Open Access Indonesian Journal of Medical Reviews
Journal Homepage: https://hmpublisher.com/index.php/OAIJMR

Locking Plates on Femoral Fractures: A Narrative Literature Review

Satria Putra Wicaksana[1*]

[1]Department of Orthopaedic and Traumatology, Faculty of Medicine, Universitas Sriwijaya/Dr. Mohammad Hoesin General Hospital, Palembang, Indonesia

ARTICLE INFO

Keywords:
Femoral fractures
Fixation
Humerus fractures
Plate fixation
Prosthetic replacement

***Corresponding author:**
Satria Putra Wicaksana

E-mail address:
satriaputrawicaksana@gmail.com

The author has reviewed and approved the final version of the manuscript.

https://doi.org/10.37275/oaijmr.v1i4.47

A B S T R A C T

Plate fixation is still the most preferred method in treating distal femoral fractures. This literature review aimed to describe the locking plates on femoral fractures. Management of proximal humerus fractures remains a difficult problem for the orthopedic surgeon. In the setting of displaced fractures, there is no consensus on the best treatment option, with some studies favoring prosthetic replacement and others favoring reduction and plate fixation. The heterogeneity of multiple factors in the literature, including patient population, fracture type, and outcome measures reported, makes it difficult to determine the best treatment option for a given fracture pattern. Avascular necrosis is one of the most severe complications following open reduction internal fixation of proximal humerus fractures. In conclusion, the fixation of proximal humerus fractures with fixed-angle locking plates is a relatively new advancement in the field of orthopedics that has rapidly increased in popularity. Despite promising clinical results, there remains a high rate of complications that require further surgery, suggesting that the surgical technique should be used carefully and only in well-selected patients.

1. Introduction

Many fixation techniques have been described, from tension banding, intramedullary nailing, and plate fixation. Displaced and comminuted proximal humerus fractures pose complex management problems for the orthopedic surgeon. There is different consensus concerning the best treatment option for each patient: non-operative management, internal fixation, or prosthetic replacement. In biomechanical analysis, locking plates demonstrate significantly greater torsional stability in a cadaveric model, suggesting better clinical performance than non-locking plates. Clinically, many studies have shown that locking plates provide high union rates for displaced proximal humerus fractures.[1-3]

Plate fixation is still the most preferred method in treating distal femoral fractures. In most severe injuries, accompanied by medial support loss (33-A3, 33-C2, and 33-C3 fracture types according to AO classification), the use of both the lateral and the medial plate to achieve stable osteosynthesis has been discussed. The surgeon can use osteosynthesis for distal femur fracture treatment, plating, nailing, or trans-osseous osteosynthesis. However, only some available studies prove that their results are comparable.[4,5] However, the majority of surgeons prefer plating. It is associated with several advantages. The main one is that plating is possible for any fracture, which is especially important in the case of intra-articular multi-fragmented fractures of the distal femur. This literature review aimed to describe the locking plates on femoral fractures.

Management of femoral fractures

Plating for managing fractures in such locations was first applied in the 1960s. Since then, many plates would compare the treatment results using one versus two. Management of proximal humerus fractures remains a difficult problem for the orthopedic surgeon. In the setting of displaced fractures, there is no consensus on the best treatment option, with some studies favoring prosthetic replacement and others favoring reduction and plate fixation.[7,8] The heterogeneity of multiple factors in the literature, including patient population, fracture type, and outcome measures reported, makes it difficult to determine the best treatment option for a given fracture pattern.

Shoulder range of motion following open reduction internal fixation with a proximal humerus locking plate is one of, if not the most important, outcomes concerning post-operative patient function. Therefore, it was surprising that only two studies specifically commented on a range of motion as one of the outcomes of interest. While it is true that range of motion is a significant component of the constant score, including other variables such as pain, strength, and ability to sleep in this score makes it only a rough proxy for an actual patient's range of motion. Further study is needed to evaluate a post-operative range of motion after the proximal humerus locking plate and how it relates to patient function.[9,10]

Fixation technique and its complication

Avascular necrosis (AVN) is one of the most feared complications following open reduction internal fixation of proximal humerus fractures. AVN can develop as long as five years after injury. This phenomenon is supported by the observation that studies with longer follow-ups usually also report higher rates of AVN.[11] Similarly, the adverse outcomes associated with AVN, including pain, decreased range of motion, and glenohumeral joint arthritis, can take years to develop. This may explain why so few patients in this review required joint replacement surgery, given that the average follow-up was only 29.2 months. The fixation technique has also contributed to AVN, especially in plate fixation, given the need for extensive soft tissue dissection. The most important risk factor for varus malunion is loss of the medial cortical buttress from fracture comminution at this location.[12] The high rate of complication is important because a varus malunited fracture is more likely to be complicated by both screws cut out and subacromial impingement, both common problems that often require revision surgery to correct. Biomechanical studies show potential benefits over standard plating techniques, including improved rigidity and stability at the fracture site, especially in severe comminution or osteoporotic bone cases. Further advances in the technology for treating these injuries may be associated with designing an "anatomical" medial plate and a method for its minimally invasive implantation. The development of a lateral plate that could provide stability similar to bilateral osteosynthesis seems even more prospective. Undoubtedly, such a plate would also be helpful in limb reconstruction surgery for changing the external fixation to an internal one after deformity correction and limb lengthening.[10-12]

2. Conclusion

Fixation of proximal humerus fractures with fixed-angle locking plates is a relatively new advancement in the field of orthopedics that has rapidly increased in popularity. Despite promising clinical results, there remains a high rate of complications that require further surgery, suggesting that the surgical technique should be used carefully and only in well-selected patients.

3. References

1. Bottlang M, Fitzpatrick DC, Sheerin D, Kubiak E, Gellman R. Dynamic fixation of distal femur fractures using far cortical locking screws: a prospective observational study. J Orthop Trauma. 2014; 28(4): 181–8.
2. Ries Z, Hansen K, Bottlang M, Madey S, Fitzpatrick D, Marsh JL. Healing results of

periprosthetic distal femur fractures treated with far cortical locking technology: a preliminary retrospective study. Iowa Orthop J. 2013; 33: 7–11.

3. Khursheed O, Wani MM, Rashid S, Lone AH, Manaan Q. Results of treatment of distal extra: articular femur fractures with locking plates using minimally invasive approach—experience with 25 consecutive geriatric patients. Musculoskelet Surg. 2015; 99(2): 139–47.
4. Doshi HK, Wenxian P, Burgula MV, Murphy DP. Clinical outcomes of distal femoral fractures in the geriatric population using locking plates with a minimally invasive approach. Geriatr Orthop Surg Rehabil. 2013; 4(1): 16–20.
5. Vallier HA, Immler W. Comparison of the 95-degree angled blade plate and the locking condylar plate for the treatment of distal femoral fractures. J Orthop Trauma. 2012; 26(6): 327–32.
6. Griffin XL, Parsons N, Zbaeda MM, McArthur J. Interventions for treating fractures of the distal femur in adults. Cochrane Database Syst Rev. 2015; 8: CD010606.
7. Kammerlander C, Riedmuller P, Gosch M, Zegg M, Kammerlander-Knauer U. Functional outcome and mortality in geriatric distal femoral fractures. Injury. 2012; 43(7): 1096–101.
8. 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(3): 353–60.
9. Hartin NL, Harris I, Hazratwala K. Retrograde nailing versus fixed-angle blade plating for supracondylar femoral fractures: a randomized controlled trial. ANZ J Surg. 2006; 76(5): 290–4.
10. Schmal H, Strohm PC, Jaeger M, Sudkamp NP. Flexible fixation and fracture healing: do locked plating 'internal fixators' resemble external fixators? J Orthop Trauma. 2011; 25(Suppl1): S15–20.
11. Fragomen AT, Rozbruch SR. The mechanics of external fixation. HSS J. 2007; 3(1): 13–29.
12. Ricci WM, Streubel PN, Morshed S, Collinge CA, Nork SE, Gardner MJ. Risk factors for failure of locked plate fixation of distal femur fractures: an analysis of 335 cases. J Orthop Trauma. 2014; 28(2): 83–9.