



Original Research Article

Management of type 2 & type 3 acromio-clavicular joint injuries by principles of tension band wiring

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ARTICLE INFO

Article history:

Received 17-05-2020

Accepted 29-07-2020

Available online 19-09-2020

Keywords:

AC joint dislocation

Tension band wiring

Constant score

ABSTRACT

Introduction: Injuries to the acromioclavicular (AC) joint represent a wide variety of soft tissue disruptions that result in mild pain to significant displacement, chronic pain & changes in shoulder biomechanics resulting in long term morbidity. Main aim is to study the outcome of AC joint dislocation managed by tension band wiring, which is cost effective & also gives excellent results in cases of traumatic AC joint dislocation.

Methods: 23 cases of type 2 & 3 AC joint dislocation were selected depending on Rockwood classification for a period of 12 months (January 2019 – December 2019), who all underwent Tension band wiring (TBW) & followed the post-operative protocol accordingly with minimal mobilization to full range of movement, with suture removal on day 12 followed by maximum possible range of movement by 12 weeks onwards.

Results: We had majority type 3 AC joint dislocations than type 2 AC joint dislocation, male predominance was seen with major causal factor to be Road traffic accident, among males & females the dominant limb (i.e., right upper limb) involvement was seen, patients were evaluated at 4, 6 & 12 weeks intervals using CONSTANT score. 17 patients had excellent results with near normal range of shoulder movements, 4 had good results due to mild restriction of movement & pain, 2 had poor results that were due to hematoma & infection in one patient which was treated according to culture sensitivity of the organism & antibiotics, another patient had stiffness & pin migration for which implant removal was done. Following which regular mobilization was started.

Conclusion: After conducting this study we arrived at an inference where AC joint injuries do contribute to major morbidity for the patient in view of altered shoulder biomechanics which resulted in loss of shoulder movements & affecting day to day activities. Hence an AC joint injury has to be addressed surgically as early as possible to make patients return to their pre injury status. Tension band principle also has the advantage of being cost effective, short surgical time and early rehabilitation.

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1. Introduction

AC joint is a plain synovial joint, with an intervening disc. Joint is formed by lateral end clavicle & Acromion process. Injuries to the acromioclavicular (AC) joint represent a spectrum of soft tissue disruptions that can result in mild, transient pain about the joint to significant displacement, chronic pain, and changes in shoulder biomechanics resulting in long-term disability.¹ Injuries to the acromioclavicular joint are usually the result of a

force applied downward on the acromion. The clavicle rests against the first rib, and the rib blocks further downward displacement of the clavicle. As a result, if the clavicle is not fractured, the acromioclavicular and coracoclavicular ligaments are ruptured. The severity of any superior or posterior displacement of the clavicle is determined by the severity of injury to the acromioclavicular and coracoclavicular ligaments, the acromioclavicular joint capsule, and the trapezius and deltoid muscles.² In AC injuries males are affected most commonly with a male-to-female ratio of approximately 5:1 & age group affected <30 years and are commonly occurs in athletes and contact sport

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persons.³ In our study we have considered rockwood type 2 & 3 injuries, where in type 2 acromioclavicular ligament is disrupted, and coracoclavicular ligament is intact & type 3 have acromioclavicular & coracoclavicular ligament rupture. It is accepted that conservative management is indicated for type I and II (Incomplete dislocation) AC injuries (Rockwood classification) 2, if the patient is symptomatic enough then surgery could be considered in type 2 injuries as well, Type III AC joint injuries are center of controversy for management, no perfect study exists which clearly demonstrates the clear superiority of conservative over surgical management, 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, 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, but in our study we have selected tension band wiring as a method for fixation & analyzed the outcome, morbidity & range of movements.⁴

2. Materials and Methods

This prospective Study was conducted for duration of 12 months from January 2019 – December 2019 for 23 patients who had Acromioclavicular joint dislocations (type 2 & 3). The study was conducted after taking ethical clearance. These patients underwent fixation with tension band wiring. Patients included were between the age groups of 20years – 50 years. Chronic & open injuries, with other severe injuries were excluded from the study.

2.1. Clinical & radiographic evaluation

Patients were initially examined in emergency room and were quickly evaluated for other injuries like – chest trauma, nerve injuries (brachial plexus), vascular injury. Pertaining to AC joint injuries patients had – local tenderness, swelling (deformity), ballotement positive, inability to move the affected shoulder, local bruising.

2.2. Radio-graphically patients were evaluated with 3 views

2.2.1. Antero-posterior

Patient in erect posture with beam of X-ray perpendicular cassette.

2.2.2. Zanca view

Beam of x-ray making an 10^0 angle with the cassette (10^0 cephalad directed) - this view gave us more information regarding the amount of AC joint surface exposed due to dislocation.

2.2.3. Stress view

Patient was asked to hold a weight of 5kgs in each limb & x rays were taken to compare both sides, joint with dislocation had become much more prominent than the other joint.

Surgical technique : AC joint was approached through lateral incision after palpating all the shoulder bony landmarks, the fibro cartilaginous disc was extirpated if found torn, reduction done by applying downward pressure on lateral end clavicle, followingly 1.5mm/1.8mm k wires were introduced from lateral margin of acromion through AC joint & secured it in clavicle under C- arm guidance, tension band wire was applied around this k wire construct, knot was buried superiorly over clavicle, k wires were cut & bent in the lateral acromion & buried downwards.

2.3. Intra- operative picture



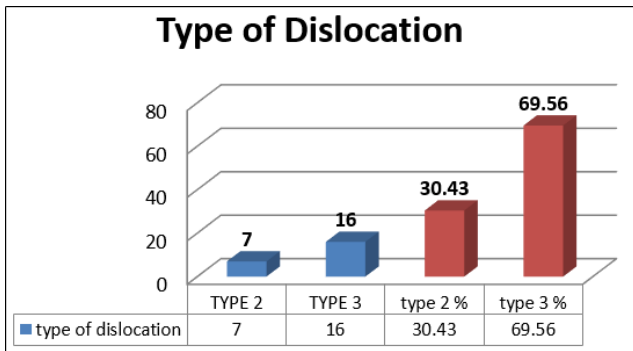
Fig. 1: AC joint reduced & tension band wiring done

Following the procedure patients were discharged on day 3 & sutures were removed on day 12, during these first 12 days course they were immobilized with Arm pouch, with active/ passive movement of elbow only. Patients were followed at regular intervals 4 weeks, 6 weeks & at 12 weeks. During these follow up patients were evaluated using constant score (consisting of pain, activity level, arm positioning, abduction strength, range of movement) & were grouped into excellent, good & poor results.

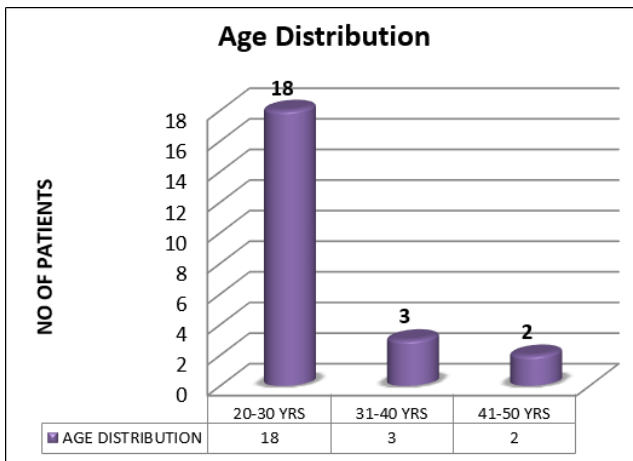
3. Results

According to the study conducted with 23 patients we had 16 type 3 AC joint dislocation & 7 type 2 AC joint dislocation.

According to the graph we drew up from the data, Active young patients who are in the economically productive age

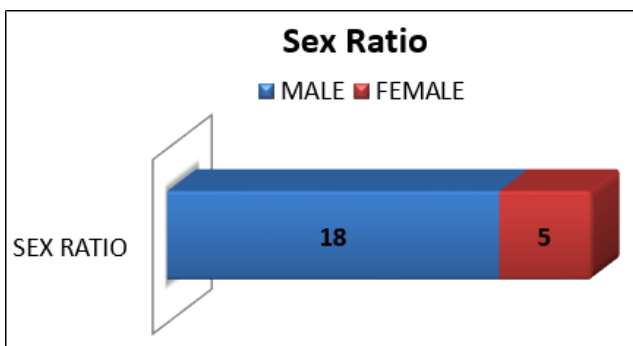


Graph 1: Type of dislocation



Graph 2: Age distribution

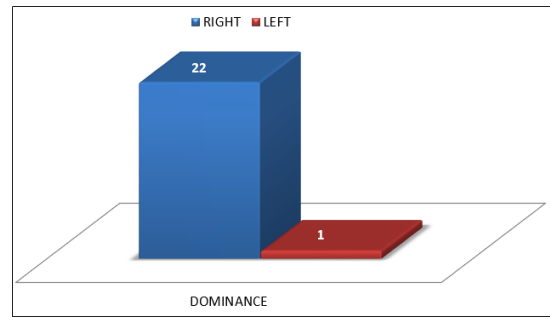
group were involved (20-30 yrs) in AC joint injuries, as compared to old age patients were the incidence AC joint injuries will be reduced due to reduced mobility as the aging increases.



Graph 3: Sex ratio

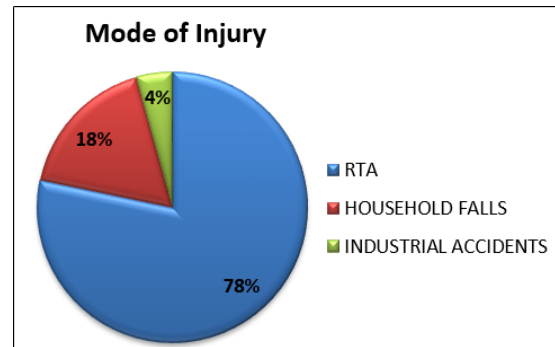
In our study we found that males (18) were involved more in the AC joint dislocation than females (5), due to their activities outdoor which predisposes them for trauma. Whereas females have lesser preponderance due to their activities limited to indoors in an Indian setup.

3.1. Sidedness / dominance of involovement



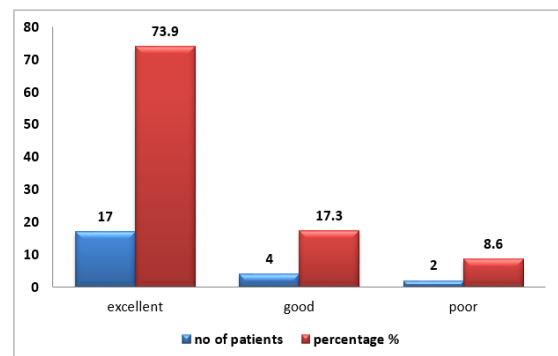
Graph 4: Dominance

In our study we found that 22 of right side AC joint involvement was seen in both male & female, in order to break the fall patients have been using there dominant right upper extremity, followingly have contracted the injury. With minority being non dominant side.



Graph 5: Mode of injury

In our study we found majority of the injuries were due to Road traffic accidents following we have household falls & industrial accidents.



Graph 6: Constant score

According to the constant score we had 17 excellent (73.91%), 4 good (17.39%) & 2 (8.69%) poor results.

The excellent score indicated that patient had full range of movement & had returned to daily activity, good results patient had mild restricted movement of the affected shoulder & pain, poor results were due to hematoma & infection in one patient which was treated according to the sensitivity of organism, another patient had stiffness & pin migration for which implant removal was done & shoulder was mobilized accordingly.

4. Discussion

We conducted a prospective study for duration of one year, 23 patients were studied who had actual follow up until full recovery with good shoulder movement & pain free. We have used tension band wiring for type 2 & 3 injuries which still has some controversy regarding treatment either to be made conservative with strapping or surgical as we have chosen to be tension band wiring, Controversy exists on the best modality of managing AC dislocation. Conclusion drawn from various study done earlier show a lot of variations as regard the study group, patient activity requirement, surgical expertise, type of fixation / repair/reconstruction, environmental factors etc. In contrast to type I and type II AC joint injuries, greater diversity exists regarding the optimal treatment of type III AC joint injuries, mainly due to difficulty in differentiating type III from type V injuries of the AC joint. Type III AC joint injuries have a totally torn AC and CC ligaments with 25% to 100% superior displacement as compared to the contra lateral shoulder.⁵ 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.⁶ 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.^{6,7} We consider that early AC degeneration is not caused by articular perforation with wires, it is also seen after conservative treatment and coracoclavicular fixation.⁷ In a study in which Type III AC Dislocations were managed by single technique of K-wire and tension band wiring along with repair of coraco-clavicular ligament concluded that "Tension band wiring with K-wires is a simple & less time consuming surgical technique allowing faster rehabilitation in active patients to achieve a stable & pain free shoulder without any post-operative complications."⁸ In a more recent study, Gstettner et al.⁷ retrospectively reviewed patients with AC joint injury, grade III who were treated with a hook plate surgically in comparison to those treated conservatively at a mean follow-up of 34 months. Improved Constant Scores were found in the

surgically treated group.⁹ Bosworth⁸ in 1941 was the first to describe a screw inserted from the clavicle into the coracoid and thereby functioning similar to the CC ligament.¹⁰ Few more studies stated that compared tension band wiring thereupon of ligament transfer concluded that acute AC joint dislocation, treated with both tension band wiring & Coroco Acromio ligament reconstruction achieved satisfactory results which were similar. But patients who were treated by TBW had relatively shorter duration of surgery. In a study by Harsh Raval, J.B. Panse, Neel Shah "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 of coraco-clavicular ligament concluded that "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".⁴ In an another study Chang Gung¹¹ "Surgical treatment of acute complete acromioclavicular dislocation: comparison of tension band wiring with ligament transfer" among Twenty-nine patients with tension band wiring (group 1) and 27 patients with CA ligament reconstruction (group 2) were followed-up for 12-47 (mean, 23.6) months concluded that acute complete AC dislocation, treated with tension band wiring for the AC joint or CA ligament reconstruction achieved similar satisfactory rates. However, patients who received the previous had relatively shorter operating times. Joint transfixion by a K-wire used to anchor a tension band is a simple, fast, and inexpensive technique. Concern about a risk of osteoarthritis has been raised, however. In our study, acromio-clavicular osteoarthritis was not significantly more common on the operated side than on the contralateral side. Thus, the osteoarthritis was bilateral in half the cases, despite the absence of specific risk factors.¹² 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.⁴ Most of the operative procedures for AC dislocation that have been reported had high incidence of complications such as breakage or migration of metallic device, failure of fixation or erosion of bone and subsequent loss of reduction.⁸

According to the study we conducted we used 1.5-1.8mm k wires as higher thickness wires can cause osteolysis, pin migration & skin irritation whereas small diameter pins gives lesser strength for reduction & have chances of implant failure. And also on doing open reduction we could observe the condition of AC joint & the surrounding structures, direct vision anatomical reduction, removal of injured disc, removal osteophytes, and capsular ligament reconstruction could be done. Due to achieving anatomical reduction patients had early recovery from pain, had good range of movement & reduction in early arthritis of ac joint.

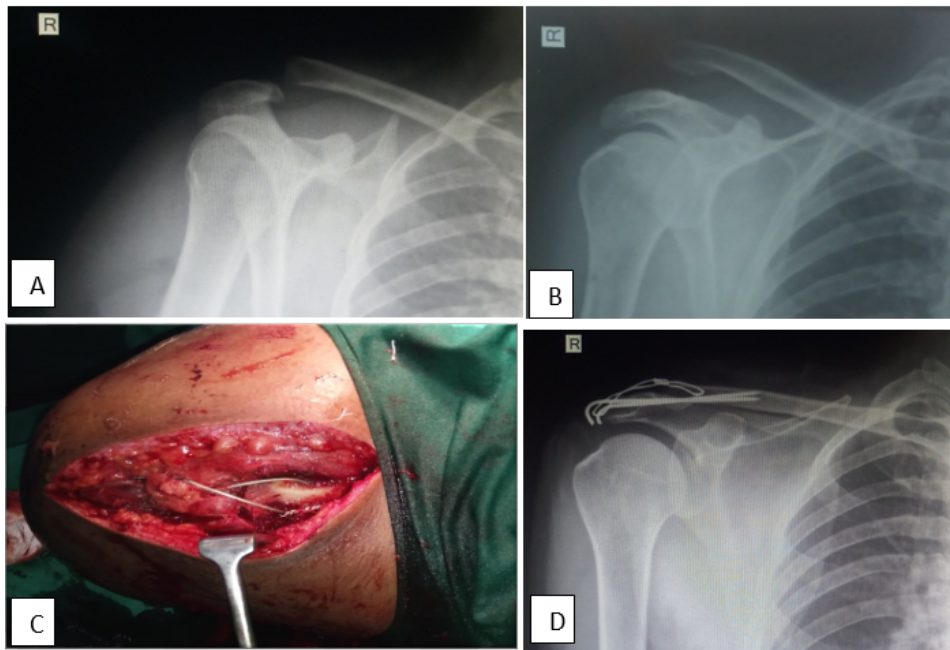


Fig. 2: Case 1: Preoperative radiographs; **A:** AP View; **B:** Zanca view; **C:** Intra operative picture of tension band wiring; **D:** Post operative radiograph



Fig. 3: Case 1: Clinical pictures; **A:** Operated right side AC joint; **B:** Over head abduction; **C:** Abduction in right side operated AC joint dislocation

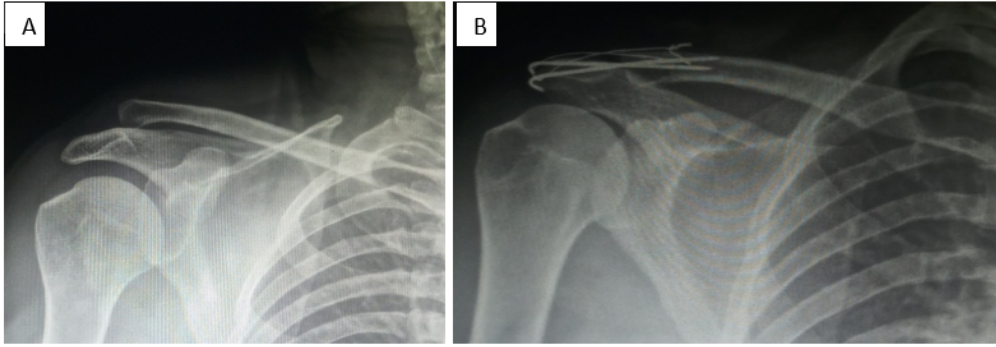


Fig. 4: Case 2: Radiographs; A: Pre Op; B: Post Op

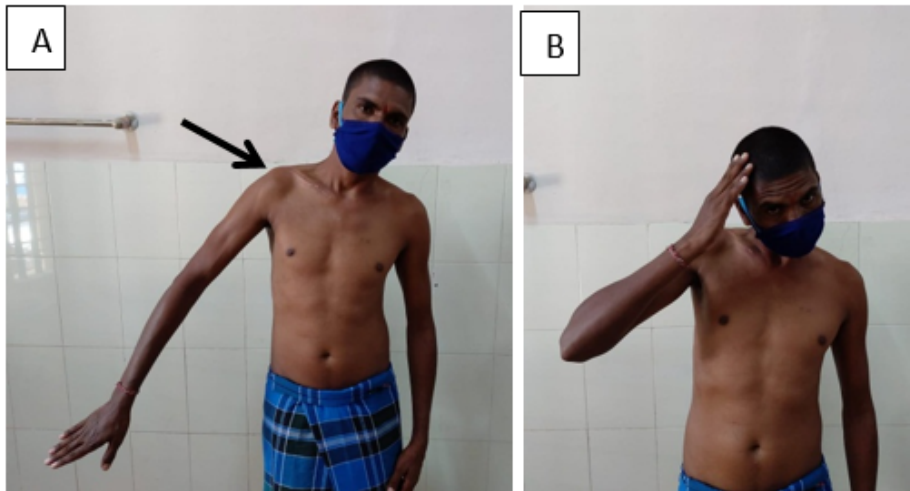


Fig. 5: Case 2: Clinical pictures; Patients' right shoulder was operated & follow up at 3 months

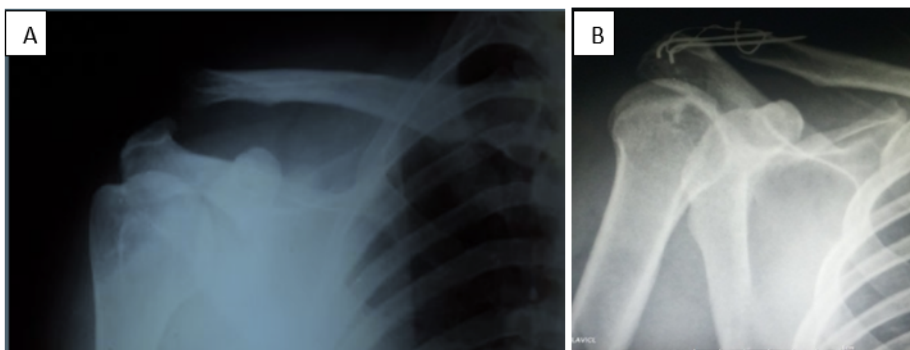


Fig. 6: Case 3: Radiographs; A: Pre Op x-ray; B: Post Op x-ray



Fig. 7: Case 3: Clinical pictures; Patients' right shoulder was operated & follow up at 3 months

5. Conclusion

Tension band wiring in acute type 2 & 3 Acromioclavicular injuries has resulted in excellent functional outcome. Though there is risk of implant migration and need for implant removal at later stage, this technique has the advantage of being cost effective, short surgical time and early rehabilitation. The limitations of our study is that we have not compared our technique with other forms of fixation & we have analyzed only the outcome of tension band wiring, also we have not evaluated in other types of dislocations or in immature & geriatric skeleton.

6. Source of Funding

Nil.

7. Conflict of Interest

None

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Cite this article: VV, Sunil S . Management of type 2 & type 3 acromio-clavicular joint injuries by principles of tension band wiring. *Indian J Orthop Surg* 2020;6(3):175-181.