ORIGINAL ARTICLE

Acromioclavicular separation: The Clinical results of coracoclavicular ligament reconstruction using Multistrand Vicryl band and temporary AC joint K wire fixation

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ABSTRACT

We treated surgically 16 patients with symptomatic complete dislocation of the acromioclavicular joint. The surgical procedure included debridment of Ac jaoint, reconstruction of the coracoclavicular ligament with multistrand vicryl band, repair of the acromioclavicular ligament, and imbrications of the deltotrapezius aponeurosis over the top of the distal clavicle. A temporary K wire fixaton of acromioclavicular joint was used to stabilize the joint. One patients was lost to follow-up.15 patients were followed for an average of 6 months (4–8 months). Functional outcome was assessed according to Imatani acromioclavicular rating scale. The results were excellent in 12 patients, good in two, and poor in one. Superficial infection (k-wire entry point) occurred in four patients which was treated with antibiotics, wound care and removal of k-wires around 4thweek after surgery. Laterl migaraiton of K wire occured in one patient In two patients, there was loosening of the Kwires where subluxation occured in five cases and complete dislocation in one two cases.

Keywords: AC separation;Coracoclavicular ligament; Reconstruction; Multistrand Vicryl band; Temporary across Ac joint K wire fixation

INTODUCTION

Injuries to the acromioclavicular joint accounts for approximately 12% of those to the shoulder girdle seen in the clinical practice. Young men are most commonly affected, 25% to 52% of these injuries occur during sport activities [3]. Incidence of AC joint injury is highest in sports activity, motor vehicle accident, and fall from height [4, 16] AC joint dislocation usually occurs as a result of direct trauma to the shoulder region most often when a force is applied to the acromion with the arm in adducted position [2, 3,] Subcutaneous position of joint without a large amount of muscle protection increase the incidence of injury [5].

Tossy et al first classified these dislocations into type I, II and III [2]. Rockwood et al have extended this classification scheme to include three relatively less common categories which make up type IV to VI [appendix III]. Most authors agree that type I and II injuries are generally treated nonoperatively with good results, and that type IV to VI needs to be treated surgically to prevent chronic disabling pain, weakness, stiffness, decreased range of motion and deformity. The treatment of type III injuries remains controversial. [1, 3, 4, 6,11] Many authors recommend early nonoperative treatment in most cases of type III but suggest that surgical repair be considered in certain subgroup of patients such as young patients, thin patients, those who perform heavy labor, overhead activity and patients who have occupation requiring repetitive lifting.[2, 3, 11, 15]Urist reported unsatisfactory result of conservative treatment in10% to50% cases that resulted in change of jobs or recreational activity or subsequent surgery. Surgical fixation of ACJ has been used to improve cosmetic appearance, lateral clavicle pain, and compromised lifting or bench press strength. [4] In addition to the discussion about the indication of surgical management, there is a lack of consensus regarding the suitability of different surgical technique. [2].

Numerous surgical reconstruction of CC ligament complex has been accomplished by a number of different techniques including the use of hardware fixation from the clavicle to the acromion, hardware fixation from clavicle to coracoid and reconstruction with autologous semitendinosus tendon or CA ligament and different synthetic material have been used to avoid removal of metallic hard ware. [6, 11,13]

CC cerclage causes anterior subluxation of the distal clavicle with malreduction of ACJ, which has been shown to cause pain, arthritis and weakness. Synthetic cerclage material with time can also

wear through bone, cutting through clavicle or coracoids resulting in possible cause of loss of reduction. [5] The Bosworth (coracoclavicular) screw and hook plate techniques require a second surgery for removal. In addition, the Bosworth screw is associated with number of complications like screw pullout, infection, calcification, and irritation over the screw head. [6,]. Complication of dynamic muscle transfer is that it reconstructs static constraint with dynamic tissue which is not as anatomically appealing as other techniques. Augmentation with polydioxanon bands is limited by their lack of stiffness. [5] Common criticism of CA transfer is the consequences of altering an important restraining mechanism to upward migration of the humeral head. [16]CC ligament augmentation with Dacron has been described and major complication of this procedure includes distal clavicle osteolysis, aseptic foreign body reaction and rupture of Dacron graft. [5]

Direct repair of AC and CC ligaments can be done in chronic AC separation (>3-4weeks) but with the additional resection of the distal 0.8 to 1.0 cm of the clavicle.[16] Some authors consider that the scarring tissues will fill the space between the clavicle and the coracoid process and that will secure the repair.[13]

The primary stability of the AC joint is provided by the superior acromioclavicular ligament and the attachments of the trapezius and deltoid muscles and some surgeons choose not to repair ruptured coracoclavicular ligaments, deltoid and trapezius muscles attachments are considered important clinical stabilizers of the clavicle and that their repair with reinforcement is a useful addition to any method of surgical treatment. [14]

As there is no local data available this study will help us to design better treatment option for complete AC joint dislocation in local prospectus.

Study Design
Quasi-Experimental Study

Setting
Study was carried out in Orthopedics department of Lahore General Hospital, Lahore.

Duration:
The duration of study was from November 2008 to May 2011.

Sample technique: Convenient Sampling

Sampling population: All patients presented in our emergency or out door departments who meet the inclusion and exclusion criteria.

Sample Selection: Inclusion criteria:
1. Complete AC joint dislocation (Rockwood Type III, IV, V, VI)
2. Patient aged between 16 to 45 year, both gender.

Exclusion Criteria:
1. Previous shoulder injury, Arthritis, associated neurological deficit, frozen shoulder, Rotator cuff tear and subacromial bursitis
2. Concomitant injury to respective shoulder
3. Injuries older than four weeks

METHODOLOGY

In this study we have treated total 16 cases of complete ACJ dislocation between 16 to 45 year of age who fulfilled the inclusion criteria, the diagnosis was made on clinical and radiological basis. Initial radiologic investigations consist AP view, & amp; nbsp; stress radiograph of ACJ, Zanka view, and Stryker notch view. We use six No.5 vicryl (polyglactin 910 absorbable suture Ethicon Johnson and Johnson) and two 1.8mm. The procedures were performed under general anesthesia. The patient were placed in the beach-chair position; the head was slightly deviated toward the contra lateral side. The shoulder was completely free for full rotation with the anterior and posterior shoulder girdle exposed 4 to 6 cm long skin incision used vertically in Langer's lines. Started posterior to the clavicle and then crossed the clavicle medially to the acromioclavicular joint, and then extended to the tip of the coracoid process. Most of the time, the anterior part of the deltoid and the trapezius muscles as well as the periosteum over the top of the distal clavicle and the acromion might be stripped off. If not, we developed this interval so that the distal part of the clavicle can be freely grasped and mobilized. In this way, the torn coracoclavicular ligaments easely visualized, as well as base of the coracoid process. The AC joint was debrided of any loose fragments or intra-articular disk. With a probe, both sides of the base of the coracoid process as well as its knee was identified. A curved forceps can be passed around the coracoid as closer to the bone as possible to avoid damage to neurovascular structures. Using this curved forceps the multistrand vicryl band was passed around the

coracoid and crossed into opposite directions. The assistant then reduced the acromioclavicular joint The 2 ends of the vicryl cord Passed around the clavicle making two turns (to prevent clavicular erosion and fracture) and tied with a knot placed antero- inferiorly to avoid subcutaneous irritation. Two K-wires 1.8mm diameter were inserted about 2 cm apart through the lateral border of acromion across the joint into the clavicle for 3 to 4 cm . The position of k-wires and accuracy of reduction of acromioclavicular joint can be confirmed on C arm. K-wires were bent and cut outside the skin for easy subsequent removal as out patient. The capsule and ligaments of acromioclavicular joint also the damaged trapezius and deltoid insertion were repaired and the wound close Forearm sling was applied. Sutures can be removed at 10 days, k-wires at 4 to 6 weeks. Active and passive range of motion exercises can be started after removal of k-wires to prevent breakage and migration. All patients wiere followed up in out patient department weekly for first 5-6 weeks and then monthly for three months. During postoperative evaluation the functional outcome (pain, function/strength, and movement) was graded by using the score of Imatani et al, which is specifically designed to evaluate ACJ injuries. This score assigns 40 points for pain, 30 for function and strength, and 30 for motion. A score of 90 to 100 was deemed excellent; 80 to 89, good; 70 to79, fair; and less than 70, poor. Degree of reduction of ACJ was evaluated in AP radiograph of shoulder according to modified Rosenorm and Pedersen classification. [1, 15] K wire complications and loss of reduction was expressed as number of cases.

CLINICAL RESULTS

All of the patients were males between 25 and 40 years old (mean, twenty-three years and seven months). The right shoulder was involved in 9 and the left in 7. In 7 of the 16 patients the injury was to the dominant extremity. The mechanism of injury was RTA in 14 patients and fall in remaining.The patients all had severe pain and tenderness well localized to the acromioclavicular joint, with a prominent deformity and a limited range of motion of the shoulder.The limitation of motion was most severe in abduction, flexion, and adduction.. All of these patients had complete vertical displacement at the acromioclavicular joint on both the ordinary and stress roentgenograms.The vertical displacement at the acromioclavicular joint was equal to or greater than the total height of the joint in 12 of the 16 patients on both views. In other four patients the displacement equaled the joint height only on the stress views. In these four patients the coracoclavicular distance was increased by seven millimeters in the unstressed roentgenograms and nine millimeters in the stressed ones. In all of the patients who underwent surgery and could be followed, the acromioclavicular ligaments and coracoclavicular ligaments were found to be completely torn. Intraarticular minicus was torn in 9 patients The amount of injury to the deltoid and trapezius muscle however, was variable, and did not correlate with the amount of displacement on preoperative roentgenograms. Muscle tears were most commonly seen near the bone attachments of the two muscles in the region of the acromioclavicular joint. The injuries varied from gross muscle ruptures over the joint to small areas of hemorrhage. In threepatients there was no visible injury to either muscle.

FOLLOW-UP FINDINGS

On final evaluation using modified Imatani scoring system with follow up from 04 months to 8 months (average 06 months).11 out of 16 patients who had Rockwood type III, five patients with type V injuries were relieved of their symptoms, regained a full range of motion and had mild occasional pain during activity. Overall score for 12 patients were 90-95 was considere excellent and for two patients the scoring was from 80 to 85 and was considerd good and one patient had score of less than 70 and his shoulder movement was restiricted espsially over head abduction.these three patients had one thing common that they were operated after three weeks of there injuries. Loss of shoulder strength was significantly greater in these patients. Superficial infection (k-wire entry point) occurred in four patients which was treated with antibiotics, wound care and removal of k-wires around 4th week after surgery. Laterl migaraiton of K wire occured in one patient at 5th week postoperatively because of its poor hold noted at the time of insertion. No K wire breakage and and medial migraion has been observed.

Radiographically

Complete loss of reduction according tomodified Rosenorm and Pedersen classification occured in two patients which was associated with immediat post operative sublauxation. up to 2mm of subluxation observed in five patient which was

associated with satisfactory clinical outcome. They had type V dislocation and were operated after two weeks of injury. Anatomical reduction was achieved in the rest of patients. Radiographic evidence of degenerative arthritis was noted in 3 patients 14-16 months after surgery with mild to moderate shoulder dysfunction. And these three patients were above the age of 40 years.

DISCUSSION

The incidence of loss of reduction has been reported from 10-15%, to as high as 44% despite an initial anatomic reduction. Stam and Dawson 31 reported on a series of 20 surgical reconstructions using Dacron tape in which 9 has residual dislocation on stress views and 14 out of 20 patients had erosion of the clavicle by Dacron tape. Six of the 14 required surgical release of the Dacron tape to prevent fracture. One fracture did occur from this mechanism. In our series of 15 patients loss of reduction up to 2mm was noted in five patients. They had type V dislocation and were operated after two weeks of injury. Being bio-absorbable and passing vicryl cord around the clavicle making two turns instead of just tying around the clavicle, eliminate motion between vicryl cord and clavicle on rotary movement. This prevents erosion of the clavicle. No clavicular erosion and fracture was noted in our patients suggesting significant advantage of just adding two turns of the vicryl cord before tying in our technique.

Neault and associates 32 reported 3 cases of deep infection following the use of Dacron tape. All patients responded to removal of foreign material. These authors believed that the use of a non absorbable suture might act as nidus for infection, which may occur acutely or even years later. We did not encounter any surgical wound infection in our patients. This may be attributed to the bio-absorbable nature of the vicryl thread. However superficial infection at k-wire entry points occurred in four patients which was treated with antibiotics, wound care and removal of k-wires around 4th week after surgery.

There have been numerous reports of migration of acromioclavicular trans-fixation pins into the areas of vital organs including the lungs, liver, neck, spinal canal, subclavian artery and the aorta, with potentially devastating complications. Smooth k-wires, threaded pins, Stienmann pins and Hagie pins have all been reported to migrate. The pins also have a tendency to break medial to the bend, leaving the medial piece free to migrate. There was no medial pin migration and breakage noted in our series except one k-wire that backed out at 5th week postoperatively. This was because of its poor hold noted at the time of insertion. Bending and cutting k-wires outside the skin, removal of k-wires at 4 to 6 weeks and no active and passive range of motion exercises before the removal of k-wires may the cause of significantly less number of pin related complications like breakage and migration in our patients.

Ossification of coracoclavicular and acromioclavicular ligament has been reported in patients after surgical or non-surgical treatment and as early as third week. In the series of Arner and associates35 the reported incidence ranges from 50% to 85%. These authors termed this as a rule rather than the exception. Goldberg and associates 36 reported a case of transient brachial plexus injury caused by calcification around a Dacron graft. In most series, however there has been no correlation between the ossification and symptoms or compromise of shoulder function. A similar incidence was observed in our study where asymptomatic incomplete ossification of coracoclavicular ligament was seen in 06 out of 15 patients.

Degenerative changes, related pain and disability may develop over time in all types of injuries treated conservatively or surgically. Cook and Heiner 37 reported degenerative changes as high as 24% in their review. Henkel and associates 38 found 21% incidence after the use hook plates. Radiographic evidence of degenerative arthritis was noted in 3 patients 14 to 16 months after surgery with mild to moderate shoulder dysfunction in our patients.

Broos and associates 39 reported on the long term results of 87 patients with complete acromioclavicular joint dislocation treated surgically with a Bosworth screw or a Wolter plate. Sixteen patients had an implant failure, redislocation was seen in 25% of the patients, calcification in 39%,and arthritis in 41%.Their end results were good or excellent in only 60% and fair or bad in 40% of the patients. Overall 80% excellent, 13% good and 6 % fair results in our patients clearly suggest the efficacy of the technique we used for our patients.

CONCLUSION

The results in our series suggest that surgical treatment of complete acromioclavicular joint

dislocation is an effective and reliable method of treatment. Despite the fact that early mobilization was not allowed in our patients, returning to full activities and good cosmetic results were seen in majority of our patients along with a very low rate of complications. We recommend the use of vicryl cord augmentation of the coracoclavicular ligament. It is a safe, reproducible technique which provides a secure reduction during ligament healing. . Bending and cutting k-wires outside the skin, removal of k-wires at 4 to 6 weeks and no active and passive range of motion exercises before the removal of k-wires may the cause of significantly less number of pin related complications like breakage and migration in our patients.

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