Original Article

Functional and radiological outcome of condylar buttress plate in patients with intra-articular distal femoral fracture

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Objective: To determine the functional and radiological outcome of condylar buttress plate in patients with intra-articular distal femoral fracture at tertiary care hospital of Karachi, Pakistan.

Methodology: Consecutive patients presenting with intra-articular distal femoral fracture underwent surgical management with condylar buttress plate implant. Functional outcome at 12th week postoperatively was categorized as per the Schatzker and Lambert criteria. Acceptable outcome was defined as good to excellent functional outcomes along with evidence of union on radiological examination.

Results: There were 66 (73.3%) male patients in total of 90 recruited patients with mean age of 37.6±8.7 years and mean weight was 62.1±6.5 kg. Functional outcome after 12 weeks were excellent in 49(54.4%) and good in 30(33.3%) patients. Radiological evidence of union was observed in 86(95.6%) and was acceptable in 79(87.8%) patients.

Conclusion: The functional and radiological outcome of condylar buttress plate was found satisfactory in patients with intra-articular distal femoral fracture. (Rawal Med J 202;46:98-101).

Keywords: Distal femoral fractures, condylar buttress plate, functional outcome.

INTRODUCTION

Distal femoral fractures (DFF), mostly caused by high-energy trauma in young or fall in elderly population, account for around 4 to 7% of the femoral fractures in the adult patients, and nearly 31% of the DFF involve distal portion with an incidence rate of 37 per hundred thousand patients per year.[1-5] Functional and anatomic restoration of DFF remains a formidable challenge in clinical practice due to inherent fracture complexity, osteoporotic bone, unstable nature and degree of comminution, thin cortices, intra-articular involvement, and short articular segment.[4-7] No management method has been considered as standard of care due to associated frequent complications such as compromised knee function or stiffness, delayed or non-union, malalignment, prolonged hospitalization, implant failure, infection, and higher mortality rate.[3,5,7,9]

Relative rarity and diversity of DFF make it difficult to establish a gold standard management protocol, however, surgical restoration and fixation are the general recommendations and non-surgical management is reserved for too frail or non-ambulatory patients.[5,7] In cases with significant bone loss, multiple surgical attempts for limb reconstruction, restoration are time consuming and demanding, both financially and psychologically, for the patients.[1,5,9] The primary goal of the management of DFF is anatomic restoration of the articular surface, rigid fixation without external immobilization, restoration of limb alignment, length, and motion, and optimum functional recovery and early mobilization.[3,9]

Surgical management options have shown superiority over non-surgical methods.[9,10] Various surgical methods adopted include antegrade or retrograde intramedullary nailing, locking plates fixation, fixed-angle blade plates, and dynamic condylar screw (DCS).[4,9,11] However, use of fixed angle devices such as DCS and condylar blade plate is limited in comminuted fractures as it requires certain amount of bone stock, therefore, condylar buttress plate have been developed for these

fractures. However, local data on effectiveness of condylar buttress plate for the management of intra-articular distal femoral fracture is scarce. Hence, aim of this study was to determine the functional and radiological outcome of condylar buttress plate in patients with intra-articular distal femoral fracture at our institution.

METHODOLOGY

This prospective observational study was conducted at the department of orthopedics, Jinnah Postgraduate Medical Center, Karachi, Pakistan. After taken approval form the institutional review board (IRB), patients presenting with intra-articular distal femoral fracture from January to July 2013 were recruited for the study. Inform consent was obtained from all patients. inclusion criteria entailed patients of either gender, age between 18 to 60 years, AO type C3 fracture, presenting within seven days of injury, and American Society of Anesthesiology (ASA) status I or II. Patients with ASA status of III or IV, patients with bleeding diathesis, patients with pathological fractures or Paget's disease, or patients with immune compromised patients like uncontrolled diabetes mellitus, cardiovascular diseases (CVD), and malignancy were excluded.

Surgical management was performed by the consultant with more than five years of post-fellowship experience with condylar buttress plate implant. Post-operative rehabilitation protocol was same for all the patients, with gradual increase in the range of motion and full weight bearing was allowed after radiological evidence of callus. All the patients were followed as outpatients at the end of 2nd week, 4th week, 8th week, and final outcome was measured at the end of 12th week postoperatively. Sample size n=90 for this study was calculated at 95% confidence level, and 10% error margin with least expected proportion of acceptable outcome as 37% as reported in a past study.[3]

Functional outcome was categorized as per the Schatzker and Lambert criteria for the functional assessment of femur fracture.[12] Acceptable outcome was defined as good to excellent functional outcomes along with evidence of union on radiological examination at 12th week postoperatively.

Statistical Analysis: Statistical analysis was performed using SPSS version 21. Potential effect modifiers such as age, gender, and weight were controlled through stratification and post stratification Chi-square test was performed with significance criteria of p-value ≤ 0.05.

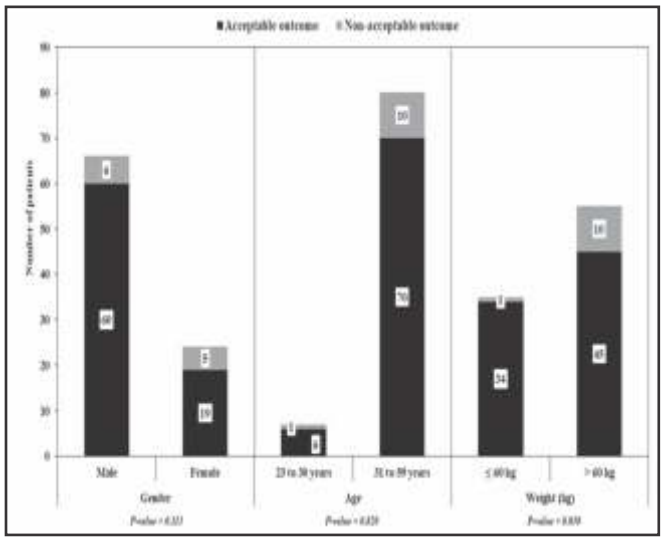
RESULTS

There were 66 (73.3%) male patients in total of 90 recruited patients with mean age of 37.6±8.7 years and mean weight was 62.1±6.5 kg (Table). Functional outcome after 12 weeks postoperative were categorized as excellent 54.4% (49) and good in 33.3% (30). Radiological evidence of union was observed in 95.6% (86) and acceptable outcome was found in 87.8% (79) patients.

Table. Patients' demographic characteristics, radiological and functional outcome (n=90).

Characteristic	Total
Gender	
Male	73.3% (66)
Female	26.7% (24)
Age (years)	37.6 ± 8.7
23 to 30 years	11.1% (10)
31 to 59 years	88.9% (80)
Weight (kg)	62.1 ± 6.5
≤ 60 kg	38.9% (35)
> 60 kg	61.1% (55)
Functional outcome: Schatzker and Lambert classification	
Excellent	54.4% (49)
Good	33.3% (30)
Moderate	7.8% (7)
Poor	4.4% (4)
Radiological outcome	
Union	95.6% (86)
Non-union	4.4% (4)
Acceptable outcome	87.8% (79)

Fig. Acceptable outcome stratified by age, gender, and weight.



Stratification of age group showed that patients with ≤30 years of age have slightly higher, but insignificant, acceptable outcome as compared to the patients with >30 years, 90% vs. 87.5%; p=0.820). Similarly, gender wise stratification showed that male patients have slightly higher, but insignificant, acceptable outcome as compared to female patients, 90.9% vs. 79.2%; p=0.133). However, stratification by weight showed that patients with ≤60 kg weight have significantly higher acceptable outcome as compared to the patients with patients with > 60 kg weight, 97.1% vs. 81.8%; p=0.030 (Fig.).

DISCUSSION

Management of DFF remains a clinical challenge due to lack of standard management guidelines and consensus treatment modality due to complex nature of the fracture often comminuted and intra-articular in nature.[10] Currently preferred treatment options are exclusively surgical, various surgical methods and implants evolve over the years, with these innovative techniques, such as percutaneous plating, multiple fracture type can be managed with minimally invasive methods.[6,7,9,13,14,15]

There are three broad categories of available management options, intramedullary nailing, bridge plating, and open anatomical reduction fixation with plate and screw.[13] Several factors shape up the selection of appropriate implant for the management of DFF such as pattern and type of fracture, articular involvement, degree of comminution, quality of the bone, availability, and surgeon experience.[13] The DCS overcome the challenge allowing freedom in flexion and extension plane, however, the major disadvantage of DCS is it requires removal of large amount of bone for the condylar lag screw and in cases wherever revision surgery needed it make it difficult. The later evolution of implants is condylar buttress plate, allowing multiple screws in comminuted fragments.[6]

Outcome did not differ by gender or age but patients with less body weight (≤ 60 kg) were found to have relatively higher rate of acceptable outcome as compared to their high (> 60 kg) body weight counterpart. In various clinical setting, the reported satisfactory results vary from 50 to 84% with fracture union rate of 90 to 100% without needing bone grafting.[3,16,17,18] Loss of firm interface between the plate and screw may cause complications such as packing out of the screw and varus collapse.[19] Subsequent overcoming include bone graft, additional plates, angulation of screws, and locked buttress plate.[20-24]

It has been argued that more recently introduced treatment options such as distal femoral locked plate fixation, DCS fixation, locking compression plate, and Ilizarov fixator methods showed more effectiveness in achieving acceptable functional outcomes with adequate alignment, and high rate of union.[3,5,6,13] Further multicenter randomized studies are needed to formulate the optimal management strategy and guidelines for the patients with intra-articular DFF.

CONCLUSION

Condylar buttress plate is an effective management modality of intra-articular distal femoral fracture with satisfactory acceptable functional and radiological outcomes. It can be readily available and relatively less expensive treatment option in clinical setups of low and middle income countries like Pakistan.

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Conflict of Interest: None declared
Rec. Date: Aug 31, 2020 Revision Rec. Date: Nov 21, 2020 Accept Date: Dec 29, 2020

REFERENCES

1. Iyengar R, Cherukuri N, Patnala C. Reconstruction of Traumatic, Open Supracondylar Femoral Fractures by Autologous Fibular Strut Grafting and Cortico-Cancellous Bone Grafting—A Single-Centre, Observational Study. J Orthop Trauma 2018;32:75-81.
2. Yuvarajan P, Kaul R, Maini L. Review of concepts in distal femoral fractures management. Pb J Orthop 2009;11:44-8.
3. Petsatodis G, Chatzisymeon A, Antonarakos P, Givissis P, Papadopoulos P, Christodoulou A. Condylar buttress plate versus fixed angle condylar blade plate versus dynamic condylar screw for supracondylar intra-articular distal femoral fractures. J Orthop Surg 2010;18:35-8.
4. Padha K, Singh S, Ghani A, Dang H. Distal femur fractures and its treatment with distal femur locking plate. JK Sci 2016;18:76-80.
5. Ahmed AS, Tabl EA. Treatment of open intraarticular distal femur fractures by Ilizarov fixator; an approach to improve the outcome with mid-term results. Injury 2019;50:1731-8.
6. Machhi R, Namsha B, Dindod V. Outcome of intra articular distal femur fracture treated with locking compression plate. Int J Orthop 2017;3:503-7.
7. Chen F, Li R, Lall A, Schwechter EM. Primary Total Knee Arthroplasty for Distal Femur Fractures: A Systematic Review of Indications, Implants, Techniques, and Results. Am J Orthop 2017;46:E163.
8. Virk JS, Garg SK, Gupta P, Jangira V, Singh J, Rana S. Distal femur locking plate: the answer to all distal femoral fractures. J Clin Diagn Res 2016;10:RC01-5.
9. von Keudell A, Shoji K, Nasr M, Lucas R, Dolan R, Weaver MJ. Treatment options for distal femur fractures. J Orthop Trauma 2016;30:25-7.
10. Ehlinger M, Ducrot G, Adam P, Bonnomet F. Distal femur fractures. Surgical techniques and a review of the literature. Orthop Traumatol Surg Res 2013;99:353-60.
11. Hassankhani EG, Birjandinejad A, Kashani FO, Hassankhani GG. Hybrid External Fixation for Open Severe Comminuted Fractures of the Distal Femur. Surg Sci 2013;4:176-83.
12. Schatzker J, Lambert DC. Supracondylar fractures of the femur. Clin Orthop Relat Res 1979;138:77-83.
13. El Mwafy HM, Abd El Gawad MM, El Din AF, Youssef WM. Surgical treatment of distal femoral fractures using a distal femoral locked plate versus a condylar buttress plate. Menoufia Med J 2015;28:948-53.
14. Kregor PJ, Stannard JA, Zlowodzki M, Cole PA. Treatment of distal femur fractures using the less invasive stabilization system: surgical experience and early clinical results in 103 fractures. J Orthop Trauma 2004;18:509-20.
15. Vallier HA, Hennessey TA, Sontich JK, Patterson BM. Failure of LCP condylar plate fixation in the distal part of the femur: A report of six cases. J Bone Joint Surg Am 2006;88:846-53.
16. Weng CJ, Wu CC, Feng KF, Tseng IC, Lee PC, Huang YC. High incidence of varus deformity in association with condylar buttress plates used to treat supraintercondylar fracture of the femur. Formos J Musculoskelet Disord 2012;3:50-5.
17. Sié EJ, Mobiot CA, Traoré A, Lambin Y. Distal femoral fractures treated with condylar buttress plate in a West African hospital. J Clin Orthop Trauma 2012;3:98-102.
18. Kolb K, Grützner P, Koller H, Windisch C, Marx F, Kolb W. The condylar plate for treatment of distal femoral fractures: a long-term follow-up study. Injury. 2009;40(4):440-8.
19. Albert MJ. Supracondylar fractures of the femur. J Am Acad Orthop Surg 1997;5:163-71.
20. Hui LI, Ding ZQ, Zhai WL, Kang LQ, Yao XT. Bone splint technique and plating application in adolescent high-energy comminuted fracture of distal femur with bone defects. Chin J Traumatol 2008;11:58-61.
21. Ziran B, Rohde R, Wharton A. Lateral and anterior plating of intra-articular distal femoral fractures treated via an anterior approach. Int Orthop 2002;26:370-3.
22. Simonian PT, Thompson GJ, Emley W, Harrington RM, Benirschke SK, Swiontkowski MF. Angulated screw placement in the lateral condylar buttress plate for supracondylar femoral fractures. Injury 1998;29:101-4.
23. Haidukewych GJ, Ricci W. Locked plating in orthopaedic trauma: a clinical update. J Am Acad Orthop Surg 2008;16:347-55.
24. Haidukewych GJ. Innovations in locking plate technology. J Am Acad Orthop Surg 2004;12:205-12.