proximal femoral nailing (PFN) is another method of fixation that provides good stability and less cut off complication but has some disadvantages such as high risk of malunion and re-fracture [14, 15]. In addition, intramedullary implants had different results in treatment of sub-trochanteric and intertrochanteric fractures based on previous studies [16, 17]. Therefore, it is not possible to determine the superior method in the treatment of intertrochanteric fractures according to previous findings.

These retrospective study was designed to compare intra and postoperative complication and functional outcome the DHS and PFN in type one and two of intertrochanteric femoral fractures.

Methodology

This retrospective study was designed in Imam Hossein Hospital in Tehran, Iran in the period of April 2015 to April 2017. Inclusion criteria were all patients with non-pathological traumatic intertrochanteric type 1 and 2 fracture based on Boyd and Griffin classification. Exclusion criteria were age over 85 or less than 55 years, any other type of hip fractures, history of coagulation disorders, anticoagulant drugs consumption, patients with multiple traumas and multiple fractures. 200 patients were included and randomly divided into equal PFN and DHS groups by computer. All patient data were extracted from data base of orthopedic and radiologic ward. The variables including "age, sex, mortality rate, hemoglobin depletion (g/dl), intraoperative blood loss, union, operation time, infection, periprosthetic fracture, device failure" and Harris hip score were investigated in two groups.

Data Analysis

After collecting and analyzing the data, the data were entered into SPSS software v.16 and while providing descriptive statistics for the studied variables, chi-square, t-test and logistic regression were used to analyze the data. Significance level was considered to be less than 0.05.

Results

In this study, 200 patients with intertrochanteric fractures were fixed by DHS or IMN were divided into equal two groups.

The mean age +- SD of the patients in the PFN group was 71.82 +- 8.7 and 70.48 +- 9.2 in the DHS group (Table 1).

There was no significant difference in age between the two study groups (p Value = 0.24).

Most patients in PFN group (56 patients) and DHS (57 patients) were male and so there was no significant difference in gender between the two groups (p Value = 0.431) (Table 2).

Table 1. Mean age in the two groups

Type of surgery	Number	Mean age	Minimum	Maximum	P-value
Dynamic hip screw (DHS)	100	70,48	55	85	
Intramedullary nail (PFN)	100	71,82	55	85	0.24
Total	200	71,15	55	85	

Table 2. Gender distribution in the two study groups

Type of surgery	Male	Female	Total	P-value
Dynamic hip screw (DHS)	56	44	100	
Intramedullary nail (PFN)	57	43	100	0.431
Total	113	87	200	

Three deaths were reported between two to four weeks after discharge in the PFN group. They were one males and two females. Main cause of death was cardiac problem. There weren't postoperative complications in these patients. There was no mortality rate difference between the two groups based on statistical analysis (p Value = 0.191) (Table

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3).

Table 3. Mortality rate in the two study groups

Type of surgery	Sample number	Mortality rate	Percentage (%)	P-value
Dynamic hip screw (DHS)	100	0	0%	
Intramedullary nail (PFN)	100	3	3%	0.832
Total	200	3	1.5%	

The mean hemoglobin depletion in DHS and PFN groups was 2.415 +-0.4 g/dl and 2.377 +-0.4 g/dl, respectively (Table 4). The average intraoperative blood loss based on mop collection and blood in suction bottle were 123 +- 23 ml in DHS group and 120 +- 25 ml in PFN group. There wasn't significant difference between the two groups in respect to blood loss (p Value = 0.378) (table 5).

Table 4. Hemoglobin depletion in the two study groups

Type of surgery	Sample number	Mean (g/dL)	Minimum (g/dL)	Maximum (g/dL)	P-value
Dynamic hip screw (DH	100	2,415	0,1	5,3	
Intramedullary nail (PFN)	100	2,377	0,1	6,9	0.448
Total	200	2,390	0,1	6,9	

Table 5. Blood loss in the two study groups

Type of surgery	Sample number	Mean (cc)	Minimum (cc)	Maximum (cc)	P-value
Dynamic hip screw (DHS)	100	123	85	210	
Intramedullary nail (PFN)	100	120	95	200	0.378
Total	200	121.5	85	210	

The average operative time from skin incision to wound closure was 58.7 +- 12 min and 60.4 +-15 in PFN and DHS groups respectively, there wasn't significant difference between the two groups in respect operative time (p Value = 0.299) (table 6).

Table 6. Operative time in the two study groups

Type of surgery	Sample number	Mean (min)	Minimum (min)	Maximum (min)	P-value
Dynamic hip screw (DHS)	100	60.4	45	85	
Intramedullary nail (PFN)	100	58.7	40	80	0.299
Total	200	59.55	40	85	

Only three patients in DHS group were complicated with mild to moderate wound drainage between 5 to 9 days postoperation. All of them were treated by intravenous antibiotic and local debridement without need of device removal. (table7).

Table 7. Wound drainage in the two study groups

Type of surgery	Sample number	Wound drainage rate	Percentage (%)	P-value
Dynamic hip screw (DHS)	100	0	3%	
Intramedullary nail (PFN)	100	3	0%	0.832
Total	200	3	1.5%	

Six nail cut off were observed in the DHS group and 8 in the PFN group based on postoperative follow up at six-month and one-year intervals. All of them were candidate for joint arthroplasty.

Three cases of periprosthetic fractures distal to nail were observed in the PFN group after complete union due to recurrent falling while no fracture was seen in the DHS group.

The union rate of fractures in PFN and DHS groups were 86% and 87%, respectively. There was no significant difference between the two groups in respect of nail cut off periprosthetic fractures and union rate. (p Value = 0.251) (Table 8).

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Table 8. Radiographic findings in the two study groups

Type of surgery	Sample number	Number of unions (%)	Number of per prosthetic fractures (%)	Number of device failures (%)	P-value
Dynamic hip screw (DHS)	100	87) 87(%	0)0(%	6)6(%	
Intramedullary nail (PFN)	100	86)86(%	3)3(%	8)8(%	0.251
Total	200	173)86.5(%	3)1.5(%	14)7(%	

Functional Harris hip score was assessed at month of three, six and twelve. (Table 9).

The mean score were 41.35 +- 4.2, 81.56 +- 5.1, and 91.23 +- 6.7 in PFN group at month of three, six and twelve respectively.

The mean score in DHS group at month of three, six and twelve were 42.12 +- 3.1, 80.57 +- 4.4 and 90.78 +- 6.8 respectively.

Based on above results Harris hip score was same in two groups. (Table 9).

Table 9. Harris score in the two study groups

Hariss score	Dynamic hip screw (DHS)	Intramedullary nail (PFN)	P-value
Hariss score month three	42.12	41.35	0.141
Hariss score month six	80.57	81.56	0.143
Hariss score month twelve	90.78	91.23	0.637

Discussion

The main finding of this retrospective study was the same intra and postoperative result in fixation by DHS and PFN in type one and two of intertrochanteric fractures.

Intertrochanteric hip fractures make up about half of all hip fractures in the elderly. Among these fractures, 50 to 60% are classified as unstable [18, 19]. Unstable intertrochanteric fractures often occur with increasing age and low bone mineral density and are associated with a high rate of complications [20]. In the last few decades, the treatment of intertrochanteric fractures has evolved significantly. Various methods of fixation tools have come and gone that these treatments have been used depending on the type of fracture and bone quality [11].

In 2017, Mario Ronga et al. conducted a multivariate analysis study. They showed in type A1 intertrochanteric fractures, the dynamic hip screw (DHS) group lost significantly less blood than the Gama Nail group (IMN). DHS was recomended in the treatment of patients with type A1 intertrochanteric fracture [21]. The result of this study is not consistent with our study, but it should be noted that this study examined only one type of intertrochanteric fracture and this can be an effective factor in the rate of bleeding.

Xianshang Zeng et al. [22] reported that in osteoporotic patients with type 31-A1 intertrochanteric fractures, Gamma Nail implantation was associated with fewer radiological complications in compare to DHS. Rudolf Reindl et al. reported that patients who were underwent intramedullary nail implantation had better radiological results, but there was no functional outcome difference between the two groups [23]. In a 2013 study by Xiao Huang et al. during a meta-analysis, they showed that PFN (Proximal Femoral Nailing) and dynamic hip screw (DHS) are equally effective in treating patients with intertrochanteric fractures and given the advances that are taking place in the field of these devices, they recommended further studies to better compare the two methods [24].

Saarenpaa et al., in the study of the therapeutic effects of Gamma Nail and DHS, stated that in Gamma Nail group, the need for open reduction and the difficulty of closed reduction, as well as the need for auxiliary fixation in type 2C fracture (based on Seinsheimer classification) was more. In the DHS group, most failures were observed in the 3A group. Therefore, based on the results of their study, the type of fracture was very important in determining the appropriate tools for stabilization. In other words, despite the problems and drawbacks of Gamma Nail over DHS,

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this device was preferred to DHS in type 3A fracture [25].

In a study on comparing the results of treatment of reverse-obliquity intertrochanteric fractures with intermodular hip screw (IMHS) and DHS, after 12 months of follow-up, Matre et al. showed that the need for reoperation was significantly higher in the DHS group. Also, in their study, there were differences in terms of quality of life and pain and the ability to move in favor of IMHS [26].

Given the cases from the mentioned studies, it seems that there is no single result to prove the superiority of one device in treatment of intertrochanteric fractures.

The objective of our study was to compare PFN and DHS in patients with type one and two intertrochanteric hip fracture. The results of our study showed that there was no significant difference between the two groups in respect of the complications or benefits. According to this study, DHS and PFN groups were not significantly different in terms of age and sex distribution without confounding effect.

So it is recommended in treatment of type one and two intertrochanteric fractures the device selection is better to be based on availability, surgeon experience and cost of implant.

Due to the limitations such as distortion of patients' information, lack of follow-up by patients, etc., it is recommended that a comprehensive database be established to record patient information at the time of hospitalization as well as subsequent follow-ups so these cases can be investigated more thoroughly.

Conclusion

There is no clear superiority in terms of functional outcome and complications in treatment of type one and two intertrochanteric fracture between dynamic hip screw (DHS) and Proximal femoral nailing. Therefore, it is recommended decisions making is better based on device cost, availability and surgeon experience.

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Conflict of Interest

The authors hereby state that there is no conflict of interest in the present research.

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