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ORIGINAL ARTICLE

Different modalities of fixation of acromio-clavicular joint dislocation: joint stability outcome

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ABSTRACT

Keywords: dislocation, acromioclavicular, stability, mersilene tape, tension band.

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Background: Severe acromioclavicular (AC) joint injuries Rockwood types III, IV, V and VI always need surgical management. **Aim of the work:** The aim of this study was to evaluate for how long the AC joint is stable with different surgical methods. **Patients and methods:** twenty patients were conducted in this cohort prospective study with AC joint dislocation. Rockwood types III, IV, V and VI treated surgically by 3 different techniques Group 1 by mersilene tape with AC k wires, Group 2 by percutaneous AC joint screw and Group 3 by tension band wire. All Surgeries were performed at Orthopedic Department of Aswan University Hospital between May 2019 and August 2021and follow up time between 6 to 15 months. Patients age ranged from 20 to 57 (mean; 34.95±11.57) years, 17 male and 3 female. Constant score of the shoulder joint was used for final functional outcome. **Results:** AC joint was stable in all patients treated with the different techniques. Constant score of the shoulder joint showed no significant difference between the 3 groups; however the mersilene tape was superior to other used procedures. Operative time was highest with Group 1. Bleeding time is the least with Group 2. **Conclusion:** AC joint stability was achieved with using either mersilene tape, percutaneous AC joint screw, or tension band with no significant difference, however after 6 months of follow up mersilene tape achieve the highest stability over other used procedures.

INTRODUCTION

Acromioclavicular (AC) joint is an essential connection between the axial skeleton and the shoulder joint. AC joint instability after its injuries interfere with normal functional outcome of the shoulder join. Injuries of AC joint represents about 9% from Injuries of the shoulder girdle especially between age 20 to 40 years which is more common in male [1]. Most AC joint injuries due to direct hit to the outer side of the abducted shoulder joint [2]. According Rockwood classification, the AC joint dislocations were classified into 6 types [3 - 5]. Severe acromioclavicular (AC) joint injuries with Rockwood types III, IV, V and VI that always need surgical management. Conservative management is recommended for types I and II [6]. while type III is still debatable [7]. Achievement of postoperative AC joint stability is a mandatory for satisfactory shoulder joint functional outcome. Many surgical

techniques were published for treatment of types III, IV, V and VI either reconstruction as : autologous tendon graft or fixation as : percutaneous AC joint screw , mersilene tape , arthroscopic adjustable loop, easy bond sutures or coraco-clavicular screw. Optimal surgical technique is still controversial where each of which has its own pros and cons [8 - 9]. Aim of the work: The aim of this study was to evaluate for how long the AC joint is stable with different surgical methods; Mersilene tape, tension band, and percutaneous AC joint screw.

PATIENTS AND METHODS

Twenty patients were conducted in this cohort prospective study with AC joint dislocation seventeen (85 %) patients were male and 3 (15%) were female. The mean age of patients was 34 (ranged from 20 to 57) years. According Rockwood classification; 9 patients were types III (45%), 9 patients were type IV (45%) and 2 patients were type V (10%). The participants were treated surgically by 3 different techniques Group 1; 10 patients (50%) treated by mersilene tape with AC k wires, Group 2; 7 patients (35%) by tension band wire and Group 3; 3 patients (15%) by percutaneous AC joint screw. All surgeries were performed at Orthopedic Department of Aswan University Hospital between May 2019 and August 2021. Inclusion criteria: (1) trauma less than 3 weeks, (2) patients were above18 years, (3) closed injuries. Open injuries, immune compromising patients and any shoulder joint disease were excluded from the study. All patients detailed histories were analyzed; personal, trauma and comorbidities. General and local examination, and Radiograph (shoulder X-rays and CT) for all participants were performed.

Surgical techniques

All operations were done under general anesthesia. Beach chair was the position for all patients. Longitudinal horizontal incision (about 7 cm) just distal to the lateral end of the clavicle. The AC joint was fixed either by mersilene tape with k wires [10] (figure 1), tension band wire [11] or percutaneous AC joint screw [12] (figure 2), these surgeries were assisted with image intensifier and the operative time and blood loss were calculated. Post-operative protocol: arm sling, anti oedematous and pain killer medication.

Follow-up

Plain Radiograph was done at day one post-operatively and at the 1st, 3rd and at 6th months during the follow up period to evaluate the AC joint reduction stability (stable, subluxation or dislocation). Follow up period was between 6 to 15 months. the functional outcome was assessed using Constant score of shoulder joint [13] at the final period of the follow-up.

STATISTICAL ANALYSIS

SPSS 23.0 software (SPSS Inc, Chicago, IL, USA) was used for all statistical analyses. Normally distributed qualitative data were presented as mean ± SD. Qualitative data were described in terms of frequencies and percentages. Statistical testing utilized Mann-Whitney U test for continuous variables, Statistical significance was defined as $p < 0.05$ (two-tailed).

RESULTS

Twenty patients with closed AC joint dissociation, 17 male and 3 female divided into 3 groups managed by 3 different modalities; Group 1 included 10 patients treated by mersilene tape, Group 2 included 7 patients treated by fixation with Percutaneous AC screws and Group 3 included 3 patients treated by tension band wire in the period from May 2019 till August 2021. The mean follow up period was 8 (ranged from 6 to 15) months. The AC joint was stable in all patients treated with the

different techniques (P>0.05). Statistically, there is no significant difference between the 3 groups (P>0.05) as regard the relation between the functional outcome and Rockwood classification types. The time of the operation in group 1, 2 and 3 was 77.55±7.89, 54.85±7.44 and 55.00±5.00 min, respectively. Group 1 reported longest operation time versus the least in group 2 (P<0.001). The amount of bleeding in group 1, 2 and 3 was 100.30±17.27, 43.14±4.74 and 76.66±2.88 ml respectively. Group 1 reported higher amount of blood loss versus the least in group 2 (P<0.001). Constant score of the shoulder joint showed no significant difference between the 3 groups (P>0.05). The constant shoulder score improved with increased follow up period (P<0.001) in all 3 method, obviously in merseline tap group.

DISCUSSION

The postoperative stability of AC joint injuries is important issues after surgical treatment AC joint dislocation; Rockwood type III, IV, V and VI. As regard the best technical modality that achieve this AC joint stability is still debatable [8, 15, 16].

Reduction AC joint dislocation and fixation using percutaneous K-wires was the traditional method for years but this method was abandoned as it was often complicated with k wires migration, with potential risk for neurovascular neck structures [17, 18]. Recently several published literatures introduced more safe methods that aimed to either CC ligaments repair or reconstruction as; free tendon graft (autologous or synthetic), loops, screws, plates or Mersilene tape sutures [19, 20, 21].

In the current study that conducted on 20 participants, the AC joint dislocation was fixed either by mersilene tape with k wires, percutaneous AC joint screw, or tension band wire. We reported stability of the AC joint in all patients treated with the different techniques, with no significant difference between the 3 groups (P>0.05). However; mersilene tape was superior over other used surgical techniques. As regard the time of the operation, the group 1 recorded longest operation time while the least in group 2 (P<0.001), where it was in group 1, 2 and 3 was 77.55±7.89, 54.85±7.44 and 55.00±5.00 min, respectively. As regard the amount of bleeding, group 1 reported higher amount of blood loss versus the least in group 2 (P<0.001), where, it was in group 1, 2 and 3 was 100.30±17.27, 43.14±4.74 and 76.66±2.88 ml respectively. Similar to our study, Patidar et al reported the results of surgical management of 12 patient suffered from AC joint injuries by ethibond sutures and Mersilene tape, where, the mean operation time was 54 min and the mean bleeding amount was 100 ml[22].

Chen et al. (2014) reported in their study that Mersilene tape recorded less operative time (P = 0.005) and bleeding loss (P = 0.010) than using hook plate [23]. In other side Huang et al reported no difference between the Merseline tap and hook plate as regard operative time in acute dislocation of AC joint type V($p = 0.846$) [14]. The result was different between Chen et al and Huang et al as the injuries was difference [14, 23].

Statistically, there is no significant difference between the 3 groups (P>0.05) as regard the relation between the functional outcome and Rockwood classification types. At 6 follow-up the Constant score of the shoulder joint showed no significant difference between the 3 groups (P>0.05). We observed that the constant shoulder score improved with longer follow up period (P<0.001) in all 3 method, obviously in merseline tap group. Our results regard the functional outcome and constant shoulder score were similar to that reported with Chen et al and Deshpande et al [23, 24].

CONCLUSION

The all 3 surgical techniques (mersilene tape, PAC screw, and tension band wire) used in our study for management of AC joint dislocations achieved AC joint stability and satisfying functional outcomes. However; mersilene tape was superior over other used techniques.

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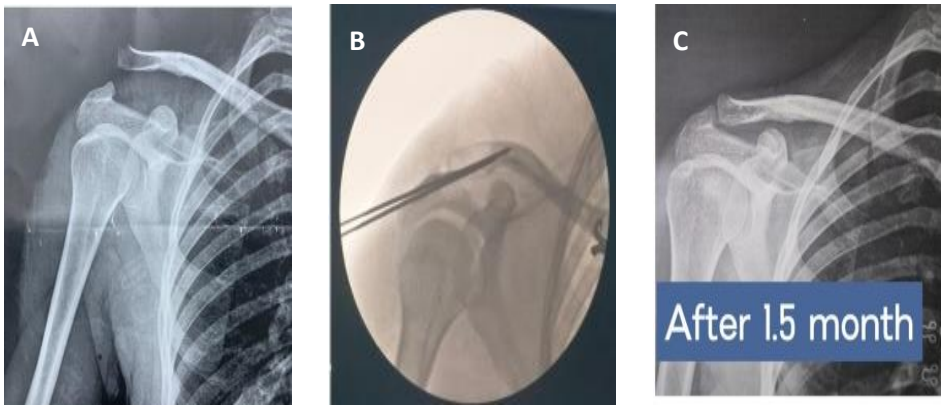

Figure 1 Male patient 42 years old, worker with Rt sided AC joint injury due to road traffic accident treated by Merselin Tap + k-wires; A) preoperative x-ray finding, B) one month postoperative follow up X-ray. C) one and half month postoperative follow up x-ray after removal of the wires

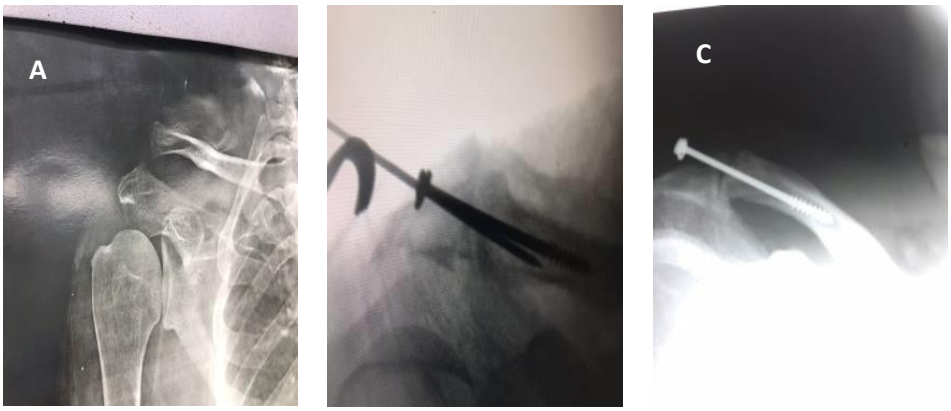

Figure 2 Male patient 35 years old, worker with Rt sided AC joint injury due to sport injury treated by screw A) preoperative x-ray finding, B) intra-operative fluoroscopy show fixation with screw. C) one and half month post-operative follow up x-ray.

Table (1): Demographic data of the studied participants (n=20):

Variable name	N	(%)
Age (years)		
• Mean ± SD	34.95 ± 11.57	
• Range	20 – 57	
Sex		
• Male	17	(85.0)
• Female	3	(15.0)
Side of the injury		
• Right	10	(50.0)
• Left	10	(50.0)
Mode of trauma		
• Assault	5	(25.0)
• Fall to ground	4	(20.0)
• Road traffic accident	4	(20.0)
• Sport injury	7	(35.0)
Comorbidity		
• Free	14	(70.0)
• Hypertension	4	(20.0)
• Asthma	1	(5.0)
• Diabetes mellitus	1	(5.0)
Classification of injury		
• III	9	(45.0)
• IV	9	(45.0)
• V	2	(10.0)
Methods of fixation		
• Mersilene tape	10	(50.0)
• Percutaneous screw	7	(35.0)
• Tension band	3	(15.0)

Quantitative data are presented as mean ± SD and range; qualitative data are presented as number (percentage).

Table (2): Comparison of surgical parameters according to used technique (n=20)

Variable name	Mersilene tape (Group1, n=10)	Percutaneous screw (Group 2, n=7)	Tension band (Group 3, n=3)	P value[1]
Duration of operation (min)	77.55 ± 7.89	54.85 ± 7.44	55.00 ± 5.00	**< 0.001*** **1~2,3**
Blood loss (ml)	100.30 ± 17.27	43.14 ± 4.74	76.66 ± 2.88	**< 0.001*** **1~2,3** **2~3**

Quantitative data are presented as mean ± SD. Significance defined by $p < 0.05$.

Table 3 Comparison of Constant shoulder score according to used technique (n=20)

Variable name	Mersilene tape (Group1, n=10)	Percutaneous screw (Group 2, n=7)	Tension band (Group 3, n=3)	P value[1]
Constant shoulder score				
• After 3 months	40.88 ± 12.69	27.57 ± 9.32	41.66 ± 11.54	0.103
• After 6 months	75.22 ± 9.98	61.85 ± 9.35	67.66 ± 13.50	0.092
P value[2]	**< 0.0001***	**< 0.0001***	**< 0.0001***	

Quantitative data are presented as mean ± SD. Significance defined by $p < 0.05$.

P value[1]: for comparing the three studied groups.

P value[2]: for comparing the same group over time.