

NONUNION OF FRACTURE CLAVICLE; TREATMENT BY COMPRESSION PLATE AND BONE GRAFT

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ABSTRACT

Objective: To evaluate the results of surgical treatment of nonunion fracture clavicle by compression plate and bone graft.

Material and Methods: This study was conducted in the department of orthopaedic and Trauma Khyber Teaching hospital Peshawar from December 2001 to December 2003. Fifteen cases of non-union of the clavicle fracture after conservative treatment were included in the study. Non-union of clavicle resulting from other mode of treatment like primary open reduction and internal fixation were excluded. The nonunion was excised and fixed with 3.5 mm dynamic compression plate. The site was grafted with cancellous bone graft.

Results: We have been successful in all 15 patients with early return to normal mobility of the joints. The consequent narrowing of the shoulder girdle is fully acceptable for appearance and activities of the shoulder girdle. We obtained bony union within 4 months in all these cases.

Conclusion: We have found this method a useful treatment for the non-union of clavicle after conservative treatment has failed. The technique is simple and does not require any special instrument. It facilitates an early return to normal activities of shoulder girdle and gives a quick recovery from non-union.

Key words: Non-union fracture clavicle, pseudoarthrosis, Compression plate, Bone graft.

INTRODUCTION

Fractures of the clavicle, one of the most common bony injuries, rarely require open

reduction. Mechanism of injury in 94% of patients with clavicle fractures is consistent with a direct blow instead of a fall on the outstretched hand, as is widely believed to be the most common mechanism of injury.¹

Although often viewed as benign injury. Clavicle fracture can lead to complications, particularly nonunion. The nonunion rate has been reported to be less than 0.1%.² Major contributing factors to non union include severe initial trauma, marked initial displacement, shortening, soft tissue interposition, refracture, open fracture, polytrauma and inadequate initial immobilization. A clavicle nonunion is rarely asymptomatic and often results in disability from pain at the site of nonunion, altered shoulder mechanics or a compression lesion involving the underlying brachial plexus or vascular structures.^{2,3,4}

There is controversy concerning the management of symptomatic nonunion of the clavicle. The options include excision of the site,^{5,6} interosseous wiring with a bone graft,⁷ intramedullary fixation,^{8,9} interfragmentary screw fixation and dynamic compression plating,^{10,11,12} or reconstruction plate,¹³ with various combination of cortical¹⁴ or cancellous auto graft.^{16,17} Allograft has also been used.^{4,14} The need to restore the length of the clavicle and the width of the shoulder girdle is emphasized by those who advocate an interposed iliac crest graft. This may not be necessary from either functional or cosmetic point of view. We report the reconstruction of fifteen clavicles nonunion by primary excision of the nonunion, plating and cancellous grafting with iliac crest bone.

MATERIAL AND METHODS

We studied fifteen patients treated for nonunion of the clavicle since December 2001 to December 2003. We recorded their age, gender, occupation at the time of injury, arm dominance, the initial fracture pattern and treatment, and the time elapsed between the injury and operative treatment. All fifteen patients were interviewed, examined in detail, range of movements, grip and pinch strength, and the width of the shoulder girdle on both sides were recorded. We used

a questionnaire (DASH: Disabilities of the Arm, Shoulder and Hand) to allow patients to record upper-limb function.

Operative technique

Proper scrubbing and draping was done. General anesthesia was given. Incision made parallel with and just distal to the clavicle. Periosteum incised and elevated with periosteum elevator. The site of nonunion is identified and exposed circumferentially. The area of nonunion was completely excised down to the bleeding bone. The cut ends of the clavicle are compressed together. Four to six holes dynamic compression plate is then contoured to fit the upper surface of the clavicle. Area around the nonunion is packed with cancellous bone graft from the iliac crest. The wound is closed over the drain.

A shoulder splint is used for the comfort of the patient for the first few weeks, but gentle pendulum exercises are encouraged when postoperative pain has settled. Active movements of the shoulder is allowed only when there is early evidence of radiographic union, usually at ten weeks. Strengthening exercises for the shoulder muscles are started at twelve to fifteen weeks.

RESULTS

Of the fifteen patients, twelve were male, and three were female. The dominant arm was involved in nine. Six patient's job required heavy use of arm, six had work that was not physically demanding and three were female, who were housewives. Their average age was 35 (16 to 45). All these patients had been treated conservatively for four to ten months.

The average time to union was ten weeks, and all patients returned to full function and employment. All had full pain relief and none had limitation of activities. No patient was dissatisfied with his or her

appearance. None of the patient had narrowing of the shoulder girdle except one.

The range of shoulder movement was equal on both sides and the average reduction in length of the clavicle and therefore of the width of the shoulder girdle was 0.8 cm (0 to 1.1). Pinch-grip strengths were only slightly reduced on the operated side. The DASH questionnaire confirmed that no patients had any difficulties with shoulder-related activities, such as heavy household works, washing the hair or back, or putting on clothing.

DISCUSSION

Most closed fractures of the clavicle are managed conservatively and often unite with some shortening.¹⁸ Nonunion is rare, but associated factors include high energy or open injuries, inadequate immobilization and closed fractures treated by operation.

Painless nonunion rarely requires treatment, unless neurovascular symptoms are present. Pain or neurovascular compromise require treatment by operation, and many options have been described.¹⁹

Partial removal of the clavicle has been described for nonunion associated with a thoracic outlet syndrome and local pain,^{5,20} but may cause dissatisfaction because of the appearance of the shoulder. Intramedullary pinning may be combined with cancellous bone or onlay Iliac-crest grafting,^{7,8} but this is difficult because the pin has to pass through the thin ends of the clavicle bone close to neurovascular structures. Such pinning may cause distraction, and migration of the thin Kirschner wires.²¹

Interosseous wiring with iliac-crest bone graft has been described,⁷ as has simple lag-screw fixation with bone grafting. Neither method gives full stability.¹²

Internal fixation with an AO semi tubular plate with or without cancellous bone

grafting has been used. Cortical auto grafting or allografting has been reported.^{16,17} The screw heads are prominent under the skin. And the thin semitubular plate may not provide adequate stability.^{22,23}

For nonunion with large gaps, tricortical iliac-crest interposition grafts with AO dynamic 3.5 compression plating have been used,⁶ but this leaves two fracture sites and is technically demanding.

The technique, which we describe, respects AO principles for the treatment of nonunion, allows early postoperative mobilization of adjacent joints, and minimizes morbidity. The lack of restoration of shoulder width has proved to be cosmetically acceptable and gives excellent function.

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