ORIGINAL RESEARCH

Treatment Of Unstable Proximal Femoral Fractures With Proximal Lateral Femur Locking Plates

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ABSTRACT

Introduction: A large proportion of hospitalization for trauma is due to proximal femoral fractures. This study was conducted to observe the outcome of unstable proximal femoral fractures treated with proximal lateral femur locking plate.

Material and Method: We prospectively followed the clinical results of 25 cases of unstable proximal femoral fractures treated with proximal lateral femur locking plates (PLFLP) from May 2011 to October 2012. The progress of fracture healing, as well as the occurrence of complications, was recorded. The function of the hip joint was evaluated by the Modified Harris Hip Score 6 months after the operation.

Result: All the 25 patients were available for evaluation at 6 months follow up with the mean follow up time of 8 months. The average age of our patients was 55.4 years. Peak incidence was in the age group of 61-80 years. All of these fractures were of the complex type whereas we had 5(20%) patients falling under the Sensheimer type IV and another 5 (20%) falling under the Sensheimer type V, indicating more complex and unstable fractures.

Conclusion: The proximal lateral femur locking plate is the kind of stable and effective internal fixation for treating unstable proximal femoral fractures which has the advantage of stable fixation especially for the lateral femoral wall fracture.

Keywords: Proximal femoral fractures, Fracture fixation, Locking plates, Locking screws.

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INTRODUCTION

Proximal femoral fractures account for a large proportion of hospitalizations among trauma cases.[1] An overwhelming majority of these patients (>90%) are aged above 50 years.[2] Their mortality rate range between 4.5-22%.[3] Hence the interest in development and improvement in management of these fractures remains high. Intertrochanteric &subtrochanteric fractures are major pathology in all fractures of the proximal femur.[4] Several devices were developed to treat these types of fractures including the dynamic hip screw, 95^{o} angled blade plates and intramedullary nails, each with their own set of complications & controversies.[5-7]

Stable proximal femoral fractures can be managed with conventional implants with predictable results whereas unstable fractures in this region are challenging & prone to complications. Unstable proximal femoral fractures are difficult to treat and ideal treatment method still remains controversial. Intramedullary nailing is advocated by various authors in their studies as the preferred surgical method.[8,9,10] But, generally there is lack of consensus on the treatment of unstable proximal femoral fractures.We took up a prospective study under the title of internal fixation of proximal femoral fractures with proximal femoral locking compression plate. Our aims and objectives being to study the results of treatment of proximal femoral fractures with proximal femoral locking compression plate with the use of such an implant. Here we report our experience of complex proximal femoral fractures.

MATERIALS AND METHODS

The prospective study is a series of 25 patients who were admitted and operated from May 2011 to October 2012 in our institute, GMC Jammu, for complex proximal femoral fractures using proximal femoral locking plate. To be included in this study, patients were supposed to be, cognitively intact, living in their own home or apartment before fracture, aged more than 18 years, patients with closed or type 1 Gustilo-Anderson complex femoral fractures. Patients with these criteria were excluded: skeletally immature patients, pathological fractures, polytrauma, ipsilateral

lower limb fractures that significantly affect the functional outcome, Gustilo-Anderson type II & III fractures, inability to walk independently prior to injury, neurological and psychiatric disorders that would preclude reliable assessment, all types of fractures of neck of femur.

For pertrochanteric fractures AO classification was used whereas for subtrochanteric fractures. Senshei-mer classification was used. The results were evaluated using modified Harris Hip scores.[11] Plain radiographs (Antero-posterior and lateral views) were obtained preoperatively to assess the fracture pattern.

Age of fracture at surgery	No. of cases	Percentage
0-5	3	12
6-10	20	80
11-15	1	4
16-20	1	4
Total	**25**	**100**

Table 1: Age of fracture at the time of surgery

Surgical technique

The operation was performed under GA or spinal anaesthesia. The procedure was done by standard lateral approach. [12] After ensuring perfect anatomic placement of the plate to the proximal fragment, a 3.2 mm drill tip guide wire is inserted through a wire sleeve that is threaded to the most proximal hole at a predetermined 95^{o}angle.A second guide wire is then inserted through the drill sleeve of the second hole in a 120^{O} angle. The guide wires were advanced to the subchondral bone & their correct placement was confirmed by fluoroscopy, in AP and lateral views. Placement of the proximal guide wire in the AP view is into the midportion of the inferomedial quadrant of the femoral head along a path subtending a 50^{O} angle to the femoral shaft. The proximal wire is ideally placed slightly posterior to center in the lateral view. This accommodates an antevertedposition for the second guide wire and screw. Accurate positioning of the proximal guide wire and ultimately the locking screws assures frontal plane alignment. Before a guide wire is inserted into the second guide wire hole, verification for correct sagittal plane alignment of the plate on the proximal femur is done. This usually requires both visual and fluoroscopic assessment and prevents an extension (apex anterior) deformity when the plate is attached to the diaphysis. When this alignment is satisfactory, the guide wires through the next two (distal) wire guides maintaining biplanar fluoroscopic control were inserted. In some patterns, insertion of the third guide wire may have to be deferred until final reduction and compression, where possible has been achieved. Two 7.3 mm, cannulated, self drilling & self tapping, locking head screws are inserted through the first 95^{O} and the second 120^{O} holes. The plate fixed to the proximal segment may now be used for anatomic reduction to the shaft in cases where the initial closed reduction was unsuccessful. A k-wire inserted through the most distal plate hole or a conventional 4.5 mm screw in the most distal combi-hole of the plate can be used for holding the alignment of the plate to the shaft. Thereafter, a 5.0 mm, cannulated self drilling, self tapping, locking head screw is inserted through the third 135^{O} angle hole. The convergence of the three locking head screws in the AP plane allows an angular stable buttress that increases the stability of fractures fixation. The plate is then distally fixed with an additional 2 to 3bicortical locking head screws. [13]

Postoperatively a cephalosporin antibiotic was used for 24 hours after fixation of closed fractures (and an aminoglycoside was added for open fractures, if any) and patients were mobilised on the second post operative day. Quadriceps and abductor stretching and strengthening exercises are initiated during the first week.[14,15]

Depending upon the patients condition he/she progresses from partial weight bearing to full weight bearing by the third month.Patients were examined regularly at 3 week intervals for signs of union (radiological & clinical),varus collapse (neck shaft angle), limb shortening and implant failure and final follow up assessment was done by using the modified Harris Hip score at 6 Months.

STATISTICAL ANALYSIS

SPSS version 21 was used to generate tables. Descriptive statistics was used to reach the results.

RESULTS

All the 25 patients were available for evaluation at 6 months follow up. The mean follow up time was 8 months (range: 6-12 months). There were 19 males and 6 females in our study. The average age of our patients was 55.4 years. Peak incidence was in the age group of 61-80 years (80%). The mechanism of injury was RTA in 10(40%) patients, domestic fall in 10 (40%) patients and fall from height in 5 (20%) of cases. In our study we had 8 (32%) type AO31A2.3, 6 (24%) type AO31A2.2, and 1 (4%) typeAO31A2.1 fractures in the trochanteric group as per the AO pertrochanteric classification. All of these fractures were of the complex type whereas we had 5 (20%) patients falling under the Sensheimer type IV and another 5 (20%) falling under the Sensheimer type V, indicating more complex and unstable fractures.

We operated on right side in 13 (52%) of cases and on left side in 12 (48%). The mean duration of surgery was 81.8 minutes. 12% of patients in our study were operated in the first week, majority 80% of patients were operated in the second week and only 8% of cases were operated in the third week. Nevertheless, we operated all our patients before 3 weeks.

Table-2: Associated injuries

Associated injury	No. of cases	Percentage
Distal end of radius fracture	2	8
Fracture both bones forearm	1	4
Fracture humerus	1	4
Chest injury	1	4
Head injury	1	4
Fracture acetabulum	1	4
Fracture pubic rami	1	4
No associated injury	19	76
Total	**25**	**100**

Average time for union in our study was 13.8 weeks, with no case of non-union. We assessed our patients using modified Harris Hip scoring system. We achieved excellent to good results in 22 (88%) patients , fair in 1(4%) and poor in 2 (8%) patients. Out of 25 patients we had a complication rate of 20% and varus collapse being the most common complication, however we had no complication in the form of knee stiffness, complications of recumbency & screw cut out.

DISCUSSION

Optimal management of proximal femoral fractures remains a challenge for the orthopaedic surgeon owing to the high risk of complications. [16] The aim of treatment in these fractures is to achieve anatomical reduction with a stable fracture fixation which helps bone union and early mobilisation. [17]

Operative treatment is the best option in most cases of hip fractures.[18] Proximal femoral fractures include intertrochanteric &subtrochanteric fractures.[19] In elderly patients early mobilisation without weight bearing may not be clinically possible, therefore stability of the preferred fixation method is crucial. [20]

Proximal femoral fractures are usually managed by surgical fixation. The choice of implants depends upon the fracture pattern, age of patients and existing co-morbidities. Stable and simple fractures of the proximal femur can be easily treated with osteosyntheses with conventional implants with predictable results. However, management of unstable fractures is a challenge for the surgeon because of difficulty in obtaining anatomical reduction. Several plate designs have been developed over the last decades for the treatment of unstable fractures.[21]

Fracture stability is a relative term. It refers to the ability of the reduced fracture to support physiologic loading. Fracture stability refers not only to the number of fragments but the fracture planes as well. In our study only complex (unstable) extracapsular proximal femoral fractures were included for the study. It included the following fracture patterns. [22]

a) Large posteromedial fragment.
b) Reverse oblique pattern
c) Shattered lateral wall, detatched greater trochanter
d) Inability to reduce the fracture.
e) Trochanteric fractures with subtrochanteric extensions.

Intertrochanteric and subtrochanteric fractures are major pathology in all fractures of the proximal femur.[4] Several devices were developed to treat these type of fractures including the dynamic hip screw, 95^{O} angled blade plates, intramedullary nails, but fixation failures such as varus collapse of the femoral head and cutout of the proximal femoral screws were frequently reported.[5-7] The Dynamic Hip Screw plating has been the treatment of choice for stable intertrochanteric fractures but it cannot be used in unstable fracture patterns like reverse oblique and in fractures with shattered lateral wall.[23-25] Furthermore, dynamic hip screw or dynamic condylar screw plates when used in unstable proximal femoral fractures, cannot adequately prevent a secondary limb shortening after weight bearing due to lateralization of the head/neck fragment from gliding along the screw.[26] Meanwhile, several authors propose use of anti-rotation screw or trochanteric stabilisation plate in unstable fractures.

The use of cephalomedullary nails like Gamma hail in particular was associated with higher rate of complications like fractures at the distal tip, penetration screws, blocks healing of the proximal fragment to the lateral wall and delayed healing in A2 type fractures.[27,28] Although conventional plating systems such as the 95^{O} angled blade plate can achieve angular stable fixation, but they require a wide exposure and precise plate positioning with little margin of error.[29,30]

Proximal femoral locking compression plate as a modality of internal fixation in the complex (unstable) proximal femoral fractures has the several advantages. Proximal femoral locking compression plate has been used to improve osteosynthesis of pertrochanteric fractures of the femur. [30]

Figure-1: Pre-operative radiograph showing unstable pertrochanteric

Figure-2: Post-operative radiograph

Figure-3: 20 week post-operative radiograph

Figure-4: Photograph showing functional status at final follow-up

The proximal femoral locking compression plate is a limited contact, angular, stable construct designed specifically for fractures in the proximal femoral region.[29] The screw head locks into the proximal femoral locking compression plate, thereby creating an angular stable construct. Thus, the proximal femoral locking compression plate does not fail at the screw bone interface and provides strong anchor in osteoporotic bones.[29,30] The multiple locking screw holes of the proximal femoral locking compression plate provides various options to tackle complex (unstable) fracture patterns. The proximal femoral locking compression plate also functions as an internalised external fixator. This minimises pressure on the periosteum enabling more biological healing.

The locking proximal anatomic femoral plate is a part of a new generation of plates developed in an effort to increase early mobilisation of patients. They are theoretically superior because they can be applied with less bone injury and provide stabilisation through the placement of more screws at different angles into the proximal portion of the femur.

Results of our study are comparable with other studies. When we look at the fracture type in Biao Zhong series according to AO classification 48% cases were of the 31 A1 type, 22% were of 31A2 & 30% were 31A3. In our series all the fractures of the pertrochanteric region 15 (60%) were of the 31A2 type whereas 10 (40%) cases were of the IV &V Sensheimer type. Thus all the fractures in our study were more complex (unstable) type.

Considering the union rate, in our series of 25 patients, we achieved a union rate of 100%. Guo-Chun Zha et al. in their series reported a union rate of 98% at 6 months.Their study included 108 patients of

pertrochanteric fractures managed by proximal femoral locking compression plate.

Wang ya-bin et al in their comparative series of DHS & PFN in the treatment of subtrochanteric femoral fractures, which included 42 patients all of whom were available for final follow up concluded , 87% of patients has excellent to good hip function as assessed by Harris Hip scoring system. They concluded PFN is a useful device in the treatment of subtrochanteric fractures. In the present study hip function was excellent to good in 88% of patients at 6 months follow up as per the modified Harris Hip Scoring system. Three patients (12%) with fair/ poor scoring in our series were attributed to varus collapse, limb shortening and hip pain due to painful scar & palpable hardware.

When we look at the complication rate, Biao Zhong series (2012) in 41 patients reported following complications: wound infection in 2, varusangulatin in 5, implant breakage in 3, a combined complication rate of 24.3% in both subtrochanteric and intertro-chanteric group were noted but it was significantly higher in the trochanteric group. Varus collapse/ angulation being the commonest complication. In our series we had a complication rate of 20%,varus angulation being the commonest in 2 (8%) cases, in 1(4%) patient we had superficial wound infection, limb shortening and guide wire breakage in 1(4%) cases each. However we had no case of implant failure, knee stiffness, screw cut out & complications of recumbency. Our complication rate of 20% &varus collapse being the commonest complication was comparable to the above series.

CONCLUSION

Our study concluded that the PFLCP can be a feasible alternative to the treatment of pertrochanteric & subtrochanteric fractures treatment with. A PFLCP can provide good to excellent healing in such fractures, with a limited number of complications if done properly. It has the characteristics of less invasion, secure fixation, rapid fracture union & satisfactory functional recovery. This plate can be applied to all fractures in the peritrochanteric region regardless of greater trochanteric, femoral neck or shaft extension. In such plates locked & non locking screws may be placed in non aggressive manner, fixed angle prevents shortening and varus collapse seen with traditional implants. It can be applied by submuscular approach also with minimal stripping of soft tissue around fracture & offer excellent stability and rotational control in complex proximal femoral fractures.

REFERENCES

1. Fox K.M, Magaziner J, Hebel J.R: Intertrochanteric versus femoral neck fractures; differential characteristics, treatment and sequelae. J Gerontol A Bio Sci Med Sci 1999; 54:635-640.
2. Zuckerman J.D. Hip fracture N Engl J Med. 1996; 334- 1525
3. Dobbs R.E., Parrizi J. Lewallen D.G. Perioperative morbidity and 30 day mortality after intertrochanteric hip fractures treated by internal fixation or Arthroplasty.J Arthroplasty. 2005;20: 963-966.
4. K.j. Koval and J.D Zuckermann, Handbook of fractures ,Lippincott Williams & Wilkins, 3rd edition, 2006.
5. A.A. Suckel, K. Dietz, N. Wuelkar and P. Helwig, Evaluation of complication of three different types of proximal extra auricular femur fractures difference in complications, age , sex , & Surviving rates. International orthopaedics, 2007;31: 689-695.
6. C. Sadowski, A. Lubbeke, M. Saudan,et.al: Treatment of reverse oblique & transverse intertrochanteric fractures with use of an intramedullary nail or a 95o screw plate: a prospective , randomized study’’; JBJS- series A 2002;84:372-381.
7. J.E. Madsen,L.Naess, A.K. Aune, A. Alno, A. Ekeland and K. Stromsoe: ‘’ Dynamic hip screw with trochanteric stabilizing plate in the treatment of unstable proximal femoral fractures a comparative study with the gamma nail &compression hip screw,’’; Journal of Orthopaedic trauma, 1998 vol. 12, no 4, pp. 241-248.
8. Kregor PJ, Obremskey WT, Kreder GH, Swiontkow MF: Evidence Based Orthopaedic trauma working group instable pertrochanteric femoral fractures. J orthop trauma 2005; 19:63-6.
9. Min WK, Kim SY, Kim TK, Lee KB et al : Proximal femoral nail for the treatment of reverse obliquity intertrochanteric fractures compared with gamma nail; J trauma 2007;63: 1054-60
10. Parker MJ,Handoll HH. Intramedullary nails for extracapsular hip fractures in adults. Cochrance Database sys Rev 2006; 19 (3) : CD004961
11. Byrd JW, Jones KS. Prospective analysis of hip arthroscopy with 2 year follow up; Arthroscopy. 2000: 16 (6): 578-87.
12. Surgical exposures in orthopaedics. 4thedi. The femur. Stanley Hoppenfield pp 464-67.
13. Master technique in orthopaedic surgery. 3rdedi. Subtrochanteric femur fractures. DoaldA .Wiss pp 352-56
14. Helmy N, J andoVt, Lu T etal. Muscle function & functional outcome following standard antegrade reamed intramedullary nailing of

isolated femoral shaft fractures J orthop Trauma 2008; 22: 10-15.
15. Archdeacon M, Ford KR, Wyrich J, et al. A prospective functional outcome and motion analysis evaluation of the hip abductors after femur fracture and antegrade nailing j orthop trauma 2008; 22: 3-9.
16. Haidukewych GJ, Berry DJ. Salvage of failed treatment of hip fractures. Jam AcadOrthopSurg 2005; 13: 1010-9.
17. M. Ahmad, R. Nanda , A.S. Bajwa, J. Candal-couto, S. Green, and A.C. HI, ''Biomechanical testing of the locking compression plate. When does the distance between bone and implant significantly reduce construct Stability?'' Injury 2007; Vol 38, no. 3, pp 358-364.
18. Khan N, Askar Z, AhmaedI . Intertrochanteric fracture of femur; outcome of dynamic hip screw in elderly patients professional;Med.J. 2010; 17: 328-33.
19. Rockwood & Green's fractures in adults, Vol.2, 7th ed. Intertrochanteric fractures. Thomas A Russell pp 15976-1600.
20. Weller I ,Wai EK, Janglal S, Kreder HJ, The effect of hospital type and surgical delay on mortality rate after surgery for hip fracture. JBJS Br. 2005; 87: 361-6.
21. Medoff R.M. A new device for the fixation of unstable pertrochanteric fractures of the hip. JBJS Am. 1991; 73 (8) : 1192-1199.
22. Knobe Mathias, GradlGertraud, Burger Andreasladen, TarkinIvans. 2013 clinical orthopaedics & Related Research.11999-013-2834-9.
23. Campbell canale St, Beaty JH. Campbell's operative orthopaedics. 11th ed. Philladelphia PA: Mosby; 2008.
24. Rockwood CA, Green DP, Bucholz RW. Rockwood & Green's fractures in adults . 7th ed. Philadlphia PA: wolters Kluwer Health LippincottWilliams& Wilkins; 2010 .
25. Yong c, Tan C, Penafort R. Dynamic hip Screw Compared to condylar blade plate in the treatment of unstable fragility intertrochanteric fractures. Malays Orthop J. 2009; 3: 13-8
26. Nungu K.S, O levod C, RehnbergL . Treatment of subtrochanteric fractures with the AO dynamic condylar screw; Injury 1993; 24: 90-92.
27. Butt Krikler S.J. Nafie Ali. Comparison of dynamic hip screw and gamma nail; a prospective randomized controlled trial. Injury 1995; 26 (9) : 615-18
28. Watson J.I. Moed B.R. lpsilateral femoral neck and shaft fractures; complications and their treatment .Clinortho related research. 2002; 399: 78
29. Siebenrock KA, Muller U, Ganz R. Indirect reduction with a condylar blade plate for osteosynthesis of subtrochanteric femoral fractures. Injury 1998; 29 : C7-15.
30. Yoo MC, Cho YJ, Kim KI, Khairuddin M, Chun YS. Treatment of unstable peritrochanteric femoral fractures using a 95 ^{o} degrees angled blade plate. J orthop trauma 2005; 19: 687-92.