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Results of glenohumeral arthrodesis with dual pelvic reconstruction plates in young patients

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Abstract

Purpose: The aim of this study was to evaluate the long-term outcome of shoulder arthrodesis with plate fixation and primary autogenous grafting in terms of pain, functional status, and arthrodesis position.

Method and material: The study included 8 patients (7 males and 1 female; mean age: 46.5 years; range: 42 to 55 years) who underwent arthrodesis with plate fixation and primary autogenous grafting. Mean follow-up period was 18 months. Four cases had blast injury, TB shoulder in 2 patients, sequelae of septic arthritis and paralytic disorder in 1 each. Arthrodesis was performed in all cases according to AO principles with plate fixation and primary autogenous grafting. Follow-up assessments included monthly radiologic control for union, the visual analog scale (VAS) for pain and the Oxford shoulder score (OSS) for functional status.

Results: Radiological fusion was seen in all cases in an average of 16 (range: 12 to 18) weeks, and arthrodesis was stable at physical examination. The accompanying humerus shaft fracture was also fixed with plate. One patient with traumatic palsy experienced a humerus fracture distal to the arthrodesis plate at the 8th postoperative month. Two patients had a superficial wound infection after surgery. One patient had hardware symptoms and latissimus dorsi flap was done. The target positions of 30° of abduction, 30° of forward flexion, and 30° of internal rotation were achieved with an average deviation of 7°. Mean active abduction was 68.1° (range: 55° to 90°), flexion was 67.5° (range: 60° to 85°), and internal rotation was at the level of trochanter. The mean OSS was 35.9 (range: 32 to 40), and the mean VAS score was 2.9 (range: 1 to 7).

Conclusion: Our findings show that AO reconstruction plate and primary autogenous bone grafting is a safe and effective arthrodesis method that can also be used as a salvage procedure.

Keywords: Glenohumeral arthritis, Recon plate, Good functions

Introduction

Glenohumeral joint arthrodesis has become a rare entity due to the introduction of shoulder arthroplasty and presence of few specific indications for the procedure (1). But it is an excellent procedure for the patients with severe shoulder dysfunction with limited treatment options. Common reported indications for shoulder arthrodesis include brachial plexus injury, tumour resection, chronic infection, failed prosthetic arthroplasty, pseudo paralysis of the shoulder due to combined rotator cuff and deltoid deficiency.

Shoulder arthrodesis relieves patient of pain and gives decent amount of function. Patient relies on scapulothoracic motion for their daily activities. Various options for osteosynthesis are wire loops, tension band wiring, external fixators, and internal fixation with screws and plates have been proposed to perform fixation between humerus and scapula with or without the acromion.

Shoulder arthrodesis with recon plates have the advantage that they can be bent easily and accurately as per the bone contour of the joint that decreases operative time with minimal skin and soft tissue impingement that decreases chances of removal of implant after bony union. Therefore, arthrodesis with recon plates is recommended by many researchers.

The purpose of our research is to examine the midterm outcome of glenohumeral arthrodesis with dual reconstruction plates.

Methodology

In this study, we followed 8 patients who underwent shoulder arthrodesis from June 2017 to November 2020 at GMC Jammu. They were followed for a minimum of 18 months. There were 7 males and 1 female and age range from 42 to 55 years (mean 46.5 years). Left side was involved in 5 patients and right in 3 patients with all patients being right hand dominant. Indications for surgery was gunshot or blast injury in 4 patients, TB shoulder in 2 patients, sequelae of septic arthritis and paralytic disorder in 1 each. Fibular strut graft taken from ipsilateral limb in blast injury patients and cancellous bone grafting was done in all patients.

Procedure: Floppy lateral position used with affected side up after administering general anaesthesia. Skin incision started from spine of scapula extending laterally over acromion and deltoid tuberosity. Rotator cuff muscles are cut to expose glenohumeral joint. Cartilage over humeral head, acromion under surface and glenoid cavity is denuded, then glenohumeral and acromioclavicular articulation is temporarily fixed with k wires in 30 degrees of abduction, 30 degree of forward flexion and 40 to 50 degrees of internal rotation so that by elbow flexion, the hand can reach the mouth. The humerus is then fixed with glenoid and acromion with cancellous screws. The recon plate is then contoured to the contour of scapula and humerus and fixed with screws. Minimum 10 cortices each side is secured in each plate. Cancellous bone graft is then applied over the site after taking it from iliac crest. Fibular strut is taken in patient with bone loss and fixed with screws after which plate is applied. In the postoperative, limb is held in place by abduction brace /pillow for minimum of 8-12 weeks. At follow up, radiological union is ascertained and brace and exercises started.

Results

- 1. Pain:** all patients had pain in the preoperative period when arm was unsupported. This discomfort decreased in the postoperative period. No patients had complaints of glenohumeral or scapulothoracic pain in the follow-up period.
- 2. Arthrodesis:** all of our arthrodesis got bony union without any pseudoarthrosis. The average time to union was 5.4 months (4.3-7.1 months) as evidenced by the presence of trabeculae of regenerated bone crossing glenohumeral surface on serial radiographs. The final position of arthrodesis was maintained in all patients in the postoperative period.
- 3. Complications:** there was no case of pseudoarthrosis. There were no deep wound infections but 2 patients had superficial infection over spine of scapula and acromion area which healed with debridement and antibiotics over a period of 10 days. There was scapular prominence in all of our patients accentuated by atrophy of muscles around scapula. One patient had peri-implant fracture which was then fixed with plate.
- 4. Function:** all patients could feed and dress themselves with same limb. They could wash their face, put hand in front pocket but no patient could put hand in back pocket. The average amount of flexion and abduction was 80 degrees (range 60-90 degrees) and 70 degrees (range 50-80 degrees) respectively. All patients could do manual work the same limb postoperatively.
- 5. Satisfaction:** all patients were of the opinion that arthrodesis improved their shoulder function with no pain. Although some of them had to change their

occupation to a lighter one but they too were satisfied after the procedure.

Discussion

The objectives of shoulder arthrodesis are limited. It is mainly done to relieve pain and to gain fair amount of shoulder function. It is rarely indicated now in selected patients who are not able to carry out activities of daily living and are having pain lasting more than 3 months.

Various type of shoulder arthrodesis is proposed with intra articular and extra articular methods and different types of fixation methods. A recon plate bends easily and gets contoured as per bony anatomy of the region. This has an advantage of decreased irritation to local soft tissue structures. We have arthrodesed the shoulder joint in 30 degree abduction, 30 degrees of forward flexion and 40 degree of internal rotation. The various complications of shoulder arthrodesis are infection, non-union, implant impingement, and peri implant fracture.

The incidence of non-union in literature is 0 to 20% in these cases. It is then treated with bone grafting and refixation. In our series, compression was achieved with screws and plate and bone grafting was done in every case to achieve union. We achieved union in all our cases.

Postoperative infection reported in literature is 0-14% in these cases. In our series, we used prophylactic antibiotics and didn't encounter any deep infection. Two patients had superficial infection which subsided with debridement and antibiotics. No plate or screw loosening was found.

The implant used to fix shoulder arthrodesis often leads to skin irritation when it is placed in a relatively superficial layer as is the case in shoulder joint; therefore, removal of the implant usually is required after a firm bony fusion is achieved in the majority of cases. Richards *et al.* reported a lower rate of complications with a reconstruction plate than with a DCP. On the other hand, Diaz *et al.* reported that five of eight cases treated with a reconstruction plate required implant removal. Imprecise contouring leads to impingement of soft tissue structures and leads to need for implant removal. We have no case with these complaints to undergo implant removal at midterm follow up of 18 months.



Fig 1: preoperative radiographs with deformation of proximal humerus.



Fig 2: shows exposure of humerus and provisional fixation with 2 CCS screws



Fig 3: intraoperative view of fixation of proximal humerus with glenoid and fixation with two recon plates



Fig 4: shows AP and Lateral view of shoulder fusion of arthrodesis site at 3 months follow up

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Conclusion

With specific indications, shoulder arthrodesis done in patients results in a good painless postoperative shoulder function and thus presents an excellent operative option. The position of arthrodesis chosen here ensures that arm rests comfortably at the side. The patients can move their hands to mouth and facial regions. Recon plates should be used for arthrodesis because they are easy to shape without compromising on strength. Few complications of procedure are there but are great therapeutic measure in selected individuals.