Case Report

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

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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. 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. Very few studies have been published about the use of locking compression plate (LCP) in the management of a nonunion of humeral fractures. 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. 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. Its union rate is reported to be 83 to 100%, with high subjective satisfaction. Among various plating techniques, compression plating with autologous grafting has yielded 92 to 100% healing rates. External fixation conserves the soft-tissue envelope and the vitality of remaining bone. This technique can be applied to osteoporotic and/or infected bones. The fixator enables gradual compression of the non-union site, mimicking the weight-bearing status of the lower extremity. Circular fixators have been successful in treating all types of non-unions including those of the humerus. 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. 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. 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.

**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.

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**Ethical approval:** Not required

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