

Original Article

Indications and operative outcomes of acromioclavicular joint injuries fixed with bosworth screwAnil J Nayak¹, Jayprakash V Modi², Zulfikar M Patel³, Kirtan V Tankshali⁴, Hriday P Acharya⁵

Acromioclavicular joint is a biomechanically complex joint, isolated injuries of which are rare. Complex classification system (Rockwood) and no universally approved guidelines for the treatment with the ever evolving surgical techniques pose further challenge for the treatment of the condition. We have in our current study, assessed operative outcomes of Bosworth screw fixation for AC joint injuries and the role of occupation in deciding treatment regimen and predict operative outcomes. This is a prospective cohort study of 11 patients having isolated AC joint injury classified as grade II or higher according to Rockwood classification treated with Bosworth screw fixation at high patient turnover tertiary care centre. AC joint injuries are more common in males and RTA accounts for the most of the injuries. There is significant difference in outcomes of operative fixation between high demanding and low demanding occupation as evaluated by constant shoulder score ($p < 0.01$). Operative treatment in failed conservative treatment of type II/III injuries yields better constant score. The earlier the treatment, the earlier the vocational rehabilitation especially in high demanding occupation. Occupation should be considered in making treatment choice of AC joint injuries and not only type of injury. Bosworth technique of fixation is old but cost effective, easily reproducible, less time consuming technique with smaller learning curve and should be considered in all type V injuries and in patients with type II/III injuries involved in high demanding occupation.

[J Indian Med Assoc 2018; 116: 14-6 & 26]

Key words : AC joint injuries, Bosworth screw, High demanding Occupation, Rockwood classification.

Acromioclavicular Joint is a plane synovial/ diarthrodial joint between acromion process of the scapula and lateral end of the clavicle bone¹. The joint is important link between the appendicular skeleton (upper limb) and axial skeleton. Furthermore, joint is stabilized by structures like joint capsule, acromioclavicular ligament, deltotrapezial fascia, coracoclavicular ligaments (which play major role in weight transmission). Multiple ligaments acting on single joint make biomechanics of the joint more complex. Optimal joint functioning is desired for painfree upper limb function and normal day to day weight lifting activities. Injury to the joint is rare but remains an entity with complex classification system with no emphasis on role of occupation, no standard treatment protocol, no established guidelines for the choice of ideal surgical procedure. Advances described for the treatment options for

these injuries, like anatomical coracoclavicular reconstruction (ACCR) or arthroscopic repair are more time consuming, not easily reproducible and require longer learning curves. Besides cost benefit analysis has also to be kept in mind as these newer procedures are costlier as compared to the conventional method. We have, in our present study, evaluated the role of occupation in decision making of treatment for these injuries especially Rockwood type 2 and 3 injuries (for which there still is no consensus regarding treatment recommendations) and assessed operative outcomes of Bosworth screw fixation for AC joint injuries.

MATERIALS AND METHODS

This is a prospective cohort study of the 11 Acromioclavicular joint injuries operated at a tertiary care centre between 1st January, 2014 and 31st May 2016 with Bosworth screw fixation. Patients with isolated injury of Rockwood type II to VI who were willing to get operated were included in our study. Patients of polytrauma having associated AC joint injury and patient giving negative consent for the surgery were excluded. Polytrauma patients were specifically excluded so as to remove any confounding factor affecting the treatment outcome of the procedure. Type I injury was excluded as standard treatment protocol of such injuries is conservative option only with skilful neglect. Though standard treatment protocol for

Department of Orthopaedics, GMERS, Patan 384110

¹MS (Ortho), Assistant Professor and Corresponding author²MS (Ortho), Professor and Head, Department of Orthopaedics, B J Medical College, Civil Hospital Ahmedabad 380016³MS (Ortho), Associate Professor, Department of Orthopaedics, B J Medical College, Civil Hospital Ahmedabad 380016⁴MS (Ortho), Senior resident, Department of Orthopaedics, B J Medical College, Civil Hospital Ahmedabad 380016⁵3rd year resident, Department of Orthopaedics, B J Medical College, Civil Hospital Ahmedabad 380016

type 2 injury is conservative treatment, we had patients with failed conservative treatment for these injuries and were included in our study.

As per our standard protocol, all the patients underwent radiographical investigations in the form of Anteroposterior, axillary radiograph of shoulder joint with clavicle, Zanca view of normal and affected side whenever possible in a single plate for better comparison. Patients were classified under high demanding and low demanding occupation depending upon the involvement of overhead activities and heavy weight lifting in day to day life. All the patients enrolled in our study were operated by Bosworth screw fixation^{2,3} and followed upto minimum period of one year post-operatively. Above mentioned radiographic views were obtained at each visit with evaluation of constant score and outcomes analysed.

All the patients were operated under general anaesthesia in modified beach chair position by using cannulated cancellous screw of 4.0 mm size with washer. There was no added cost burden on patient or hospital system in terms of instrumentation as CCS screws along with washer and general surgical equipment are all that is required to perform the surgery and are readily available at our centre.

OBSERVATION AND ANALYSIS

All the 11 patients enrolled in our study were males with their age ranging from 22 to 55 years and average age being 34 years. The most common mode of trauma was road traffic accident in 7 out of 11 patients. Other modes being injury while playing sports (2/11) and fall down while doing manual labour (2/11). Only 6 out of 11 patients presented to us in acute setting ie, within 3 days of injury. The presentation time of other 5 patients ranged from 7 days to 90 days. The chief complaint at the time of presentation was pain or instability at the AC joint in 9/11 patients and 2 patients came to us for cosmetic purpose. 5 out of 11 patients were treated conservatively elsewhere prior to presenting to us. Distribution of patients according to Rockwood classification is shown in the table below⁴. No patient in our study had type IV/VI injury, indicating rarity of both types (Table 1).

Time to return to daily activities ranged from 30 to 50 days and time for vocational rehabilitation ranged from 1.5 months to 6 months. 10/11 patients achieved vocational rehabilitation in our study.

Rockwood type	Number of patients
II	2
III	5
IV	-
V	4
VI	-

Constant score at the end of one year follow-up ranged from 69 to 91. Major limitations noted in our study were reduced strength for abduction and restriction of movement at terminal abduction (>150 degrees). Implant impingement was observed in 2 out of 11 patients, persistent pain with restricted range

of motion was noted in one patient and recurrence of cosmetic deformity was noted in one patient which occurred following implant removal due to impingement.

DISCUSSIONS AND RESULTS

As observed in our study, AC joint injuries are more common in males (100% in our study) and in 3rd and 4th decade of life (9 patients). Most common mode of trauma was RTA (Road Traffic Accident) in our study (7/11). Sports related injury was found only in 2 patients which is contradictory to the various studies published in literature^{6,9}. Clear mechanism of injury could not be established as majority of the RTA victims did not remember the event in the reproducible manner but majority of them had direct trauma to the joint or fall on outstretched hand. Among other modes of trauma, direct impact on AC joint (2 patients)-direct fall while performing heavy labour duties and excessive force on affected side's upper extremity- while playing sports (Kabaddi in both cases) accounted for equal incidences. There was no high risk occupation noted in our study which would predispose the patients to this type of injury.

Six patients presented to us in acute setting ie, within 3 days. The rest after atleast 7 days of injury, with range for presentation time being 7 to 90 days. The reason for late presentation was failure of conservative treatment to reduce pain and cosmetic deformity with relatively preserved range of motion. Even in the setting of acute trauma, the major presenting complain was pain or instability at the AC joint with 5/6 patients performing abduction of upto 90 degrees with pain only at terminal movements. 8/11 patients could reduce the joint manually with pressure and elevation of arm but complained of instability upon relieving the pressure/ inability to maintain reduction.

Out of 11, 2 patients had Rockwood type II injury. Both the patients were given conservative treatment trial previously for 8 weeks and persistent pain was the chief complaint at the time of admission. Rockwood type II injury has fair consensus regarding conservative treatment but we encountered these 2 patients who had failure of conservative treatment. Occupation of both the patients demanded routine overhead activities which might be the reason for the failure of conservative treatment. Five patients had Rockwood type III injury, out of which 3 patients were given conservative treatment trial previously elsewhere which had failed to relieve symptoms whereas 2 patients presented to us within 3 days of injury. None of the late presenters had SICK scapula syndrome¹. Four patients had Rockwood type V injury, all of which presented to us within 3 days of injury and were fixed in the acute sitting. No patients of type IV or VI injuries presented to us during our study period, describing rarity of these types^{7,9}.

All the patients after necessary pre-operative workup, were operated with Bosworth screw fixation under General

Anaesthesia and in modified beach chair position. Average operative time was 25 minutes in our study. None of the patients required post-operative blood transfusion as there was minimal blood loss. Postoperatively Zanca views were obtained for bilateral AC joints and coracoclavicular distance of both the sides compared. All the patients had CC distance within 10% of the normal side. Average post-operative hospital stay was one day in our study. All the patients were guarded in shoulder arm immobilizer upto 1.5 months to allow for soft tissue healing and to avoid implant backout which is a known complication of this type of fixation. Wrist and finger mobilization were started on the same day and guarded passive mobilization at shoulder was started on post-operative day 15 at the time of stitch removal. Patients were followed upto one year post-operatively. Outcomes were analysed by using Constant shoulder score which includes subjective and objective criteria like pain, ADL (sleep, work, recreation), strength, ROM (Range of Motion). Constant scores ranged from 69 to 91 at the end of one year follow-up⁵ (Figs 1 & 2).

Major disability observed in our study was terminal restriction of abduction (>150 degrees) and inability to lift the heavy weight (>15kg). There was no correlation

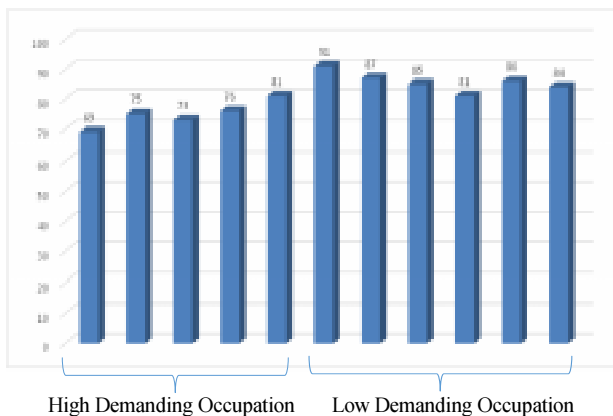


Fig 1 — Constant shoulder score follow-up at 1 year

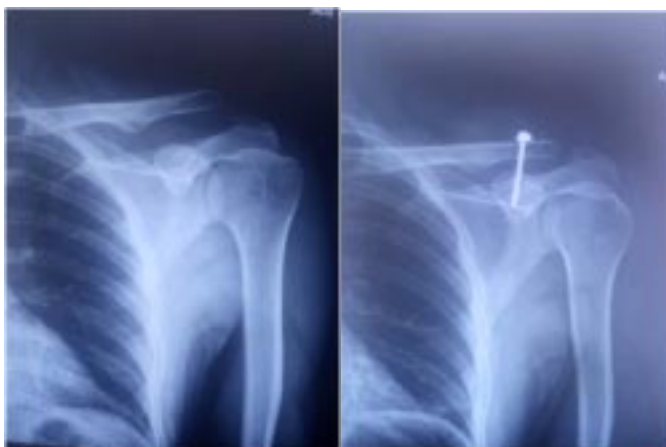


Fig 2 — Pre and postoperative AP radiograph of AC joint injury

noted between type of injury and constant score. However, occupation had definite effect on outcome. Failure of conservative treatment was noted in patients who were involved in heavy weight lifting or overhead abduction activities i.e. “high demanding occupation”. Occupation also had effect on vocational rehabilitation, with patients involved in high demanding occupation taking around 6 months for vocational rehabilitation as compared to low demanding occupation which on average required 2 months of time for vocational rehabilitation. Thus role of occupation in treatment and rehabilitation of these injuries need to be emphasized. Comparing constant scores of high demanding (74.8) with low demanding occupation (85.67), independent T test yielded t score of 4.68 with p value 0.0011 meaning thereby constant score was significantly lower in individuals involved in high demanding occupation as compared to low demanding occupation at final follow-up. High demanding occupation individuals with type II injury may be considered for operative treatment in the initial stage only as there also are high chances of failure with conservative management and operative treatment provides better vocational rehabilitation. 5/11 patients of our study presented after failed conservative treatment and 3 of them had type 2 injuries, 2 of them had type III. Except for type V injury, all the patients were involved in high demanding occupation and their shoulder score improved from average of 43.75 to 73.25 with the Bosworth technique as analysed at the one year follow-up. P values and significance is not commented due to only 4 patients but there clearly is improvement of scale 30 on average in constant scores. Thus earlier intervention should be offered even in type 2 injuries in high demanding individuals.

Complication of Implant impingement was observed in 2 patients which required implant removal at the end of one year. Recurrence of cosmetic deformity was observed in one patient after implant removal for impingement but patient had painfree and full ROM, so no further intervention was planned. One patient had persistent pain even at the end of one year with restricted ROM. The patient was manual labourer and did not follow standard physiotherapy protocol and started work at 45 days including painful overhead abduction with heavy weight carrying on head. Upon followup radiograph at one year, coracoclavicular distance was found to be 30% more than normal which might be the reason for persistent pain. The same patient could not achieve vocational rehabilitation for pre-injury occupation and had to change the occupation later on. Other than these 2 patients, no patients had increased coracoclavicular distance of more than 25% as compared to the normal side. There was no coracoid or clavicular fracture observed in our study^{3,8,9}.

Due to high patient load at our tertiary care centre,
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it was not possible to offer ACCR/ Arthroscopic reconstruction to all the patients. Our recommendation of operating type II injuries in high demanding occupation is based on small number of patients which requires larger multicentric studies to support the recommendation. Definition of High demanding occupation is based on 2 criteria of overhead abduction and heavy weight lifting which requires further validation. We recommend adding occupation to the classification system to help decide the treatment modality (Operative *versus* Conservative) and predict prognosis in a better way. But how much emphasis should be given to this occupation criteria needs to be standardized and for that larger demographic studies are required.

CONCLUSION

Acromioclavicular joint injuries are of rare occurrence and are common in males. Injury occurs mainly due to direct trauma to the joint caused by Road Traffic Accidents. Occupation has definite role in the prognosis of the injury and should be added in any classification system to recommend treatment modality. According to our study, Type II, III injuries in high demanding occupation and type V injuries should preferably be operated as it has better outcomes with earlier rehabilitation as compared to non-operative treatment. Bosworth technique is a highly cost

effective, less time consuming method with excellent outcomes and can be used for any type of AC joint injuries.

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