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Case Series

Modified Weaver-Dunn procedure, a novel approach to type-3 acromioclavicular joint dislocation

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ABSTRACT

Even though a generally accepted opinion is present about conservative management for type 1 and type 2 acromioclavicular dislocation and surgical management for type 4 to type 6 dislocations, different opinions come under play for conservative versus surgical management in cases with acute type 3 acromioclavicular joint dislocation. We came across 20 cases of type 3 AC joint dislocation with a varied age profile (range 18 to 50 years, mean 34.4±6.5 years). Patients usually complain of pain and swelling and difficulty in moving shoulder joint. The diagnosis can be confirmed by radiographs which shows widening of AC joint >2-4 mm and coracoclavicular distance >5 mm and superior displacement of distal clavicle. In our series, we have treated them with modified Weaver Dunn technique. Immobilized arm in arm pouch for 3 weeks and follow up was done to assess functional outcome. In this study we present the outcome and related complications with modified Weaver Dunn technique for type 3 acromioclavicular joint dislocation.

Keywords: Acromioclavicular dislocation, Weaver Dunn technique, Immobilized arm

INTRODUCTION

Of all shoulder joint injuries in sports persons and high demand professionals, acromioclavicular joint dislocation constitutes for about 40 percent.[1] Many of these injuries are seen in active population, generally in males in their twenties or thirties and are a result of road traffic accidents or in sports activities that necessitate contact.[2-4] Majority of these injuries are grade 1 or 2 (low grade) and can be conservatively managed with better functional outcomes. But grade 3-6 (high grade injuries) need surgical management.[5,6]

More than 150 varieties of surgeries have been reported to treat symptomatic acromioclavicular joint dislocation and greater than 60 unique methods have been reported for the reconstruction of coracoclavicular ligaments after a chronic injury.[3,7] But the best reconstructive method has still not been determined.[8] Frequently used techniques for treatment of Acromioclavicular joint dislocation are fixation by screws or wires or sutures or plate along with repair of ligaments.[5,6,9]

"Originally described by James Weaver and Harold Dunn in 1972, the Weaver-Dunn procedure (WD) involves transfer of the coracoacromial (CA) ligament from the acromion to lateral end of the clavicle.in their original series, Weaver and Dunn reported a failure rate of 28%".[9] Shoji et al suggested harvesting of Coracoacromial ligament along with acromion bone to strengthen the repair.[3,10] Further specialized variations by extra stabilizers have been proposed, with a motive of decreasing the complication of loss of reduction post-operatively.[3,11-13] "In recent literature, open or arthroscopic fixation of coracoclavicular construct using synthetic loops, flip buttons, tendon autografts or allografts has been recommended but with varied results".[6,14] These methods

have frequently been differentiated with Modified Weaver-Dunn technique which have given stable and good results.

Study design

Study was of case series. In this study, the data was collected from 20 patients who underwent modified Weaver Dunn procedure for Acromioclavicular joint dislocation in CAIMS, Karimnagar between June 2019 and June 2021. This study was accepted by the local ethics committee.

The mean duration from the time of ACJ injury to surgery was 6 days (3 to 10 days). Oxford shoulder score (OSS) and DASH score were used to evaluate all the patients. Time needed to complete functional return to their work was assessed.

Inclusion criteria

Patients with age between 18 to 50, type 3 injury or higher according to Rockwood classification and follow up for 24 weeks.

Exclusion criteria

Patient with past injury to the operating shoulder, greater than 1 fracture in same shoulder, medically unfit for the surgery and follow-up interruption. The diagnosis was established on the basis of radiological (anteroposterior [AP] and lateral views) and clinical (history, symptoms, signs). Intra or extra-articular glenohumeral joint deformity was assessed using an MRI scan.

A total of 20 patients fulfilled the study basis. Consent was acquired from patients who were selected for the study. Everyone had weakness and pain in the shoulder that affected their daily living activities postoperatively. Patient symptoms were pain over the acromioclavicular joint, deformity of the shoulder, ACJ instability with a feeling of grinding or popping and fatigue of shoulder.

Surgical technique

"Patient is placed in a beach chair position or semi sitting position under general anesthesia. Expose the acromioclavicular joint, the lateral end of clavicle, and the coracoid through an anterior curved incision. Incise the capsule and the superior acromioclavicular ligament in line with the clavicle to allow subperiosteal exposure of the clavicle and subsequent capsular and ligamentous repair. Resect subperiosteally the lateral 1 cm of the clavicle. Use a bone-cutting forceps or an oscillating saw to osteotomize the bone obliquely in an inferolateral direction (Figure 1). Remove the superior subcutaneous edge of the remaining edge of the bone with a file. Place mattress sutures in the ruptured coracoclavicular ligaments, but do not tie them. Insert two Kirschner wires about 2 cm apart through the lateral border of the acromion. While the lateral end of the clavicle is held in normal position, advance the wires into the clavicle for 2.5 to 4 cm. Hold the clavicle in the reduced position relative to the acromion and coracoid. Apply traction to the coracoacromial ligament to determine the proper length of ligament. Excise the excess ligament and place a mattress suture of a no. 1 nonabsorbable material in the ligament, leaving the suture ends free. Drill two small holes in the superior cortex of the clavicle and pass a suture end through each. Hold the clavicle in the reduced position and pull on the suture to bring the coracoacromial ligament into the medullary canal of the clavicle. Tie the suture while the reduction is maintained (Figure 1). Repair the capsule and ligament of the acromioclavicular joint and tie the sutures previously placed in the coracoclavicular ligaments".[15]

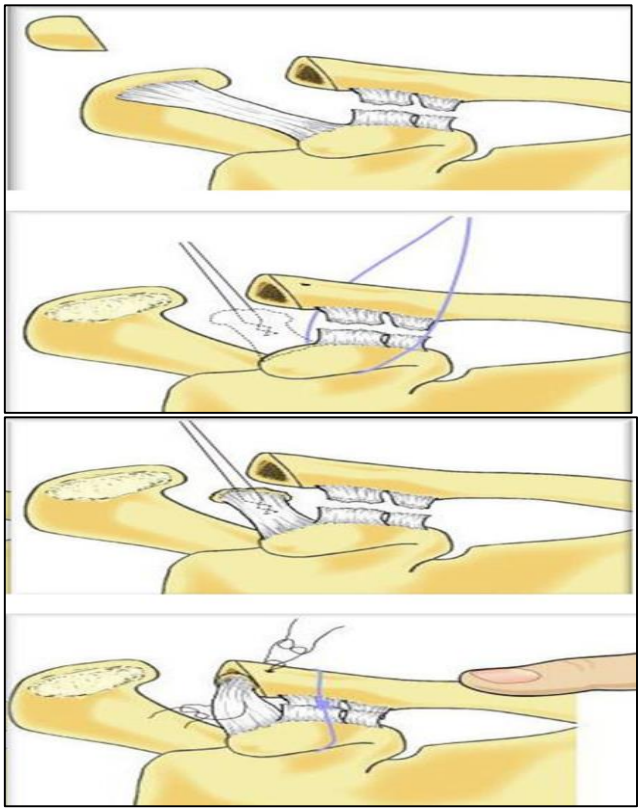

Figure 1: Clavicular osteotomy and repair of ligaments.

Postoperative management

"A sling is worn for 1 week while gentle active circumduction exercises are performed. At 2 weeks, the sutures are removed and the exercises are increased. Heavy lifting is avoided for at least 4 week, and then normal activities can be resumed, but contact sports should be avoided for at least 8 weeks".[15]

IEC approval

This study was accepted by the institutional ethics committee of Chalmeda Anand Rao institute of medical sciences, Karimnagar, Telangana.

CASE SERIES

Case 1

A 43-year-old male who is a daily waged worker came with a complaint of left shoulder pain. He fell over left side of his body with an outstretched hand. He immediately developed pain and had painful shoulder movements. On examination, swelling and step-off deformity were seen over left shoulder. An X-ray of the shoulder confirmed the diagnosis.

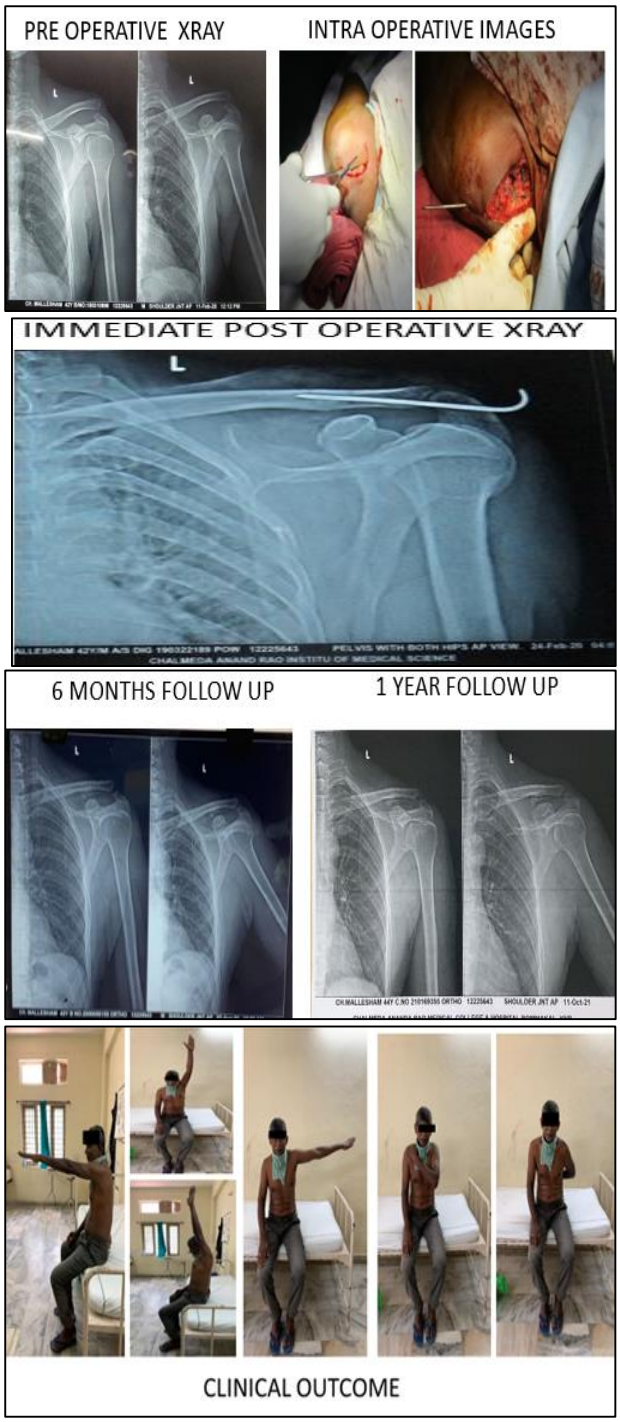

Figure 2: Clinical outcome of case 1.

Case 2

A 23-year old female who is a student came with a complaint of left shoulder pain. She fell over her right shoulder due to a motor vehicle accident. She immediately developed pain and had painful shoulder movements. On examination, swelling was seen over the right shoulder. An X-ray of the shoulder confirmed the diagnosis.

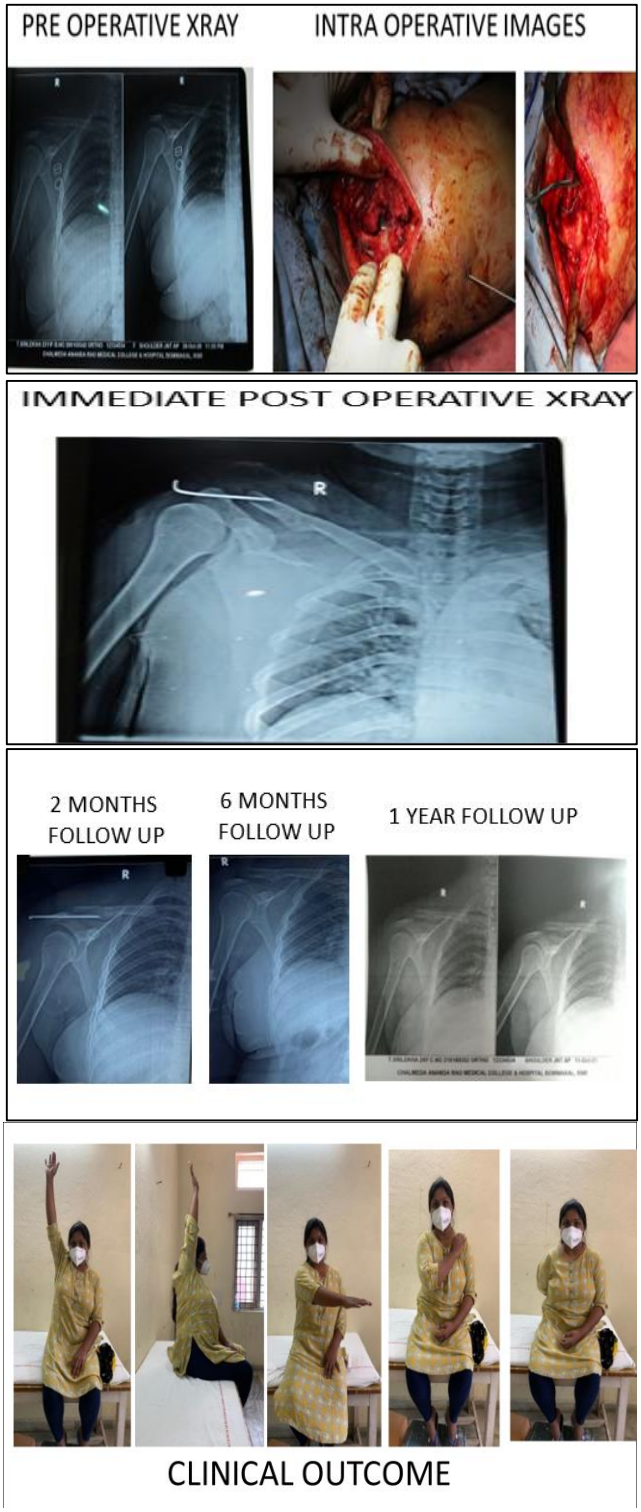

Figure 2: Clinical outcome of case 2.

Case 3

A 48-year-old male factory worker came with a complaint of inability to raise right arm and shoulder pain. He slipped and fell over right side of his body with an outstretched hand. He immediately developed pain and had painful shoulder movements. On examination, swelling and step-off deformity were seen over left shoulder. An X-ray of the shoulder confirmed the diagnosis.

Figure 4: Clinical outcome of case 3.

Case 4

A 27-year-old male athlete came with a complaint of shoulder pain after he fell down over his left shoulder while playing football. He immediately developed pain and had painful shoulder movements. On examination, swelling and step-off deformity were seen over left shoulder. An X-ray of the shoulder confirmed the diagnosis.

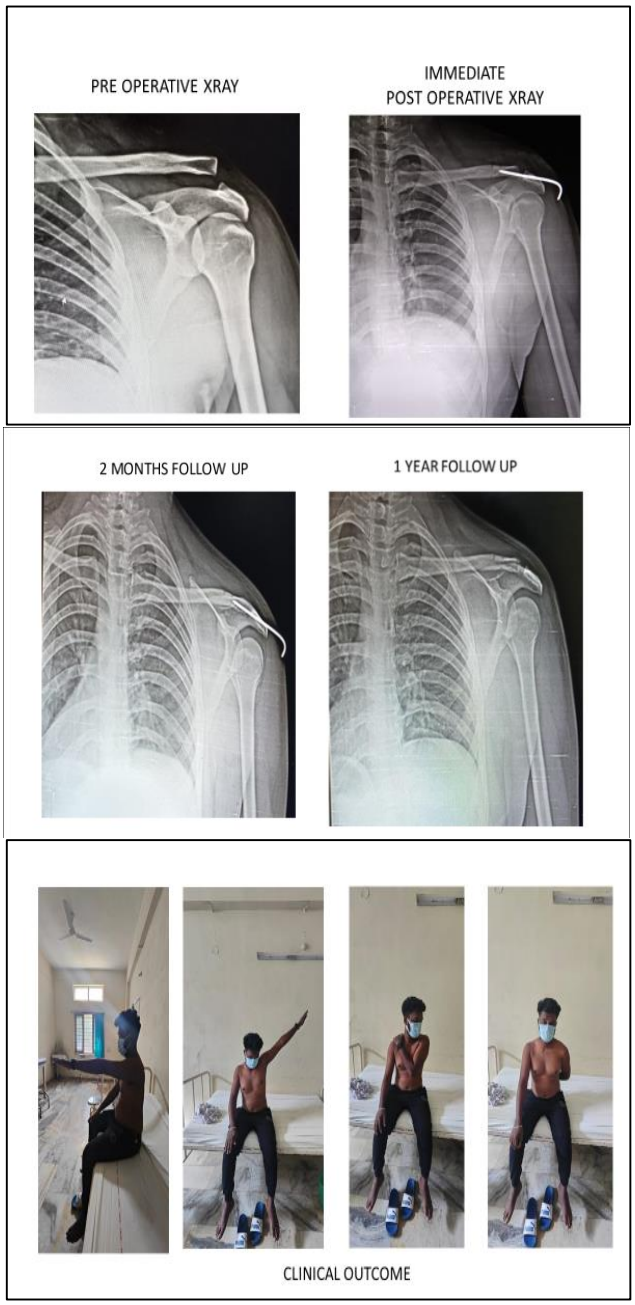

Figure 5: Clinical outcome of case 4.

Out of 20 patients, 16 were male patients and 4 were female patients (Figure 7) with a mean ± SD age of 34.4±6.5 years at the time of surgery (Figure 6). In 60% of cases, the dominant hand was involved (Figure 8).

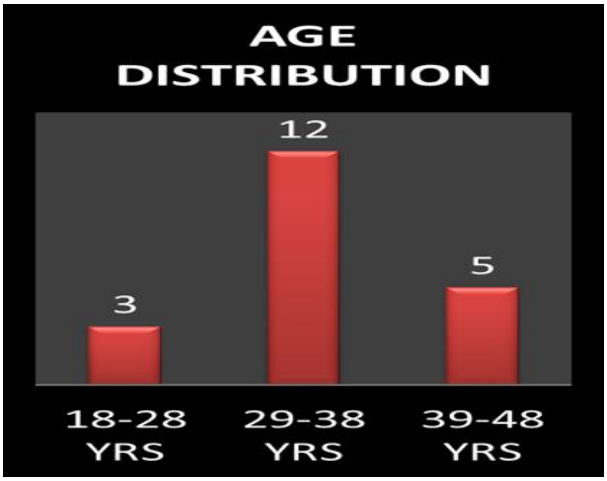

Figure 6: Age distribution.

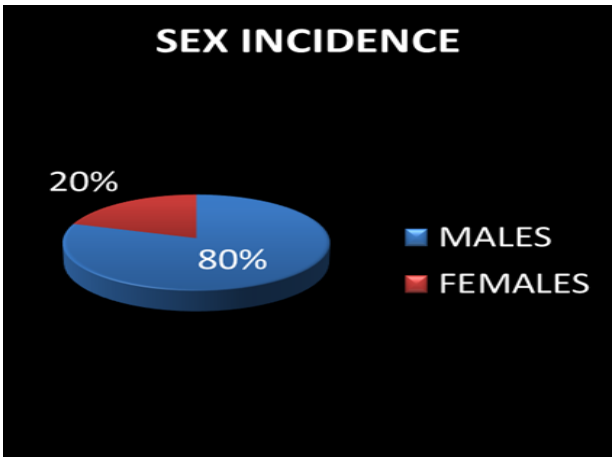

Figure 7: Sex incidence.

The mean duration from the ACJ injury to surgical treatment was 6 days (range 3 to 10 days). The mean surgery time was 51.7±2.7 minutes (range 47 to 58 minutes).

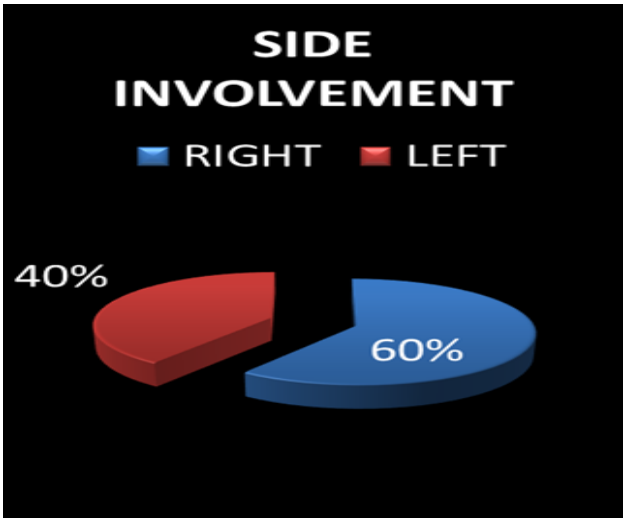

Figure 8: Side involvement.

In view of fracture distribution, out of 20 patients 11 (55%) had grade 3 acromioclavicular joint dislocation, 7 (35%) had grade 4 dislocation and 2 (10%) had grade 5 dislocation.

Clinical outcomes after a follow up of 12 months showed 15 (75%) patients with satisfactory results, 2 (10%) patients had mild pain, 3 (15%) patients had grade 2 subluxation and 1(5%) patients had infection (Figure 9).

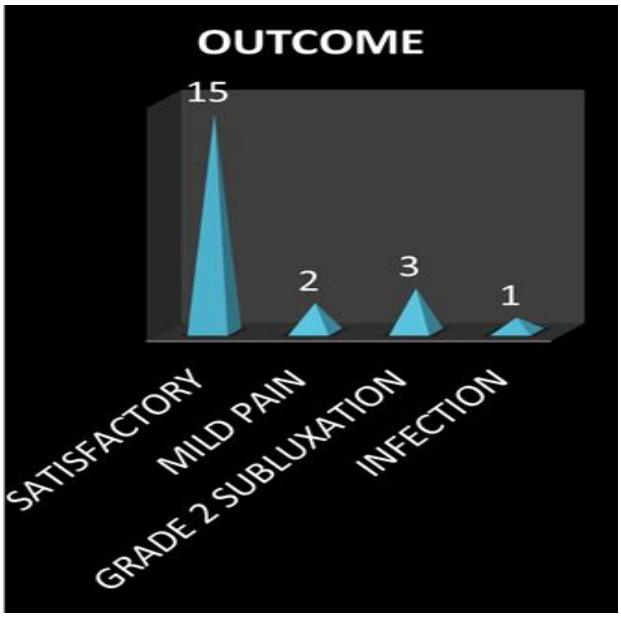

Figure 9: Outcomes.

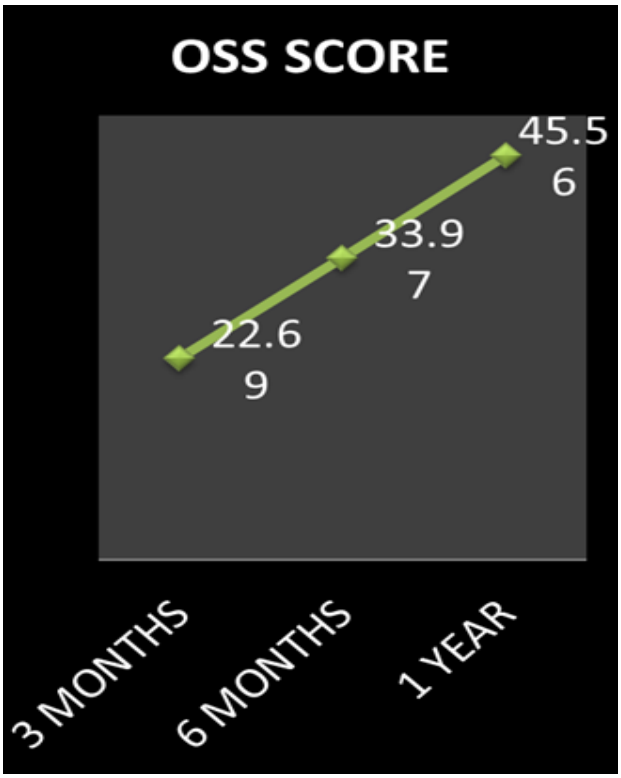

Figure 10: OSS score.

Table 1: Following are the studies showing radiological and clinical outcomes of modified Weaver-Dunn technique.

Studies	Number of patients	Patients mean age (Years)	Technique	Postoperative functional evaluation	Followup (months)	Complications
Present study	20	36	Modified Weaver Dunn	DASH:15 OSS:45.5	12	Infection subluxation
Galasso (2020)	54	50.5	Weaver Dunn	CMS:90.1	51.6	Ossification of the CC ligaments
Lopez-Alameda (2018)	28	34.7	WD with various methods of reinforcement	DASH:12.9± 16.8 OSS:42.7± 7.8	73	Osteoarthritis subluxation
Al-Ahaideb (2014)	9	38.6	WD with tight rope	CMS:97	20	Nil
Bezer (2009)	29	29.9	WD with 2 ethibond	CMS:89	69.5	Nil
Kumar (2007)	15	42	WD with polyester tape	CMS:91	26	Stiffness painful shoulder

The oxford shoulder scores (OSS) is an approved scoring system utilized to evaluate the disability and degree of pain caused by shoulder pathology. It is a 12-item patient reported PRO particularly made and developed for evaluating outcomes of shoulder surgery. The 3 months postoperative mean OSS of 22.6 improved by 33.9 in 6 months to a final mean of 45.5 (Figure 10).

The disabilities of arm, shoulder, and hand (DASH) questionnaire. It is a 30-item self-reported questionnaire in which the response options are presented as 5 point Likert scales. The scores range from 0 to 100. After a 12 month follow up, the DASH score significantly decreased to mean score of 15.

All the study subjects returned to their previous activity and level of work.

DISCUSSION

Acromioclavicular joint injuries are common in males, generally sports persons and professionals who require overhead abduction.[2,6,16] Rockwood classified acromioclavicular joint injuries into 6 grades which decide the treatment.[5,7] Many studies state that the treatment of grade 1 and 2 ACJ injuries must be non-operative which include analgesics and rest.[6,7]

In this study, after a 12 month follow up the functional outcome of modified Weaver-Dunn procedure was successful with good patient satisfaction and functional scores. Many studies show the radiological and clinical results which can be expected postoperatively. But the grade of injury, different surgical techniques, chronicity of the injury, different population characteristics and postsurgical management make it difficult to collate the outcomes.

Gupta et al study had a total number of 35 patients (26 males, 9 females) whereas Tauber et al study had 24 patients (14 males, 10 females) which is quite similar to our case series.[6,17] In Galasso et al study the dominant hand was involved in 60% of the cases. Galasso et al described a postoperative complication of loss of reduction in 1 patient (3.7%) for which no revision procedure was done.[3,8] When compared to our study, it is seen 3 patients (15%). We managed these patients conservatively by immobilization, rest and analgesics. Tauber et al described superficial wound infection postoperatively in 1 patient (8%) Which later healed with local antiseptic therapy, while in our study also 1 patient (5%) had infection postoperatively.[17] Regular wound debridement and local antibiotic dressings were done and infection subsided. In our study the mean OSS score showed an improvement from 22.6 to 45.5 whereas Gupta et al described an improvement from 25 to 43.[6] Hegazy et al in 2016 compared modified Weaver –Dunn technique with the use of semitendinosus autogenous tendon graft for Acromioclavicular joint reconstruction and concluded that the use of semitendinosus graft achieved better OSS which improved from 25 to 50 points.[14] Kumar et al compared modified Weaver-Dunn technique with the use of synthetic ligament for ACJ reconstruction. chronic Acromioclavicular joint reconstruction using synthetic ligament had a better OSS (OSS improved from 26 to 45) and earlier return to work when compared with the modified Weaver-Dunn procedure (OSS 28 to 42).[1]

CONCLUSION

Modified Weaver-Dunn technique is efficient in restoring vertical joint stability but not horizontal joint stability after surgery. It produces a good functional outcome with less complications and thus remains gold standard procedure for all patients including high demand professionals and athletes.

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Ethical approval: Not required

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