

Review Article

THE COMPARISON OF FIXATION AND CUT-OUT OF PROXIMAL INTRAMEDULLARY NAIL AND DYNAMIC HIP SCREW THERAPY IN THE TREATMENT OF STABLE INTERTROCHANTERIC FRACTURES OF THE FEMUR: A RETROSPECTIVE STUDY

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Abstract

Introduction: Intertrochanteric fractures, among the osteoporotic fractures, have higher mortality and important complications, and are more prevalent among the elderly. There are several methods for fixing these fractures that have different advantages and disadvantages. The purpose of this study was to compare the proximal intramedullary nail (PIN) and dynamic hip screw (DHS) treatments.

Material and Methods: This retrospective study, investigated the cases of 300 between 2015 and 2018 patients who complained of intertrochanteric fracture were referred to Kowsar Medical Center clinic of Semnan, Iran or admitted to orthopedic section of this center have been treated either PIN or DHS method. Patients were divided into two groups of 150 and after examining the age and sex of the patients, the rate of cut-out and fixation was compared between the two groups.

Results: The mean age of the patients was 64±0.8 years in the PIN group and 63±1.1 years in the DHS group, respectively. The rate of cut-out and implant fixation in this study were 2% and 98% in patients treated with PIN and 6.66% and 93.4% in patients treated with DHS, respectively. As well as in terms of gender in implant cut-out in PIN and DHS group 66.66% and 70% of them were women, 33.33% and 30% men, respectively.

Conclusion: According to the results of this study, proximal intramedullary nail treatment in comparison to dynamic hip screw treatment, in the treatment of intertrochanteric fractures, has more fixation and less cut-out.

Keywords: Intertrochanteric Fractures, Dynamic Hip Screw, Proximal Intramedullary Nail, Bone Plates, Femur.

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INTRODUCTION

The femur, as the longest bone in the body, has an important role in transferring body weight and moving it. Its proximal part, especially the intertrochanteric region, always is exposed to severe physical stress (1). Intertrochanteric fractures occur along the line between the large and small trochanters, and if for any reason the density and bone density of this part of the femur decrease, it can cause pathological fractures due to minor trauma. The intertrochanteric region of the femur has a large amount of blood supply, which distinguishes the fractures of this region from the femoral neck in terms of the extent of fixation and bone necrosis (2, 3). It is estimated that by 2050 the number of femoral fractures including the cervical and intertrochanteric segment will exceed 3.6 million (4). It has also been indicated that the outbreak of this fracture is directly related to age, at the age of 80 years, its incidence is five times higher in women and 8

times in men. As 20 to 30 percent of patients with intertrochanteric fractures, especially the elderly and who without dynamic activity, died within the first 12 months (5, 6).

In recent years, much advances have been made in the treatment of proximal femur fractures, both in surgical techniques and in fracture fixation devices. However, even after surgical treatment and fracture fixation, the percentage of patients returning to previous function is less than expected and their mortality rate is above normal (7, 8). In recent years, there has been a new change in the priority of young orthopedic surgeons regarding the means used to treat intertrochanteric fractures (9). A large number of different implants can be used to fix fractures, and their therapeutic purposes include rapid movement of the injured organ by firm fixing using a method with minimal invasion (10).

Generally, the goal of any intertrochanteric fracture is to restore early mobility to reduce the risk of medical complications and also restore the patient to its preoperative status. DHS is currently considered as a standard tool for comparing results, especially for stable intertrochanteric fractures (11). The PIN that introduced by the AO / ASIF group in 1998 has gained widespread popularity in the treatment of trochanteric fractures in recent years. The advantage of PIN fixation is that it reduces the biomechanical structure by reducing the distance between the hip joint and the implant (12, 13). Until now, most studies have evaluated the outcomes of PIN in unstable fractures and compared them with DHS in stable intertrochanteric fractures. On the other hand, studies comparing the two methods have different results, that way some studies highlighting the superiority of the PIN method (11, 14) and others reporting no difference between the two methods and finding both methods to be effective (15, 16). The purpose of this study was to compare the two methods of PIN and DHS fixation on the rate of cut-out and fixation in patients with intertrochanteric fractures.

MATERIAL AND METHODS

This retrospective study, investigated the cases of 300 between 2015 and 2018 patients who complained of intertrochanteric fracture were referred to Kowsar Medical Center clinic of Semnan, Iran.

Inclusion criteria were all patients referring with an intertrochanteric fracture complaint to the orthopedic clinic of Kowsar Medical Center in Semnan, Iran or patients with the same

complaint in the orthopedic section of this center who were treated by either PIN or DHS.

Exclusion criteria were age over 65 years old people, who taking chemotherapy or corticosteroids drugs, any type of malignancy, rheumatic diseases or pathologic fractures.

According to this, 300 patient cases were reviewed, of which 150 were treated with PIN and 150 were treated with DHS (plate). Then, demographic information including age, sex as well as treatment method, percentage of cut-out and fixation were evaluated during the 6-month study.

Also, in this study, patient's names were not recorded for ethical considerations. In all level of this study, the principle of confidentiality was respected, and patients' information was used only to evaluate the results of the two above treatments.

Statistic analysis

In this study, the collected data were coded and entered into SPSS 22 software. For the quantitative variable normal mean and standard deviation and qualitative variable (frequency or percentage), used descriptive statistics.

RESULTS

In this study, the records of 300 patients in both groups were examined by PIN (nail) (DHL) and DHS (DHL) plate treatment (Figure 2). Based on the results of this study, the mean age of patients was 64 ± 0.8 years and 63 ± 1.1 years in the PIN-treated group and in the DHS-treated group, respectively.



Figure1. Proximal intramedullary nail



Figure2. Dynamic hip screw

According to the results of this study, the rate of cut-out in the patients treated with PIN was 2% (Figure 3) and in the patients treated with DHS was 6.66% (Figure 4); In other words, the rate

of fixation in patients treated with PIN was 98% and in patients treated with DHS was 93.34% (Figure 5).



Figure 3. Cut-out of proximal intramedullary nail



Figure 4. Cut-out of Dynamic hip screw

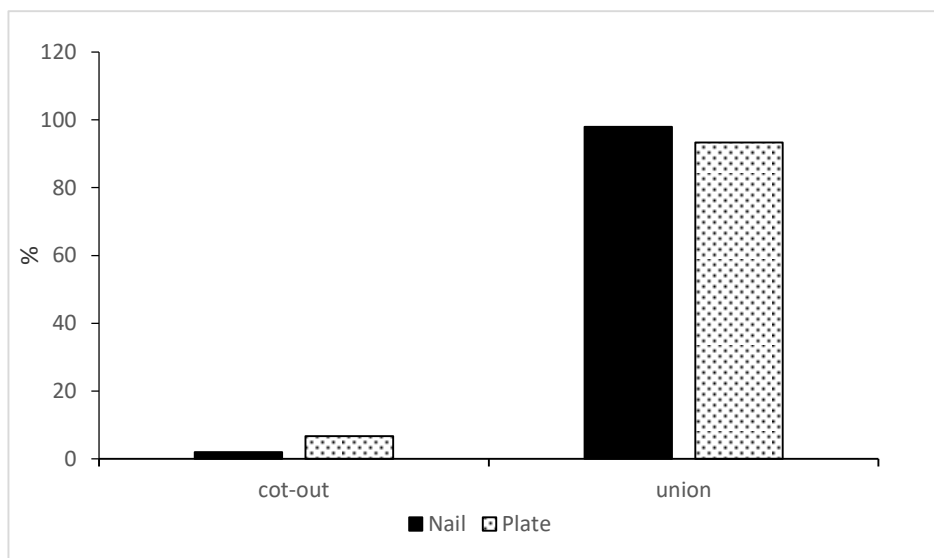


Figure 5. Percentage of cut-out and union in treatment groups

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The patient's gender study also showed that implant cut-out in the group treated with PIN treatment 66.66% of them were female and 33.33% were male and in the group treated with DHS

treatment 70% were female and 30% male, respectively (Figure 6).

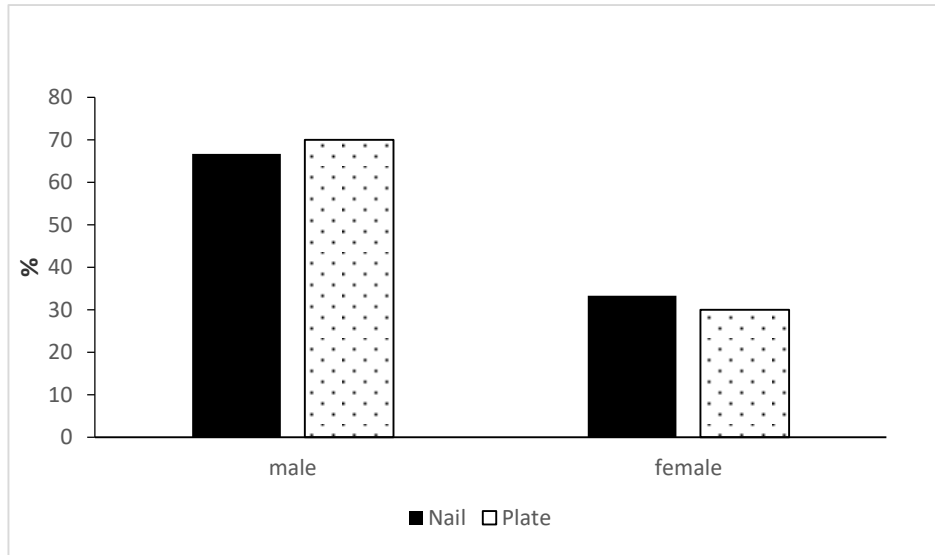


Figure 6. Percent of patients' gender in treatment groups

DISCUSSION

In the last few decades, the intracranial fractures treatment has evolved significantly. Various methods have been used from fixative devices to other methods and ultimately their performance has been impaired. DHS has long been the gold standard for fracture healing, especially in the stability of fractures (17). PIN was developed to overcome the complications of DHS implants and to facilitate the surgical treatment of unstable intracranial fractures. This type of implant as an intramedullary causes less bending and compensates for the medial column function as a barrier to prevent the medialization of the shaft (18). The purpose of this study was to compare the efficacy of PIN and DHS in the treatment of intertrochanteric fractures in terms of union and cut-out. The mean age of patients in this study was 63 years in the treatment groups, which were included in the older population. Studies have shown that at this age due to osteoporosis of all bones, and especially in the proximal femur, may also be fractured with mild trauma, which is recommended for this group of patients (19).

According to the results of this study, the rate of cut-out in the PIN-treated group was less than in the DHS-treated group. In contrast, the rate of welding in PIN patients was higher than in patients treated with DHS. Also, according to the results of the study, the prevalence of burnout in women was higher than in men. In a similar study, Baker and et al. also found that most patients (60%) were women. It seems that women be more prone to bone loss than men because of less bone strength and tenderness. Many similar studies have been done in this field, some of which are similar to those of the study, and the PIN treatment is preferable to the DHS treatment.

In the study of Ma, Kl and et al. in a meta-analysis study which involving 14 studies and 1983 patients, patients in the proximal femoral nail anti-rotation (PFNA) treated group lost less blood than the DHS treatment group and had less fixation failure in

these patients, but the PFNA method required more time for fluoroscopy.

According to the above study, patients treated with DHS required less reoperation than patients treated with Gamma nail but lost more blood (20).

Another study was done by Kamar, Ranjeetesh and et al, to compare the dynamic hip screw and proximal femoral nail treatments. This study included 50 patients with femoral intertrochanteric fractures treated with either DHS or proximal femoral nail technique. The mean age of patients in this study was 62.3 years and the most common mechanism of fracture was home falls. 24% of fractures evaluated in this study were stable, 58% were unstable and 18% were oblique, and unstable fractures were more prevalent in older patients with a higher degree of osteoporosis. The final results of this study indicated that patients treated with proximal femoral nail had a short-term initial follow-up of Harris Hip stratification but had a similar final performance in long-term follow-up (21). Saarenpaa et al. A prospective, matched study of age, sex, type of fracture, place of fracture, and ability to walk during fracture with the aim of evaluating short-term outcomes in two gamma nail and DHS therapies focusing on the functional aspect and the need for re-surgery and mortality. During the first 4 months of follow-up, there were no differences between patients treated with either Gamma Nail and DHS in terms of fracture site and return to preoperative site.

According to the overall results of their study, even though DHS treatment was less mortal and more capable of later surgery than Gamma nail method, both methods were useful for the treatment of femoral intertrochanteric fractures (22).

Generally, since intertrochanteric fractures are highly prevalent and treatment has a significant role in reducing morbidity and mortality, currently the best treatment is to use PIN to fix these

fractures. The major benefits of this method are the lack of limb shortening and stable fixation, less clinical and clinical complications and ultimately reduced mortality. On the other hand, the shorter length of the procedure and the faster the patients move and discharge with the support of the physiotherapist, the less the complications after surgery. On the other hand, in this study only the rate of fusion and cut-out in both PIN and DHS treatment in patients with intertrochanteric fractures treated with these methods was investigated and suggested that other complications such as mortality, return to previous activity, tremol embolism will also be evaluated in future studies.

CONCLUSION

According to the results of this study, PIN compared to DHS in the treatment of stable intertrochanteric fractures has a higher rate of fixation and cut-out and is recommended as the first line of treatment in such therapy.

REFERENCES

1. Jackson C, Tanios M, Ebraheim N. Management of Subtrochanteric Proximal Femur Fractures: A Review of Recent Literature. *Advances in orthopedics*. 2018;2018.
2. Noh J, Lee KH, Jung S, Hwang S. The Frequency of Occult Intertrochanteric Fractures among Individuals with Isolated Greater Trochanteric Fractures. *Hip & pelvis*. 2019;31(1):23-32.
3. Ruecker AH, Rupprecht M, Gruber M, Gebauer M, Barvencik F, Briem D, et al. The treatment of intertrochanteric fractures: results using an intramedullary nail with integrated cephalocervical screws and linear compression. *Journal of orthopaedic trauma*. 2009;23(1):22-30.
4. Miyamoto RG, Kaplan KM, Levine BR, Egol KA, Zuckerman JD. Surgical management of hip fractures: an evidence-based review of the literature. I: femoral neck fractures. *JAAOS-Journal of the American Academy of Orthopaedic Surgeons*. 2008;16(10):596-607.
5. Panula J, Pihlajamäki H, Mattila VM, Jaatinen P, Vahlberg T, Aarnio P, et al. Mortality and cause of death in hip fracture patients aged 65 or older—a population-based study. *BMC musculoskeletal disorders*. 2011;12(1):105.
6. Yu J, Zhang C, Li L, Kwong JS, Xue L, Zeng X, et al. Internal fixation treatments for intertrochanteric fracture: a systematic review and meta-analysis of randomized evidence. *Scientific reports*. 2015;5:18195.
7. Muncibì F, Petrai V, Nistri L, Civinini R, Innocenti M. Advances in the surgical treatment of fragility fractures of the upper femur. Clinical cases in mineral and bone metabolism. 2009;6(3):197.
8. Rozell JC, Hasenauer M, Donegan DJ, Neuman M. Recent advances in the treatment of hip fractures in the elderly. *F1000Research*. 2016;5.
9. Anglen JO, Weinstein JN. American Board of Orthopaedic Surgery Research Committee. Nail or plate fixation of intertrochanteric hip fractures: changing pattern of practice. A review of the American Board of Orthopaedic Surgery Database. *J Bone Joint Surg Am*. 2008;90(4):700-7.
10. Takigami I, Matsumoto K, Ohara A, Yamanaka K, Naganawa T, Ohashi M, et al. Treatment of trochanteric fractures with the PFNA (proximal femoral nail antirotation) nail system. *Bull NYU Hosp Jt Dis*. 2008;66(4):276-9.
11. Sharma A, Sethi A, Sharma S. Treatment of stable intertrochanteric fractures of the femur with proximal femoral nail versus dynamic hip screw: a comparative study. *Revista brasileira de ortopedia*. 2018;53(4):477-81.
12. Kish B, Sapir O, Carmel A, Regev A, Masrawa S, Stern A, et al. Full weight bearing after unstable per and subtrochanteric fracture using proximal femur nail. *The Journal of Bone and Joint Surgery-british Volume*. 2001;83.
13. Steinberg EL, Blumberg N, Dekel S. The fixation proximal femur nailing system: biomechanical properties of the nail and a cadaveric study. *Journal of biomechanics*. 2005;38(1):63-8.
14. Shen L, Zhang Y, Shen Y, Cui Z. Antirotation proximal femoral nail versus dynamic hip screw for intertrochanteric fractures: a meta-analysis of randomized controlled studies. *Orthopaedics & Traumatology: Surgery & Research*. 2013;99(4):377-83.
15. Huang X, Leung F, Xiang Z, Tan P-Y, Yang J, Wei D-Q, et al. Proximal femoral nail versus dynamic hip screw fixation for trochanteric fractures: a meta-analysis of randomized controlled trials. *The Scientific World Journal*. 2013;2013.
16. Goel K, Taneja D. Proximal femoral nail v/s Dynamic hip screw in treatment of intertrochanteric fracture femur. *Indian Journal of Orthopaedics*. 2018;4(3):249-55.
17. Jensen JS, Sonne-Holm S, Tønbjærvold E. Unstable trochanteric fractures: a comparative analysis of four methods of internal fixation. *Acta Orthopaedica Scandinavica*. 1980;51(1-6):949-62.
18. Kulkarni G, Limaye R, Kulkarni M, Kulkarni S. Intertrochanteric fractures. *Indian journal of Orthopaedics*. 2006;40(1):16.
19. Yoo J-H, Moon S-H, Ha Y-C, Lee DY, Gong HS, Park SY, et al. Osteoporotic fracture: 2015 position statement of the Korean society for bone and mineral research. *Journal of bone metabolism*. 2015;22(4):175-81.
20. Ma K-L, Wang X, Luan F-J, Xu H-T, Fang Y, Min J, et al. Proximal femoral nails antirotation, Gamma nails, and dynamic hip screws for fixation of intertrochanteric fractures of femur: a meta-analysis. *Orthopaedics & Traumatology: Surgery & Research*. 2014;100(8):859-66.
21. Kumar R, Singh R, Singh B. Comparative prospective study of proximal femoral nail and dynamic hip screw in treatment of intertrochanteric fracture femur. *Journal of clinical orthopaedics and trauma*. 2012;3(1):28-36.
22. Saarenpää I, Heikkinen T, Ristiniemi J, Hyvönen P, Leppilähti J, Jalovaara P. Functional comparison of the dynamic hip screw and the Gamma locking nail in trochanteric hip fractures: a matched-pair study of 268 patients. *International orthopaedics*. 2009;33(1):255-60.
23. Yeganeh A, Taghavi R, Moghtadaei M. Comparing the intramedullary nailing method versus dynamic hip screw in treatment of unstable intertrochanteric fractures. *medical archives*. 2016;70(1):53.
24. Jonnes C, Shishir S, Najimudeen S. Type II intertrochanteric fractures: proximal femoral nailing (PFN) versus dynamic hip screw (DHS). *Archives of Bone and Joint Surgery*. 2016;4(1):23.