ORIGINAL ARTICLE

Frequency of Lag Screw Cutout After Dynamic Hip Screw Fixation of Stable Intertrochanteric Femur Fracture by Keeping Tip Apex Distance Less Than 25 Milli Meter

SAJID AKHTAR[1], SHAHAB UD DIN[2], FAIZ ALI SHAH[3], *WALI MOHAMMAD[4],ABDUR REHMAN[5]*

ABSTRACT

Background: Intertrochanteric fracture is a fracture in the region of the hip, consisting of the area from the extracapsular basilar neck region to the region along lesser trochanter before the development of medullary canal. The overall incidence reported in a study conducted in China was 47.8 and 50.4 fractures per 100,000 per year for men and women, respectively. Females showed a higher fracture incidence than males in those aged 55 years and over.. The DHS has therefore become one of the standard treatments of trochanteric fractures

Aim: To determine frequency of lag screw cutout after dynamic hip screw fixation of stable intertrochanteric femur fracture by keeping TIP apex distance less than 25 millimeter.

Methods: This study was conducted at Department of Orthopaedics, Lady Reading Hospital Peshawar for the period of 6 months. This was a descriptive cross-sectional study in which a total sample size of 139 patients was taken by using 23% proportion of failure rate of dynamic hip screw fixation, 95% of confidence interval and 7% margin of error, under WHO software for sample size determination. Non probability consecutive sampling technique was used for sample collection.

Results:23% patients were in age 45-55 years, 39% patients were in age 56-65 years, 42% patients were in age 66-70 years. Mean age was 57 years with standard deviation ± 2.04. Fifty eight percent patients were male and 42% patients were female. 10% patients had screw cutout while 90% patients did not had screw cutout.

Conclusion: The frequency of lag screw cutout was 10% after dynamic hip screw fixation of stable intertrochanteric femur fracture by keeping TIP apex distance less than 25 milli meter

Keywords: dynamic hip screw fixation, stable intertrochanteric fractures, Tip Apex.

INTRODUCTION

Intertrochanteric fracture is a fracture in the region of the hip, consisting of the area from the extracapsular basilar neck region to the region along lesser trochanter before the development of medullary canal. Intertrochanteric fractures have been described as one of the most debilitating injuries leading to increased mortality and a significant socio-economic burdan[1]. The overall incidence reported in a study conducted in China was 47.8 and 50.4 fractures per 100,000 per year for men and women, respectively. Females showed a higher fracture incidence than males in those aged 55 years and over[2].

Dynamic hip screw (DHS) or sliding hip screw (SHS) has been the standard implant in treating trochanteric fractures[3]. The dynamic hip screw (DHS) has gained widespread acceptance in the last 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 pertrochanteric fractures[4,5,6,7].

There are reported mechanical failure rate changed between 1.9% and 23% in the literature including the cutting out of the lag screw from the femoral head pulling off of the plate from the femoral shaft, dissociation of the compression hip screw from the barrel and failure of the hip screw itself.[5]Cut-out of the lag screw has been shown to be the most common cause of failure and is related to the position of the screw in the femoral head .There have been two published methods in the literature which quantify the screw position, including the tip-apex distance(TAD) and the Parkers s ratio method[8]. Tip-apex distance is indicative of the position and depth of the screw in the femoral head and has been shown to be associated with cut-out failure. Patient with Tip-apex distance greater than 25 mm had a significantly greater risk of cut-out than patients with Tip-apex distance less than 25mm[9]. The objective of this study was to determine frequency of lag screw cutout after dynamic hip screw fixation of stable intertrochanteric femur fracture by keeping TIP apex distance less than 25 millimeter.

[1]Senior Registrar, Saidu Teaching Hospital, Saidu Sharif Swat,
[2]Professor,[3]Senior Registrar, [4]Senior Registrar
[5]Assistant Professor Orthopedics Surgery, Lady Reading Hospital, Peshawar, Pakistan
Correspondence: Dr. Sajid Akhtar, M Email: dr.sajid84@gmail.com

MATERIAL AND METHODS

This study was conducted at Department of Orthopaedics, Lady Reading Hospital Peshawar for the period of one year from 1st July 2014 to 30th June 2015. This was a descriptive cross-sectional study in which included 139 patients. Patients with stable intertrochanteric fractures of femur treated with dynamic hip screw fixation with tip apex distance less than 25 mm, age 45 years and above and both sexes were included. Patients having unstable fractures, with sub-trochanteric extension and pathological fractures, unfit for anesthesia, severely osteoporotic bone, taking drugs causing osteoporosis specially steroids were excluded. All patients meeting the inclusion criteria were included in the study through outdoor patient and Accident and Emergency department and were admitted in the orthopedic ward for further evaluation. The diagnosis of intertrochanteric fracture were made on the basis of x ray hip both AP and lateral views. All patients in this series underwent surgical treatment consisting of closed reduction

under image intensifier and internal fixation with 135^0DHS. No additional fixation device such as a trochanteric stabilizing plate or cerclage wiring was used and this was done under general anesthesia or spinal anesthesia by an FCPS orthopedic surgeon with three years experience at least. The immediate postoperative radiographs were used to assess the accuracy of the fracture reduction and the position of the implant in the femoral head. The position of the screw was determined by the TAD described by Baumgaertneret al[12]. The TAD defined as the sum of the distance, in millimetres, from the tip of the lag screw to the apex of the femoral head, as measured on an anteroposterior radiograph and that distance as measured on a lateral radiograph, after correction had been made for magnification. Patients were discharged on 2nd postoperative day after check x-rays. Each patient was advised to come for follow up after 3 weeks, 6 weeks and 3 months. Final follow up was done after 3 months. Radiographs of the fractures were obtained postoperatively and used to demonstrate any failure of fixation. The screw cut-out was the projection of the screw from the femoral head by more than 1mm.

RESULTS

Thirty two patients (23%) were in age 45-55 yrs, 49(39%) patients were in age 56-65 years, 58(42%) patients were in age 66-70 years with mean age was 57±2.04 years (Table 1). There were 81(58%) patients were males and 58(42%) patients were females (Table 2). Fourteen 14(10%) patients had screw cutout while 125(90%) patients didn't had screw cutout (Table 3). Stratification of screw cutout with age and gender (Tables 4&5).

Table 1: Frequency of age distribution (n=139)

Age (years)	No.	%
45 – 55	32	23.0
56 – 65	49	35.0
66 – 70	58	42.0

Table 2:Frequency of gender distribution (n=139)

Gender	No.	%
Male	81	58.0
Female	58	42.0

Table 3**:** Frequency of screw cutout (n=139)

Screw cutout	No.	%
Yes	14	10.0
No	125	90.0

Table 4:Stratification of screw cutout with age (n=139)

Screw cutout	Age (years)			Total
	45 - 55	56 - 65	66 – 70	
Yes	3	5	6	14
No	29	44	52	125
Total	32	49	58	129

Chi Square test was applied in which P value was 0.003

Table 5: Stratification of screw cutout with gender (n=139)

Screw cutout	Male	Female	Total
Yes	8	6	14
No	73	52	125
Total	81	58	139

Chi Square test was applied in which P value was 0.002

DISCUSSION

Low energy hip (neck of femur) fractures are commonly seen in osteoporotic elderly ladies, mostly in Western countries. However, the incidence has been increasing in Nigeria and other developing countries due to increased life expectancy and use of diagnostic facilities such as CT, MRI and Radionuclide (DEXA) scans, which make diagnosis easier to achieve. Our study shows that 23% patients were in age 45-55 years, 39% patients were in age 56-65 years, 42% patients were in age 66-70 years. Mean age was 57 years with standard deviation ± 2.04. Fifty eight percent patients were male and 42% patients were female. More over 10% patients had screw cutout while 90% patients didn't had screw cutout.

Dynamic hip screw (DHS) is a procedure commonly performed for intertrochanteric Neck of femur (NOF) fractures, otherwise called extra-capsular fractures. This is a technique, which allows the screw to slide within the barrel, leading to compression of the fracture fragments when the patient bears weight. It also depends on the presence of intact medial wall in the region of the lesser trochanter, to be successful. DHS failure rate has been previously reported as 8%-13%[1], but the rate has come down to 6.8%, according to a more recent study[2]. This usually happens when the head collapses in varus position. Other studies have previously recommended the essential role of adequate reduction of the fracture, as well as central placement of the wire on both AP and Lateral views of the radiograph[3].

Agni[11] had shown the associations with implant cutout, in proximal femoral fractures reduced and stabilised with either a Dynamic Hip Screw (DHS) or Intramedullary Hip Screw (IMHS) device. Radiographs of 105 consecutive patients, who underwent either DHS or IMHS fixation of a proximal femoral fracture, were reviewed retrospectively. The Tip Apex Distance (TAD) was measured, using the combined AP and lateral radiograph distances. Fractures were classified according to the Muller AO classification. patients underwent DHS fixation and 45 patients had IMHS fixation. A TAD≥25mm was found in 9 patients in the DHS group and 6 patients in the IMHS group. There was 1 cutout in the DHS group (31-A1 type) and 4 in the IMHS group. 3 of the cutouts had a TAD≥25mm. The 4 cutouts in the IMHS group had a fracture classification of 31-A2, 31-A3 and 32-A3.1 respectively. In addition, the fractures were inadequately reduced and noted to be fixed into a varus position. A TAD<25mm would appear to be associated with a lower rate of cutout. The cutout rate in the IMHS group was higher than the DHS group. Contributing factors may have included an unstable fracture configuration and inadequate closed fracture reduction at the time of surgery.

Baumgaertneret al[12] and Geller et al[13] supported the conclusion that a TAD<25mm is associated with a decreased incidence of lag screw cutout after proximal femoral fracture fixation. Baumgaertneret al[14] found that no patients with a TAD<25mm cutout and demonstrated a statistical relationship between increasing TAD and cutout, regardless of other variables related to the fracture[4]. 17% of his fracture series were also classified as having a poor reduction and that this was also related to implant failure. Geller et al[13] demonstrated a statistically significant

difference when using an intramedullary (IM) device, when comparing the outcome of TAD<25mm to TAD>25m.

CONCLUSION

Our study concludes that the frequency of lag screw cutout was 10% after dynamic hip screw fixation of stable intertrochanteric femur fracture by keeping TIP apex distance less than 25 millimeter.

REFFERENCES

1. Hartholt KA, van Beeck EF, Polinder S, van der Velde N, van Lieshout EM, Panneman MJ, et al. Societal consequences of falls in the older population: injuries, healthcare costs, and long-term reduced quality of life. J Trauma2011;71(3):748–53.
2. TianF,Zhang L, Zhao H,Liang C, Zhang N, Song H .An increase in the incidence of hip fractures in Tangshan, China.Osteoporos Int.2014; 25(4):1321-5.
3. Saarenpää I, Heikkinen T, Ristiniemi J, Hyvönen P, Leppilahti 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.IntOrthop. 2009;33(1):255–60.
4. Xu YZ, Geng DC, Mao HQ, Zhu ZS, Yang HL. A comparison of the proximal femoral anti-rotation device and dynamic hip screw in the treatment of unstable pertrochanteric fractures. J Int Med Res. 2010;38(4):1266-75
5. Luo Q, Yuen G, Lau TW, Yeung K, Leung F. A biomechanical study comparing helical blade with screw design for sliding hip fixations of unstable intertrochanteric fractures. *SciWorldJ* 2013;2013:351936..
6. O'Malley NT, Deeb AP, Bingham KW, Kates SL. Outcome of the dynamic helical hip screw system for intertrochanteric hip fractures in the elderly patients. *GeriatrOrthopSurgRehabil*2012;3(2):68-73.
7. Kaplan K, Miyamoto R, Levine BR, Egol KA, Zuckerman JD. Surgical management of hip fractures: an evidence-based review of the literature. II: intertrochanteric fractures. *J Am AcadOrthopSurg*2008;16(11):665-73.
8. Guven M, Yavuz U, Kadioglu B, Akman B, Kilincoglu V, Unay K, et al. Importance of screw position in intertrochanteric femoral fractures treated by dynamic hip screw. OrthopTraumatolSurg Res 2010;96:21-7.
9. Rubio-Availa J, Madden K, Simunovie N, Bhandari M. Tip to apex distance in the femoral intertrochanteric fractures:a systemic review. J Orthop Sci.2013;18:592-8
10. Hak DJ, Bilat C. Avoiding varusmalreduction during cephalomedullary nailing of intertrochanteric hip fractures. Arch Orthop Trauma Surg, 2010.
11. Agni N, E Sellers, R Johnson, A Gray. *Tip Apex Distance – Is It Enough To Predict Implant Failure?*. The Internet Journal of Orthopedic Surgery. 2012;9:23-56.
12. Baumgaertner MR, Curtin SL, Lindskog DM, Keggi JM. The value of the tip-apex dista`.
13. 800`in predicting failure of fixation of peritrochanteric fractures of the hip. J Bone Joint Surg Am, 1995. 77(7):1058-64.
14. Geller, J. Tip-apex distance of intramedullary devices as a predictor of cutout failure in the treatment of peritrochanteric elderly hip fractures. IntOrthop, 2010;34(5):719-22.
15. Baumgaertner MR, Solberg BD. Awareness of tip-apex distance reduces failure of fixation of trochanteric fractures of the hip. J Bone Joint Surg Br, 1997;79(6):969-71.
16. Johnson LJ, Cope MR, Shahrokhi S, Tamblyn P. Measuring tip-apex distance using a picture archiving and communication system (PACS). Injury, 2008;39(7):786-90.
17. Bridle SH, Patel AD, Bircher M, Calvert PT. Fixation of intertrochanteric fractures of the femur. A randomised prospective comparison of the gamma nail and the dynamic hip screw. J Bone Joint Surg Br, 1991;73(2):330-4.