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Functional Outcome of Dynamic Hip Screw Versus Proximal Femur Locking Compression Plate in Unstable Intertrochanteric Fracture of Femur

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ABSTRACT

Introduction: Intertrochanteric fractures are common in elderly population and pose a significant financial burden to the society. Anatomically contoured proximal femur locking compression plate (PFLCP) is the latest addition in the surgeons' armamentarium to deal with these fractures. It creates an angular stable construct, which will theoretically lessen the risk of failure by screw cut-out and varus collapse, the common mode of DHS failure.

Materials and methods: 15 men and 5 women aged 32 to 78 (mean, 55) years were randomised to the proximal femoral locking plate group, whereas 14 men and 6 women aged 38 to 75 (mean, 59) years were randomised to the conventional 135º DHS group. The time to union, medialisation of the shaft, neck-shaft angle, limb shortening, varus collapse, and functional outcome (using the Hospital for Special Surgery Hip Rating System) were assessed. Randomisation was based on the odd and even serial numbers at presentation. The modes of injury in the respective groups were: road traffic accident (n=12 & 6) and fall (n=8 & 14). Children and patients with compound fractures and associated head, chest or abdominal injuries were excluded.

Result: Patients who underwent PFLCP fixation demonstrated shorter bone union time (2.8±0.2 months) than those who underwent DHS fixation (3.2±0.1 months) ($p<0.000$). PFLCP group had 88.9% bone union whereas DHS group had 77.8% bone union at 12 weeks ($p=0.20$). Out of the total study population, 58 (64.4%) were females while 32 (35.6%) were males. 45 (50%) of the cases were due to low energy trauma (slips and falls) corresponding to the etiology of intertrochanteric femoral fractures. Right lower limb was more commonly affected than the left.

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The Boyd and Griffin classification was used in the study, according to which 70 (77.8%) fractures were falling in Boyd and Griffin type one fracture of the proximal femur (Table 3).

Conclusion: We conclude that DHS is the best implant for stable proximal femoral fractures with lesser operative time and lesser blood loss. While PFLCP can be a good alternative for unstable proximal femoral fractures with better results with slightly longer operative time and more blood loss.

Keywords: Pertrochanteric fracture, Dynamic hip screw, Proximal femur locking compression plate, Proximal femur nail

INTRODUCTION

Intertrochanteric fractures are common injuries occurring predominantly as low-energy injuries in the elderly, mostly due to direct injury to hip (e.g. fall). The financial burden to the society is tremendous. [1] Cooper was the first one to classify hip fractures into extracapsular (intertrochanteric) and intracapsular (femoral neck). [2] Since the 1800s, a lot has changed in the way these fractures are managed. From conservative treatment (including hip spica and pin traction) with bed rest, to the operative fixation with modern surgical techniques and implants, we have come a long way. Early attempts at surgical management were marred by poor asepsis, lack of intraoperative imaging, poor implant design and quality, and incomplete understanding of fracture mechanics. Langenbeck was the first to internally fix an intertrochanteric fracture with a nail. [3,4]

The real benefit of fixation lies not in improving union rates (intertrochanteric fractures rarely go into nonunion, even when treated conservatively), but in improving functional outcome and mortality rates, which are attributed to the early mobilization and better nursing care possible after surgery. Many implants have been used for fixation: Smith Peterson nail, jewett nail, trochanteric buttress plate, angled blade plate, gotfried percutaneous compression plate enders nail, dynamic hip screw (DHS), medoff plate, cephalomedullary nails, and proximal femur locking plates. Pugh and Massie first developed the DHS in 1950s by modifying the sliding hip screw systems and quickly became the gold standard. Even as widespread use of DHS revealed some complications, it is still considered the gold standard by many. [5]

DHS is the most commonly used implant worldwide for fixation of intertrochanteric fractures. The two important complications related to DHS are uncontrolled collapse and lag screw cut-out (with or without varus collapse). [6] Others include medialization of shaft, uncontrolled lateralization of proximal fragment. Although intramedullary nails are fast becoming the preferred choice for unstable fractures, their use is also associated with many complications: screw cut-out/blade cut-out (including Z effect and reverse Z effect), varus deformity, lateral

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wall blowout during reaming, difficult insertion in curved femurs, peri-implant fracture (subtrochanteric fractures in short nails), and implant breakage. [7]

Anatomically contoured locking plates (proximal femur locking compression plate [PFLCP]) have been developed to provide an angular stable construct and prevent screw cut-out and varus failure.

MATERIALS AND METHODS

This study was approved by the ethics committee of the hospital. Informed consent of each patient was obtained. 44 patients underwent surgery for unstable intertrochanteric fractures, 4 of whom were lost to follow-up, and the remaining 40 were analysed. 15 men and 5 women aged 32 to 78 (mean, 55) years were randomised to the proximal femoral locking plate group, whereas 14 men and 6 women aged 38 to 75 (mean, 59) years were randomised to the conventional 135º DHS group. Randomisation was based on the odd and even serial numbers at presentation. The modes of injury in the respective groups were: road traffic accident (n=12 & 6) and fall (n=8 & 14). Children and patients with compound fractures and associated head, chest or abdominal injuries were excluded.

The mean intervals from injury to surgery were 12.4 and 12.2 days for the locking plate and DHS groups, respectively. The elapsed times were largely due to late referrals and patient fitness for surgery. Preoperative skeletal traction was provided. Radiographs were taken; fractures were classified according to the AO classification. The neck shaft angle of the affected and the opposite normal hips was measured, and involvement of the greater (lateral wall) and lesser (posteromedial buttress) trochanters was noted. The fractures were stabilised using upper tibial skeletal traction until surgery, and reduced by closed means on a fracture table under image intensification. DHS fixation was performed using conventional techniques.

For plate fixation, a small 4-hole proximal femoral locking plate with the jig was placed on the were inserted into the femoral neck at 135º and then at 95º under image intensification (Fig. 2). The neck was drilled over the 95º guide wire first and a 6.5mm locking neck screw was inserted to counter the collapse. Two 6.5-mm locking neck screws were then inserted at 135º. The remaining 4 locking screws were inserted into the shaft (Fig. 3). The wound was closed in layers under negative suction drainage.

Antibiotics and analgesics were given as per the hospital protocol. Patients were allowed to perform quadriceps-strengthening exercises the next day. Mobilisation with no weight bearing was allowed, followed by partial weight bearing on crutches or with walking frame after 6 to 8 weeks. Sutures were removed on day 14.

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Patients were followed up at weeks 2 and 6 and thereafter monthly for 18 months to assess hip and knee function, limb shortening, callus growth, and fixation defects. Radiological evidence of callus with no tenderness was regarded as bone union. The time to union, medialisation of the shaft, neck-shaft

Angle, limb shortening, varus collapse, and functional outcome (using the Hospital for Special Surgery: Hip Rating System1) were assessed (Table). 20 patients in each group were needed to provide 80% power to detect difference between groups with a 5% level of significance. The 2 groups were compared using the Student's t test and Fisher's Exact test were used.

RESULTS

The mean age of the population was 57.8 years (range 30-70 years). Thirty three (36.7%) of the patients belonged to the 54-61 years age group followed by 27 (30%) in the 62-70 years group (Table 1).

Table 1: Age distribution of the patients, (n=90).

Age group (years)	Number of cases	Percentage (%)
30-37	07	7.8
38-45	13	14.4
46-53	10	11.1
54-61	33	36.7
62-70	27	30

Table 2: Nature of trauma, side of the fracture, and type of fracture, (n=90).

Variables	Groups	Number of cases	Percentage (%)
Nature of trauma	**Motor vehicle accident (RTA)**	30	33.3
	Fall from height	20	22.2
	Slip and fall	40	44.5
Side of fracture	**Right**	55	61.1
	Left	35	38.9
Type of fracture	**Type I**	65	72.2
	Type II	25	27.8

Out of all the cases, 40 (44.5%) healed normally, 30 (33.33%) had delayed healing, and 20 (22.2%) had shortening while none of the patients had superficial infection. Demographics of patients among group A and group B are given in Table 2.

Table 3: Demographic details of the patients with in groups, (n=45).

Demographic details	Variables	GROUP A, PFLCP*	Group B, DHS**
Nature of trauma	**Mean ± SD**	58.7±3.6	60.4±3.3
Gender	**Males**	17	15

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	Females	28	30
Affected side	**Right**	28	28
	Left	17	17
Classification	**Type I**	35	35
	Type II	10	10

*PFLCP-Proximal femoral locking compression plate, **DHSDynamic hip screw

Out of the total study population, 58 (64.4%) were females while 32 (35.6%) were males. 45 (50%) of the cases were due to low energy trauma (slips and falls) corresponding to the etiology of intertrochanteric femoral fractures. Right lower limb was more commonly affected than the left. The Boyd and Griffin classification was used in the study, according to which 70 (77.8%) fractures were falling in Boyd and Griffin type one fracture of the proximal femur (Table 3).

Table 4: Functional result of the study in terms of union time, (n=45).

Result	**Union (%)**	**Non-union (%)**	**P value**
Group A	40 (88.9%)	5 (11.1%)	0.20
Group B	35 (77.8%)	10 (22.2%)	

Mean union time for group A was 2.8±0.2 months and for group B was 3.2±0.1 months. Difference between the mean union time was statistically significant ($p<0.000$). All the patients were followed at two, four, and 12 weeks. At each follow-up, radiograph of the operated hip with the upper half of the femur was taken and assessed. Patients having non-union after 12 weeks were followed until union. In group A (PFLCP fixation), 40 (88.9%) cases while in group B (DHS fixation), 35 (77.8%) cases showed a good union of fracture after 12 weeks (Table 4). The distribution of these frequencies was statistically insignificant ($p=0.20$).

DISCUSSION

In this study of 60 cases of proximal femoral fractures were evaluating. Trivial trauma of domestic simple fall on ground was the commonest cause of fracture attributed to 48.34%. The most common mode of trauma is simple fall on ground in the older age group and road traffic accidents in younger patients.

David reported that these fractures are more common in females due to postmenopausal osteoporosis, but in our study greater number of male patients 45 (75%) were affected and female patients were 15 (25%) probably due to outdoor activities in our rural set up. [8]

Out of 60 patient 38 (63.33%) has right side fracture and 22 (36.67%) has left side fracture. In studies conducted by Gupta right sided fractures were more common, whereas in studies made by Kenzor et al left side fracture were common. [9]

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Average age of patients 57.75 years in which treated by PFLCP was 54.10 years while in DHS was 61.40 years. P-value is equal to 0.1130 which is statistically not significant.

In our study, the average surgery time was considerably higher in the PFLCP group that is 67.77 min as compare to DHS that is 49.60 min, primarily because comparatively more dissection was required as compared to DHS fixation and the increased operative time with PFLCP is may be because the surgeon is handling a new technique with new implant. Saini, et al based on their study in 2013 mean operating time for PF-LCP was 79.5 min and total blood loss averaged 233.13 ml. [10]

Union was achieved in all cases. No significant difference was found between union time of the two group of our study, but the DHS group united slightly earlier (mean 16.33 weeks) than the PF-LCP group (mean 18.60 weeks). This might be because dynamic hip screw provide control collaps at fracture site which improved microcirculation at the fracture site.

In this study the average blood loss in PF-LCP was 314ml and in DHS was 242.50 ml. Taeger showed a 43% increased blood loss in a reduction of complex unstable fractures compared to stable ones. [11]

CONCLUSION

We conclude that DHS is the best implant for stable proximal femoral fractures with lesser operative time and lesser blood loss. While PFLCP can be a good alternative for unstable proximal femoral fractures with better results with slightly longer operative time and more blood loss.

REFERENCES

1. Nieves JW, Bilezikian JP, Lane JM, Einhorn TA, Wang Y, Steinbuch M, et al. Fragility fractures of the hip and femur: incidence and patient characteristics. Osteoporos Int. 2010;21(3):399-408.
2. Dimon JH, Hughston JC. Unstable intertrochanteric fractures of the hip. J Bone Joint Surg Am. 1967;49(3):440–50.
3. Kokoroghiannis C, Aktselis I, Deligeorgis A, Fragkomichalos E, Papadimas D, Pappadas I. Evolving concepts of stability and inter-medullary fixation of intertrochanteric fractures-a review. Injury. 2012;43(6):686-93.
4. Palm H, Jacobsen S, Sonne HS, Gebuhr P. Hip fracture study group integrity of the lateral femoral wall in intertrochanteric hip fractures: an important predictor of a reoperation. J Bone Joint Surg Am. 2007;89(3):470-5.
5. Ozkan K, Türkmen I, Sahin A, Yildiz Y, Erturk S, Soylemez MS. A biomechanical comparison of proximal femoral nails and locking proximal anatomic femoral plates in femoral fracture fixation A study on synthetic bones. Indian J Orthop. 2015;49:347-51.

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6. David GL. Fractures and dislocation of hip. Campbells operative orthopaedics. Chapter 52.Volume 3. 11th ed. Philadelphia, Pennsylvania, USA: Mosby Elsevier; 2010: 3237-3308.
7. Saini P, Kumar R, Shekhawat V. Biological fixation of comminuted pertrochanteric fractures with proximal femur locking compression plate; Injury. 2013;44(2):226-31.
8. Ahn J, Bernstein J. Fractures in brief: intertrochanteric hip fractures. Clin Orthop Relat Res. 2010;468(5):1450-52.
9. Ozkan K, Unay K, Demicay C. Distal unlocked proximal femoral intramedullary nailing for intertrochanteric femur fractures. Int Orthop. 2009;33(5):1397-400.
10. Little NJ, Verma V, Fernando C. A prospective trial comparing the Holland nail with the dynamic hip screw in the treatment of intertrochanteric fractures of the hip. J Bone Joint Surg Br. 2008;90(8):1073-8.
11. McKinley JC, Robinson CM. Treatment of displaced intracapsular hip fractures with total hip arthroplasty: comparison of primary arthroplasty with early salvage arthroplasty after failed internal fixation. J Bone Joint Surg Am. 2002;84(11):2010-5.