

Case Report

A case report of recalcitrant non union humerus treated with on lay fibular bone grafting and locking compression plate

Vivekananda Bheemisetty, Rentala Vamshi*, S. Sreenivasa Reddy, Y. Thimma Reddy

Department of Orthopaedics, Osmania Medical College, Koti, Hyderabad, Telangana, India

Received: 23 November 2017

Revised: 09 January 2018

Accepted: 11 January 2018

***Correspondence:**

Dr. Rentala Vamshi,

E-mail: vamc.rentala@gmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Nonunion of diaphyseal fractures of the humerus are frequently seen in clinical practice (incidence of up to 15% in certain studies) and osteosynthesis using dynamic compression plates, intra medullary nails and Ilizarov fixators have been reported previously. Locking compression plates (LCP) are useful in the presence of disuse osteoporosis, segmental bone loss and cortical defects that preclude strong fixation. Fixation using a compression plate and a non-vascularised fibular graft achieves good outcome for infected non-union of the humerus despite prior multiple failed surgeries. We report a failed case of fracture shaft humerus which was operated three times, first with DCP and next two times with DCP and autologous cancellous bone graft from iliac crest. The patient is now treated with LCP and on lay fibular bone grafting.

Keywords: Non union humerus, On lay fibular grafting, Locking compression plate

INTRODUCTION

The incidence of nonunion of humerus has been as high as 15% of all humeral fractures.¹ Various devices such as dynamic compression plates (DCP), angled blade plates, wave plates, autograft or allograft struts, locked intramedullary nails and Ilizarov external fixators have been used in the management of nonunion of fractures of humeral diaphysis.² Very few studies have been published about the use of locking compression plate (LCP) in the management of a nonunion of humeral fractures.^{3,4} LCP is a useful implant in the presence of poor bone quality due to disuse osteoporosis, stress shielding from the previous plate, enlarged screw holes of previous loose screws, cortical thinning due to a loose intramedullary nail and segmental bone defect due to nonunion.

CASE REPORT

A 35 year old male patient by name Mujeeb Ali came to the hospital with chief complaints of pain in the right arm and inability to use the arm since 7 months, which was operated 3 times in a period of three years from 2012-2015. His activities of daily living are affected. Patient sustained an injury due to fall from a 2 wheeler vehicle, 3 years back and developed pain, swelling, deformity and loss of function at the time of injury. The radiograph of the right arm showed a fracture of distal third of shaft of the humerus (Figure 1A). He was operated for the same, 3 years back by ORIF (open Reduction Internal Fixation) using DCP (Figure1B). The patient developed pain and deformity of the arm 9 months later. The radiograph showed nonunion of the fracture (Figure 2A) and was operated for the same by ORIF using DCP for humerus and also with autologous cancellous bone graft (Figure 2B). The patient again developed similar complaints in 9

months. The radiograph showed nonunion of the fracture (Figure 3A), for which he was operated again by Implant extraction and ORIF using DCP humerus and autologous cancellous bone graft (Figure 3B).

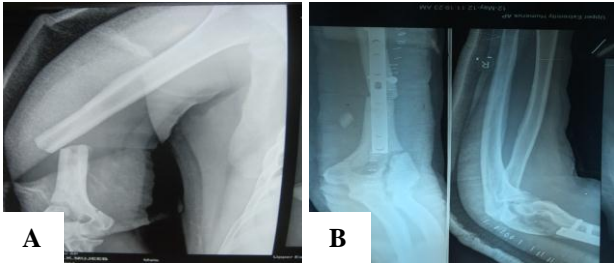


Figure 1 (A and B): Fracture of the shaft humerus treated with dynamic compression plate (DCP).



Figure 2 (A and B): Non union of fracture of the shaft humerus treated with implant extraction and ORIF with DCP and autologous cancellous bone grafting, 9 months later.

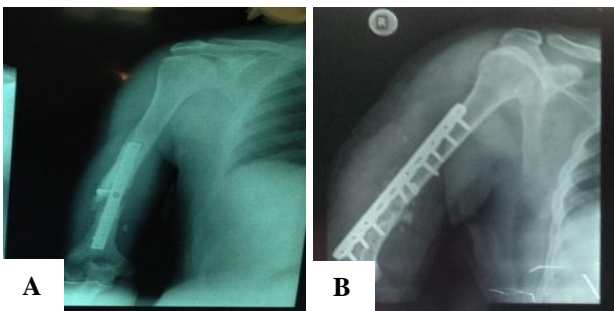


Figure 3 (A and B): Non union of fracture of the shaft humerus treated with implant extraction and ORIF with DCP and autologous cancellous bone grafting, 18 months later.

MANAGEMENT

Routine blood investigations were normal. Radiograph of the right arm, both antero posterior and lateral views were taken, which showed post operative case of DCP humerus with non union of fracture shaft humerus (Figure 4A). Pre anaesthetic clearance was taken before surgery. Posterior approach was followed and autologous fibular graft is taken from same side and on lay grafting done. 10 holed locking plate was used with 5 screws proximal and 4 distal screw fixation (Figure 4B). The

patient developed radial nerve palsy for which a cock up splint was applied.

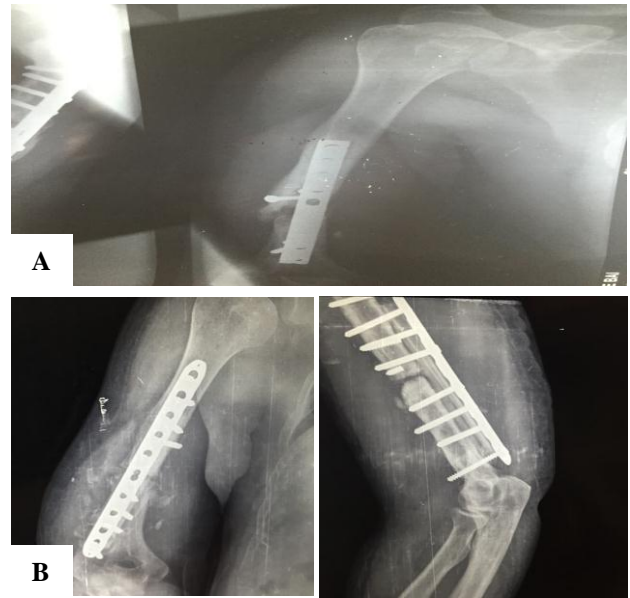


Figure 4 (A and B): Non union of fracture of the shaft humerus treated with implant extraction and ORIF with LCP and autologous On lay fibular Bone grafting, 25 months later.

Patient was not allowed to lift weights for 6 weeks and full range of elbow movements advised. Extension of the wrist using dynamic cock-up splint was advised. Radial nerve palsy resolved within 2 months of follow up.

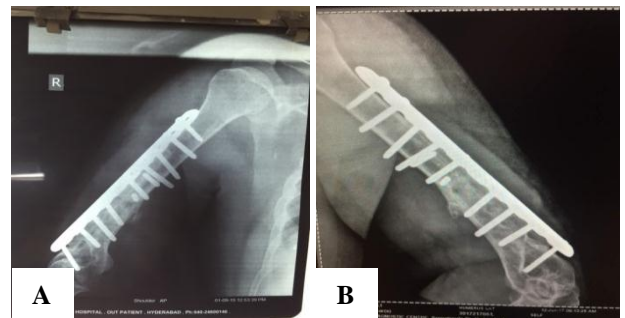


Figure 5 (A-C): Post operative x-rays taken 8 months and 18 months after the ORIF with LCP with autologous on lay fibular bone grafting showing bony union in both the xrays. Good range of motions was achieved.

Patient was followed up for 18 months. Radiographs were taken 8 months (Figure 5A) and 18 months (Figure 5B) post surgery. Complete union of the fracture was noticed in the radiographs. Good range of movements were achieved (Figure 5C).

DISCUSSION

The quality of the soft-tissue envelope, the blood supply around the fracture, mechanical stability at the fracture site, and biologic revitalisation are important for deciding the treatment modality.⁵ Poor bone quality or bone stock, scar tissue near neurovascular structures and anatomic boundaries are challenges for treating non-unions. Plate fixation is the gold standard for treating non-unions. It enables compression, correction of axis malalignment, and stimulation of osteogenesis (shingling, grafting) in a single procedure.^{6,7} Its union rate is reported to be 83 to 100%, with high subjective satisfaction.^{8,9} Among various plating techniques, compression plating with autologous grafting has yielded 92 to 100% healing rates.^{5,10,11} External fixation conserves the soft-tissue envelope and the vitality of remaining bone. This technique can be applied to osteoporotic and/ or infected bones.¹² The fixator enables gradual compression of the non-union site, mimicking the weight-bearing status of the lower extremity.^{13,14} Circular fixators have been successful in treating all types of non-unions including those of the humerus.¹⁵ This technique gradually corrects displaced, angulated, shortened, and malunited fragments during the treatment. With controlled periods of compression and distraction, healing is stimulated and the quality of regenerated bone is improved. Gradual realignment and compression of the nonunion site are possible during the treatment, whereas reduction and static compression are achieved in the second-stage plate fixation.^{16,17} External fixation is superior to internal fixation when the nonunion is complicated by deformity, infection, bone loss, and length discrepancy. However, the bulkiness of the frame and numerous wires are discomforting to patients. Non-vascular fibular strut grafting in conjunction with compression plating achieves bone union without the need of cancellous iliac crest grafts in osteoporotic, atrophic humeral non-unions.¹⁸ This technique is easy, economical, and associated with less donor-site morbidity. The fibula acts as an internal splint and adds stability for osteosynthesis, and increases screw cortical purchase and thus resistance to screw pull-out. It also shares the load and helps bone growth and integration.¹⁸

CONCLUSION

To conclude LCP is reliable in achieving union even in patients belonging to the younger age group with higher activity levels. LCP seems to fare well even in the presence of significant bone loss requiring strut grafts. The DCP is perhaps useful in the management of nonunion of humerus following conservative management (without previous implant). However, in the

management of nonunion of humerus following a previously failed DCP or IM nail without infection, the LCP should probably be the implant of choice and autologous fibular strut grafts may be necessary to accelerate union.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: Not required

REFERENCES

1. Ring D, Perey BH, Jupiter JB. The functional outcome of operative treatment of ununited fractures of the humeral diaphysis in older patients. *J Bone Joint Surg Am.* 1999;81:177–90.
2. Jupiter JB, Wyss H. Stable fixation of osteoporotic fractures and nonunions in the upper limb-life before the “locking plate” *Acta Chir Orthop Traumatol Cech.* 2010;77:361–4.
3. Ring D, Kloen P, Kadzielski J, Helfet D, Jupiter JB. Locking compression plates for osteoporotic nonunions of the diaphyseal humerus. *Clin Orthop Relat Res.* 2004;425:50–4.
4. Nadkarni B, Srivastav S, Mittal V, Agarwal S. Use of locking compression plates for long bone nonunions without removing existing intramedullary nail: Review of literature and our experience. *J Trauma.* 2008;65:482–6.
5. Rubel IF, Kloen P, Campbell D, Schwartz M, Liew A, Myers E, et al. Open reduction and internal fixation of humeral nonunions: a biomechanical and clinical study. *J Bone Joint Surg Am.* 2002;84:1315–22.
6. Otsuka NY, McKee MD, Liew A, Richards RR, Waddell JP, Powell JN, et al. The effect of comorbidity and duration of nonunion on outcome after surgical treatment for nonunion of the humerus. *J Shoulder Elbow Surg.* 1998;7:127–33.
7. Jupiter JB, Mullaji AB. Blade plate fixation of proximal humeral non-unions. *Injury.* 1994;25:301–3.
8. Kumar A, Sadiq SA. Non-union of the humeral shaft treated by internal fixation. *Int Orthop.* 2002;26:214–6.
9. Ring D, Jupiter JB, Quintero J, Sanders RA, Marti RK. Atrophic ununited diaphyseal fractures of the humerus with a bony defect: treatment by wave-plate osteosynthesis. *J Bone Joint Surg Br.* 2000;82:867–71.
10. Barquet A, Fernandez A, Luvizio J, Masliah R. A combined therapeutic protocol for aseptic nonunion of the humeral shaft: a report of 25 cases. *J Trauma.* 1989;29:95–8.
11. Segonds JM, Alnot JY, Masmajeun E. Aseptic non-union of humeral shaft fractures treated by plating and bone grafting [in French]. *Rev Chir Orthop Reparatrice Appar Mot.* 2003;89:107–14.
12. MartinezAA, HerreraA, Cuenca J. Good results with unreamed nail and bone grafting for humeral

- nonunion: a retrospective study of 21 patients. *Acta Orthop Scand*. 2002;73:273–6.
13. Dendrinos GK, Kontos S, Lyritsis E. Use of the Ilizarov technique for treatment of non-union of the tibia associated with infection. *J Bone Joint Surg Am*. 1995;77:835–46.
 14. Fattah HA, Halawa EE, Shafy TH. Non-union of the humeral shaft: a report on 25 cases. *Injury*. 1982;14:255–62.
 15. Kocaoglu M, Cakmak M, Basturk S, Tuncay I. Ilizarov method in pseudoarthrosis of long tubular bones, treatment and clinical results. *Acta Orthop Traumatol Turc*. 1996;30:120–4.
 16. Ilizarov GA. The tension-stress effect on the genesis and growth of tissues. Part 1. The influence of stability of fixation and soft-tissue preservation. *Clin Orthop Relat Res*. 1989;238:249–81.
 17. Martinez AA, Herrera A, Perez JM, Cuenca J, Martínez J. Treatment of humeral shaft nonunion by external fixation: a valuable option. *J Orthop Sci*. 2001;6:238–41.
 18. Vidyadhara S, Vamsi K, Rao SK, Gnanadoss JJ, Pandian S. Use of intramedullary fibular strut graft: a novel adjunct to plating in the treatment of osteoporotic humeral shaft nonunion. *Int Orthop*. 2009;33:1009–14.

Cite this article as: Bheemisetty V, Vamshi R, Reddy SS, Reddy YT. A case report of recalcitrant non union humerus treated with on lay fibular bone grafting and locking compression plate. *Int J Res Orthop* 2018;4:342-5.