Modified Weaver-Dunn Technique in Management of Acromio-clavicular Joint Dislocation


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Abstract

Background: The treatment of AC dislocation is based upon the classification scheme. Type I and II injuries can be treated symptomatically. The treatment of type III injuries remains somewhat controversial. While operative intervention is often reserved for types IV, V and VI. Although there are more than 60 surgical techniques reported for repair and reconstruction of Acromio-clavicular and Coraco-clavicular ligaments, no gold standard exists.

Methods: This is a prospective study was conducted on 23 patients suffering from chronic AC dislocation presented to Kasr Al-Ainy Hospital from June 2011 till December 2013, treated by Modified Weaver-Dunn technique with mean age of 38.9 years and mean follow-up duration was 10.05 month. 2 patients were excluded due to associated rotator cuff tear and one patient was lost in follow-up. So our statistics were based on 20 patients. This procedure involves the release of the Coracoacromial ligament from the acromion and its transfer with a bone block to the clavicle after resection of its distal end (1cm), and coracoclavicular sling augmentation with various types of non-absorbable materials as Dacron and mersilene tape.

Results: 20 patients with chronic AC joint dislocations were included in this study, all patients were evaluated pre and postoperative with Constant score and American Shoulder Elbow Score and accordingly we evaluated the patients after two weeks, one month, 3 month, 6 month and 12 month, with a mean of 10.05 month follow-up, American Shoulder Elbow Score; there was significant improvement from an average score of 38.15 (SD =5.02) preoperatively out of 100 points to an average score of 70.35 (SD=4.53) 3 month postoperatively and mean score of 91 (SD=6.05) on the last follow-up.

Conclusion: Results were excellent in 75% of the patients, good in 15%, fair in 5% and poor in 5%. The average Constant pain score improved postoperatively for all patients, and the scores for function, strength, and flexion improved for all patients. Our experience thus far with this technique is encouraging for patients with chronic ACJ dislocation type (III, IV, V & VI) with good radiographic evidence of ACJ reduction post operatively and patient satisfaction and early return to normal activity.

Level of Evidence: Level IV case series study.

Key Words: Acromio-clavicular Joint Dislocation – Modified Weaver-Dunn technique – Distal clavicle-Weaver dunn.

Introduction

The acromioclavicular (AC) joint is a diarthrodial joint, there is only 5 to 8 degrees of motion through it which is stabilized by static stabilizers (AC ligaments “anterior, posterior, superior & inferior”, Coracoacromial (CA) ligament and Coracoclavicular (CC) ligaments “conoid & trapezoid” and dynamic muscular stabilizers include the trapezius and deltoid [1,2,3].

Tossy et al., and Allman initially classified AC injuries as type I,II and III. Rockwood et al., subsequently added types IV, V and VI to complete the classification, it is based on radiographic displacement and the degree of ligamentous damage [4].

The goals of treatment are achieving painless range of motion of the shoulder, obtaining full strength and exhibiting no limitation in activities, the treatment of AC dislocation is based upon the classification scheme, Type I and II injuries can be treated symptomatically. A sling can be used in the acute phase for discomfort. Ice and anti-inflammatory are also helpful. Early range of motion is encouraged, the treatment of type III injuries remains somewhat controversial. While operative intervention is often reserved for types IV, V and VI [5,6,7].

Although there are more than 60 surgical techniques reported for repair and reconstruction of AC and CC ligaments, no gold standard exists [7].

Modified Weaver-Dunn Technique is a procedure involves the release of the Coracoacromial
ligament from the acromion and its transfer with a bone block to the clavicle after resection of its distal end (1cm), and coracoclavicular sling augmentation with various types of non-absorbable materials as Dacron and mersilene tape. It is described as one of the most successful technique to treat both acute and chronic AC joint dislocations [8,9,10].

The work aim to focus on the Modified Weaver-Dunn technique in treatment of chronic AC joint dislocation Rockwood type III through VI, spotting light over its advantages, disadvantages and complications.

Material and Methods

This is a prospective study was conducted on 23 patients with chronic AC dislocations presented to Kasr Al-Ainy Hospital (Level I Trauma Centre) treated by Modified Weaver-Dunn technique from June 2011 till December 2013 with mean age of 38.9 years and mean follow-up duration was 10.05 month. Two patients were excluded due to associated rotator cuff tear and one patient was lost in follow-up. So our statistics were based on 20 patients.

The patient’s ages ranged from 20 to 57 years with mean age 38.9 years. There were 6 females and 14 males.

Table (1): Sex distribution.

<table>
<thead>
<tr>
<th></th>
<th>Male</th>
<th>Female</th>
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<tbody>
<tr>
<td>Count</td>
<td>14</td>
<td>6</td>
</tr>
<tr>
<td>Percent</td>
<td>70%</td>
<td>30%</td>
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</tbody>
</table>

Table (2): Age distribution between age groups.

<table>
<thead>
<tr>
<th>Age Groups</th>
<th>Count</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>20-25 years</td>
<td>2</td>
<td>10%</td>
</tr>
<tr>
<td>26-30 years</td>
<td>3</td>
<td>15%</td>
</tr>
<tr>
<td>31-35 years</td>
<td>4</td>
<td>20%</td>
</tr>
<tr>
<td>36-40 years</td>
<td>2</td>
<td>10%</td>
</tr>
<tr>
<td>41-45 years</td>
<td>3</td>
<td>15%</td>
</tr>
<tr>
<td>46-50 years</td>
<td>3</td>
<td>15%</td>
</tr>
<tr>
<td>51-55 years</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>56-60 years</td>
<td>3</td>
<td>15%</td>
</tr>
</tbody>
</table>

Out of 20 patients; 11 patients (55%) were injured on their dominant hand side and 9 patients (45%) their injury were on the non-dominant hand side. All the patients were assessed by plain X-rays preoperatively, the dislocation were classified according to Rockwood’s; 13 patients (65%) were grade III, 3 patients (15%) were grade IV and 4 patients (20%) were grade V. All patients were of chronic onset for average duration of 13.2 months ranged from 8-24 months before surgery.

We included all patients with chronic ACJ dislocation type (III, IV, V, VI) and excluded patients with coracoid fractures, chronic ACJ dislocation type (I, II), acute ACJ dislocation, ongoing infections and rotator cuff tear.

Standard shoulder examination was performed for all the included patients regarding tenderness, range of motion, swelling, skin condition, neurovascular examination, Constant score: All the patients (100%) had loss of function on the affected side according to constant score with mean score of 42 points (range 31-52) out of 100 points (SD 5.9) and American Shoulder & Elbow Scoring System: All the patients (100%) had loss of function on the affected side with mean score of 38.15 points (range 30-48) out of 100 points (SD 5.02).

We used dynamometer for measurement of strength of abduction and inclinometer for range of motion. All patients were evaluated by plain X-rays (A-P and Zanca views) preoperatively, Preoperative imaging was used to classify the patient's dislocation and plan surgery.

Surgical technique:

All patients in this study were treated with same technique, general anesthesia and beach-chair position was used for all patients. For the first 7 patients, incisions were made horizontally along the lateral clavicle and the acromion which made us detach a big part of the anterior deltoid origin so for the next 13 patients, we used the vertical incision along the deltopectoral groove, started from the acromioclavicular joint and extend distally towards the tip of coracoid, the cephalic vein was retracted medially. The coracoid was identified as well as the conjoined tendon and pectoralis minor attachments on the coracoid.

The plane is developed between deltoid and pectoralis major, the superior aspect of the distal clavicle was exposed over its borders by subperiosteal dissection, 10mm of the distal clavicle is removed in a perpendicular fashion using an oscillating saw.

The tip of the coracoid, the coracoacromial ligament, and its insertion to the undersurface of the acromion is identified.
A 5-10mm osteotomy cut is made from the underside of the acromion and a piece of bone with the coracoacromial ligament attached is preserved.

This pedicled bone plug anchored to the tip of the coracoid is prepared with two No 5 Ethibond sutures passed through both bone and tendon.

A sling of Mersilene tape is passed under the coracoid and one end pass behind the lateral clavicle and the other end in front of it, the Mersilene tape is tied, whilst the clavicle is held down and the scapula pushed up-reducing the dislocation.

The medullary bone of the clavicle is identified and curedt to create a cavity for the bone plug to insert into.

Two or three unicortical drill holes are made in the upper cortex of the clavicle only.

The CAL is then transferred to the lateral end of clavicle with two interposing sutures through drill holes in the clavicle.

A no. 2 nonabsorbable suture is placed through the deltotrapezial fascia. Subdermal skin is closed with 2-0 or 3-0 absorbable suture. Skin is closed with a 2-0 suture in a running or interrupted fashion.

A compression dressing is applied. The arm is placed into a sling in 0 degrees of external rotation.

Shoulder rehabilitation protocol consists of Protective phase (first 6 weeks) then Basic strengthening (approximately week 6-12) when there is clinical evidence of healing and no displacement is visible on the X-ray, followed by Advanced strengthening (approximately month 3-5) full range of movement is allowed at 3 months but patients are advised to avoid activities that stress AC joint such as push-ups and bench press.

Final phase (approximately month 5-12) provides individualized conditioning for patient-specific sport or work needs.

Results

Twenty patients with chronic AC joint dislocations were included in this study, all patients were evaluated pre and postoperative with Constant score and American Shoulder Elbow Score and
accordingly we evaluated the patients after two weeks, one month, 3 month, 6 month and 12 month, with a mean of 10.05 month follow-up.

According to Constant score the maximum pain score is 15 points for no pain, 10 points for mild, 5 points for moderate and 0 points for sever. Preoperatively, 5 patients (25%) got 0 points with sever pain and 15 patients (75%) got 5 points with moderate pain. Postoperatively, 16 patients (80%) got 15 points with no pain and 4 patients (20%) got 10 points for mild pain.

Activity Level was measured by questionnaire as part of Constant score and there was significant improvement from an average score of 1.5 (SD =2.82) preoperatively to an average score of 8.8 (SD=2.19) postoperatively, 80% of patients (16) returned to their occupation and recreational activities, while 20% of patients (4) couldn't return their previous work.

American Shoulder Elbow Score was measured by questionnaire preoperatively and postoperatively (3 month/6 month), there was significant improvement from an average score of 38.15 (SD=5.02) preoperatively out of 100 points to an average score of 70.35 (SD=4.53) 3 month postoperatively and mean score of 91 (SD=6.05) on the last follow-up.

Constant score showed significant improvement from mean score of 42 (SD 5.9) preoperative, with minimum score of 31 and maximum of 52, to a mean score of 86.3 (SD 8.2) postoperative, with minimum score of 63 and maximum score of 98.

Postoperative X-ray for 18 patients (90%) had complete reduction, 2 patients (10%) had subluxation <25% immediate postoperative, 16 patients (80%) had complete reduction at last follow-up and 2 patients (10%) had <25% subluxation and 2 patients (10%) had 100% subluxation, one patient was uncontrolled diabetic and had sever infection and we had to remove the mersilene tape and ethibond sutures very early on debridement and the other patient had contralateral open tibia fracture which was treated by Illizarov and he used crutches for weight baring just 3 weeks after the surgery so he strained his shoulder and lost the reduction.

Complications:

Two patients had infection at the surgery site, one was sever that we did 3 times debridement and the wound didn't heal till we removed the mersilene tape and ethibond sutures but the patient lost the reduced AC joint, the other patient responded well to oral antibiotics. Two patients (10%) had <25% subluxation and 2 patients (10%) had 100% subluxation of the Acromioclavicular joint on their last follow-up x-rays.

Discussion

Stability across the acromioclavicular joint is achieved through a strong ligamentous complex. Urist demonstrated that with transaction of the acromioclavicular joint capsule, instability is produced in the posterior direction, where as with transaction of the coracoclavicular ligament, instability occurs superiorly, detachment of the surrounding musculature such as the deltoid and trapezius can lead to posterior dislocation, as well as superior subluxation [11].

The electiveness of surgery for complete Acromioclavicular Joint (ACJ) dislocation is controver-
sial. Availability of multiple techniques and variable results in the literature makes the treatment choice difficult.

When patients are seen more than 6 weeks after the initial injury, ACJ dislocation is considered to be chronic because there is either partial or total resorption of the coracoclavicular (CC) ligaments. The most popular and widely used CC ligament reconstruction technique for chronic injuries was originally described by Weaver and Dunn in 1972 [12], but even with a secure fixation at the time of operation, a bone-ligament interface will require a longer time to heal, this is due to the relative avascularity of the ligamentous aspect of the repair [13].

In our study we describe a modification to the Weaver-Dunn procedure, which aims to establish a stable reduction with bone-to-bone healing, provided by attaching the bone-plug-ligament graft in the medullary canal after excision of the lateral end of the clavicle, there is good blood supply to the bone-bone interface of the repair, and an initial inherent mechanical stability, and this graft is augmented with a sling of Mersilene tape passed under the coracoid and one end pass behind the lateral clavicle and the other end in front of it and we have very promising results to recommend this technique for all cases of chronic ACJ dislocation grade III, IV, V & VI.

References


