

Management of Acute Type III AC Dislocations- A study of 21 patients; managed by single technique- K-wire and tension band wiring along with repair coraco-clavicular ligament

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Abstract:

Background- The AC joint is commonly involved in traumatic injuries that affect shoulder. Treatment of acute complete acromioclavicular (AC) dislocation is still controversial. Both non-surgical and surgical methods have been reported with similar results. In addition, once surgical treatment is chosen, a satisfactory surgical technique has not been developed yet.

Methods- We report a retrospective study of 21 patients of acute AC dislocations (Type III) in patients between age group 22 years to 45 years managed with K-wires and Tension band wiring and were followed up for a mean period of 28 months. Repair of Coraco-clavicular Ligament was performed if it found completely torn.

Results- The results were assessed by Imatani's scoring system including of Pain, function and movements. The results were analyzed and also compared with standard accepted studies.

Conclusion- Fixation with K-wires and Tension band wiring is a simple, easy, less time consuming surgical technique allowing faster rehabilitation in young and adult active patients to achieve a stable, pain free shoulder with no serious intra-operative or post-operative complications.

Key words: Acromio-clavicular dislocation, K-wire, Tension Band wire, Coracoclavicular ligament.

Introduction

The Acromio-clavicular joint is a robust structure that anchors the clavicle to scapula. AC dislocations and subluxations account for approximately 15% of all shoulder girdle dislocations [1]. There is no any other joint in body, that has been treated in so many different ways as the AC joint in attempt to properly restore to its natural situation. The treatment of AC joint injury has evolved and changed as our understanding of the nature of the problem and the biomechanics of the joint has developed, both operative and non-operative treatment of complete AC dislocation (Type III) has evolved cyclic popularity.

It is accepted that conservative management is indicated for type I and II (Incomplete dislocation) AC injuries (Rockwood classification) [2], for type IV, V, VI injuries (more severe, high velocity injury) most surgeons agree that the displacement of AC joint would be too great to accept and operative modality is indicated but there is still controversy exists for the

management of Type III injuries (complete dislocation) [3].

In Type III injuries, there is complete disruption of Acromio-clavicular (AC) and Coraco-clavicular (CC) ligaments and the distal clavicular attachment of deltoid muscle with more than 75% of superior displacement of lateral end of clavicle [2].

Type III AC joint injuries are centre of controversy for management, no perfect study exists which clearly demonstrates the clear superiority of conservative over surgical management [4]. Conservative treatment is regarded as satisfactory by some but most author recommend surgery in young and active patients 5-7*. Numerous methods of non-operative treatment have been described like strapping, bracing, splinting etc. But they fail chiefly because of interposition of Articular disc, frayed capsular ligament, fragments of articular cartilage between acromium and clavicle and subsequent complications, which demands further surgical correction [5-7].

Different procedures for management of Type III injuries have been described, e.g. Acromio-clavicular reduction and fixation, CC repair or reconstruction, combined repair, coraco-clavicular fusion, dynamic muscle transfer from tip of coracoids process, distal clavicle excision. We use AC fixation with K-wires and tension band wire along with repair of AC and CC ligaments.

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Material & Methods

We had 24 patients under consideration out of which two were lost to follow up, one died of cardiac problems within two months of surgery, so our retrospective study includes 21 patients of acute AC dislocation (Type III) managed by K-wire with Tension band wiring along with repair of CC ligament if its torn.

All patients were between 22 and 45 years of age group (mean 32.2 years). Clinically patients had prominent lateral end of clavicle, local bruising, local tenderness, and ballot ability to present with.

Radiographic evaluation was done by taking 3 views:

1. Antero-posterior view (10 degree cephalad view-Zanca view) for both AC joint sitting or standing. Complete dislocation was diagnosed if lateral end of clavicle was elevated by at least 75% of width of articular surface of acromial process.
2. Axillary lateral view to visualize anterior or posterior displacement of clavicle.
3. Stress view with 5 kg weight in both hands when patient is standing upright and pulling back his/her shoulders [8].

All patients had normal neurovascular status in injured limb and had no associated injuries.

Inclusion criteria- All patients with Acute type III AC dislocation who are active in work before injury.

Exclusion criteria-

1. Patients with age less than 22 years (Immature skeleton) and more than 45 years.
2. Prior symptoms in shoulder girdle
3. Associated injuries like fracture clavicle, fracture coracoid process, fracture scapula, severe head injury, compound injuries etc.
4. Type I, II, IV, V, VI injuries
5. Presence of distal neurovascular deficits
6. Patient at high risk for general anaesthesia

Operative technique

A technique of fixation of AC joint with K-wires and tension band wiring along with the repair of CC ligament if it is torn was performed.

AC joint was exposed by lateral approach, meniscus when torn was extirpated, AC dislocation reduced and held in position with two smooth 1.5mm K-wires and (Intra-articular from lateral aspect of acromium to clavicle) under image intensifier control, followed by tension band wiring with no. 18/20 stainless steel wire (316L). Out of 24 patients, both AC & CC ligaments were ruptured in 14 patients, in 8 patients only AC ligament injury was noticed and where in 2 patients

there was only rupture of CC ligament where partial AC ligament continuity was maintained. Lateral end of K-wires were bent, associated delto-trapezial fascia and muscles were repaired. Coracoclavicular ligament was repaired by taking 3 knots of each of proximal and distal part of ligament by Ethibond no.2 and tied up them together. Advantage of repair by Ethibond is that suture can be taken through full thickness of ligament, no need to pull the thread and less chances of cut through. As we noted mid substance tear in all CC tear hence suturing was possible. Accurate anatomical reduction was confirmed radiographically.

Post-operative a pouch arm sling was given to all patients for around 3 weeks. Pendulum exercises were encouraged immediately. Active assisted movements were started as soon as tolerated by the patients for 3 weeks and were supervised by physiotherapist. Overhead abduction, heavy weight lifting was allowed only after 12 weeks. Patients returned to full activities by 14 to 16 weeks. Implants were removed after 6 months post operatively in almost all patients.

Evaluation

The evaluation was done by Imatani's scoring system [9]. It included assessment of pain, function, and movement of the shoulder. Four grades were categorized and a satisfactory outcome included an excellent or good result. This scoring system was used due to its relative simplicity and practicality.

Results

There were 16 males and 5 female patients, between 22 to 45 years of age group (mean 32.3 years). Right shoulder was involved in 14 and left shoulder was involved in 7 patients with no predilection to either dominant or non-dominant side. They had no previous shoulder symptoms and no specific contradictions for surgery. Seventeen patients were within 4 days after injury and four patients within 15 days of injury. The mechanism of injury was road traffic accident in 18 patients and fall on shoulder in 3 patients.

Results were assessed at 3 weeks, 6 weeks, 3 months, 6 to 9 months, 18 and 30 months. We observed that the subjective and objective scores in our study group improved during 6 weeks to 6 months follow up (when patients were subjected to active/assisted active mobilisation exercises thereby slowly increasing their daily activities) and functional improvement was statistically significant ($p < 0.01$)

In our study, 12 patients (57%) had excellent results having no pain or limitation of function and full range of movements, except one patient who was a high-school teacher had occasional pain on writing on blackboard. Six patients (29%) showed good result with slight or occasional pain during exercise and painful terminal abduction. The fair results were seen in three patients



Figure -1, Preoperative xray of 23 year old male showing complete type III AC dislocation



Figure-2, showing open reduction and fixation with K-wire and tension band wire along with repair of AC & CC ligament

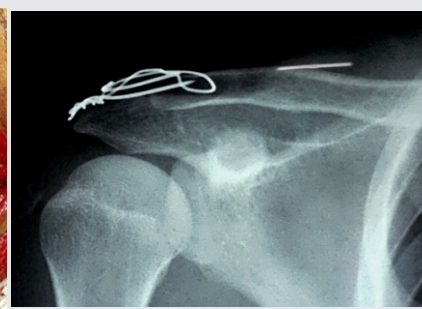


Figure-3, Post operative x-ray showing proper alignment of AC joint with K-wire and tension band wire in-situ.



Figure-4, showing Range of movements on 12th post-operative day.

(14%). None of the patients, except one required re-operation other than removal of implants after healing. Rehabilitation was quicker,

majority of patients were started their activities within 3-4 weeks time and in 7-8 weeks all of them had returned to activities of daily living. No major complications were noted, no breakage or medial migration of K-wires were noted. One 44 years old female patient had 4 mm of lateral migration of one of K-wires probably due to osteoporotic bones, at around 7th week when overhead abduction exercises were started. This patient had pain in terminal abduction so implant was removed but subsequent evaluation showed good result in subjective and objective assessment except for the cosmetic appearance. This patient also showed more than 75% superior displacement of lateral end of clavicle. Two patients had superficial infection of wound, which subsequently healed with antibiotics and dressings. Three patients complained of pain and irritation of skin due to wires in early post operative period, but gradually over a course of time they were also relieved with healing and fibrosis of overlying subcutaneous tissues.

Discussion

There is still considerable controversy as to best method of managing Type III AC dislocation. Conclusion drawn lot of variations as regard the study group, patient activity requirement, surgical expertise, type of fixation / repair / reconstruction, environmental factors etc. Conservative management of strapping / bracing / splinting gives a 17 to 28% incidence of painful sequel due to meniscal damage, interposition of fibrous tissue or persistent instability. Disadvantages of conservative

methods includes skin pressure sores and ulceration, necessity of wearing sling/brace for 8 weeks, poor patient compliance, interference with activities of daily living, no guarantee of freedom from pain, loss of shoulder and elbow motions, soft tissue calcifications, late AC joint arthritis, recurrence of deformity, late muscle atrophy, weakness and fatigue. If reconstructive procedure is required, then it's more difficult to perform later.

Depalma's anatomical dissection and studies suggest that early degenerative changes develop in the AC joint by 3rd decade and that significant changes are present by 4th decade which might interfere with result interpretation [5].

Surgical methods allow for inspection of AC joint, reduction of joint under vision, removal of damaged meniscus or loose fragments, repair of tear in capsule/delto-trapezial fascia/muscles. Surgical methods also permit an anatomical reduction and secure fixation that usually allows the resumption of shoulder motion earlier than is possible with closed techniques [5,10]. Most other surgical methods also leave 9 to 28 % patients with residual pain, sometimes due to complications of osteosynthesis. We consider that early AC degeneration is not caused by articular perforation with wires, it is also seen after conservative treatment and coracoclavicular fixation [10].

Most of the operative procedures for AC dislocation that have been reported had high incidence of such complications as breakage or migration of metallic device, failure of fixation or erosion of bone and subsequent loss of reduction. These difficulties may result in re-dislocation, infection and prolonged rehabilitation [8].

Tension band wiring along with two smooth 1.5mm K-wires prevents the migration of K-wires and gives enough stability to allow early mobilization. Smaller size or threaded K-wires were avoided as they have lesser strength so chances of breakage of wires at the joint are high. If larger dimension wires (more than 2 mm) are used, they lead to osteolysis of lateral end of

clavicle in certain cases. Most patients have no difficulty with activities of daily living but manual labourers (on some overhead activities) and athletes occasionally report pain with throwing and contact sports.

Various methods have been suggested for CC ligament injury like Bosworth screw fixation, Percutaneous coracoclavicular screw fixation, Circlage techniques by using synthetic materials, ligament reconstruction by Weaver and Dunn, End to end repair, Arthroscopic repair by Endobutton. Studies suggest that repair of CC ligament does not protect against the loss of reduction. A re-displacement rate of 9-11% (maximum upto 35% with vertical screw fixation) has been reported with coraco-clavicular fixation and about 5% after AC fixation [11]. In a study by Wei-Ching Lin, a 4.5 mm diameter of cancellous screw with supplementary techniques provided sufficient stability during the recovery period. The main advantage of this technique was its technical simplicity as compared with other techniques and the outcomes were largely similar [12]. In a study of 24 patients by Cem Zeki, they reported low rate of acromioclavicular joint arthrosis with modified Bosworth technique [13]. We performed Anatomical repair of Coracoclavicular ligament with Ethibondin all 10 patients in whom we found it to be torn and results are satisfactory. AC fixation is reported to be the best method of maintaining the anatomical reduction. Using Steinmann pins and threaded K-wires may cause loss of reduction and post traumatic arthritis [10].

We prefer AC fixation with K-wires and tension band wiring. This method is gaining popularity because of its simplicity, ease, less time consuming technique, helps quicker rehabilitation in young, adult active patients. Incidence of post traumatic AC arthritis in surgically treated patients is 25% while those treated conservatively is 45%. Surgical treatment allows for

1. Inspection of joint, achieve anatomical reduction, remove torn meniscus, capsular ligament, loose pieces of articular cartilage in the joint.

2. Repair of torn capsule, delto-trapezial fascia or muscles.

3. Improves cosmetic outcomes.

4. Allows early mobilization, return to activities of daily living and thus prevent chronic pain, late AC joint arthritis.

Our purpose of study was not to compare outcome between surgical or non-surgical line of treatment for Type III injuries but to emphasize that our surgical technique gives comparable results ($p > 0.05$) with minimal complications and that there is no statistically significant difference in our outcomes as compared to other studies of AC fixation. The limitations of our study are that we have not evaluated the results in

teenagers (immature skeleton) or geriatric (osteoporosis, less activity demand) age group patients. Also we have not carried out study in other types of AC dislocation (Type I, II, IV, V, VI) or chronic dislocations or after failure of conservative treatment.

Conclusion

We reached to conclusion that there is no statistically significant difference ($p > 0.05$) in the outcome between our technique and other similar studies apart from the fact that we had minimal minor complications; is a simple, easy faster technique promising the quicker rehabilitation; giving a stable, painless shoulder in young, adult, active patients; resulting in minimal morbidity and patient is able to return to gainful employment much earlier than those treated by other techniques.

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