

Comparison of Tight Rope Technique and Clavicular Hook Plate for the Treatment of Acute Acromioclavicular Joint Dislocations

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Abstract

Aim: This study aimed to compare the tight rope technique and clavicular hook plate for the treatment of acute acromioclavicular joint dislocations.

Study type, settings & duration: This randomized control trial was conducted at PAEC General Hospital, Islamabad from January 2019 to December 2021.

Methodology: A total of 50 patients were selected. Patients have been divided into two groups Group A patients underwent the Tight-rope technique and Group B patients underwent the clavicular hook technique. Patients presenting with acute acromioclavicular joint dislocations of Rockwood type III and V, both males and females were included aged 18 to 50. Patients presenting with type I and type II injuries, AC joint arthritis, and fractures of the distal clavicle were excluded. Both techniques were compared in terms of VAS score and CMS score postoperatively.

Results: The mean postoperative VAS pain score in group A was 1.76 ± 0.77 and 2.32 ± 1.03 in group B. The mean CMS score in group A was 88.92 ± 2.3 and 84.6 ± 3.4 in group B. The outcomes in Group A showed significant improvement as compared to group B.

Conclusion: The Tight-rope technique showed significantly better outcomes as compared to the clavicular hook plate technique.

Key words: Tight-rope technique, clavicular hook plate technique, acute acromioclavicular joint dislocations.

Introduction

Acromioclavicular (AC) joint injury is experienced by athletes and youngsters around the globe. The AC joint is a diarthrodial joint in which clavicle's lateral process articulates with acromion course because it extends anteriorly from scapula. It is worth mentioning that the AC ligament superior section is by far the critical section of AC

joint's strength. The two coraco clavicular ligaments, that support vertical stabilization, and also the coraco acromial ligament, are supporting structures. Minimal injuries do not result in substantial morbidity, but serious injury can result in major loss of shoulder strength and functionality.^{1,2}

Road traffic accidents, sports events, and falls are all likely causes of AC injuries. In sports like football, and ice hockey, AC joint damages contributes nearly forty percent of shoulder related injuries and approximately ten percent of total injuries.^{3,4} The Rockwood classification has proven to be the most frequently adopted system for grading the dislocation of AC joints, depending on the extent and position of distal clavicle displacement, ranging from Type I to Type VI.¹ While Rockwood Type I-II AC dislocated joints, noninvasive therapy is generally advised. Type III AC dislocated joints are distributed into two categories such as IIIA and IIIB injuries.⁵ For Type IIIA injuries, noninvasive therapy is indicated, and invasive intervention is recommended in case of Type IIIB injuries.⁵ Furthermore, some studies have

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Authors Contribution

MI, SS & ST conceptualized the project. MI, AM, KMBH & TY did the data collection. MI, AM, ST & KMBH also did the literature search. MI, ST & KMBH performed the statistical analysis. Drafting, revision & writing of manuscript were done by MI, SS, AM & ST.

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proposed interventions in type III related injuries in sports and intensive physical work. Injuries of AC joint associated with Rockwood type IV, V, and VI are commonly treated with surgery.⁶⁻⁸

The Weaver–Dunn procedure, coracoclavicular joint screw fixation, AC joint reconstruction with auto grafts, synthetic grafts, K-wire fixation, tension banding, Endo Button fixation, and hook plate fixation have all been suggested in case of dislocated AC joints.⁹⁻¹¹ However, the following therapeutic approaches are widely recommended in dealing AC joint dislocations, but on the other hand there is yet no gold standard defined. The Tight Rope technique and Hook plate technique are now the two most common strategies for treating AC dislocations. Both methods deliver results that are both safe and efficacious. Subacromial impingement, a second operation to eliminate the plate, pain, rotator cuff tears, and functional limits are all drawbacks of the Hook plate technique.^{12,13} A study reported that in conditions (acute and chronic), Hook plate and K-wire treated group were observed with 26.3 % complication rate and a 1.2% for reoperation.¹⁴ According to a study, the Tight Rope approach produced favourable results with lower Visual Analog Scale pain measurement as compare to Hook plate method, but a different study differed.^{15,16}

Several studies have investigated and compared different standard operating procedures for the dislocation of AC joint. However, very limited research has been conducted to compare the Tight Rope approach with the clavicular hook plate, and the results are controversial. Thus, the aim of this research work is to compare the clinical and radiological outcomes of these two surgeries for AC joint dislocation. We also present the hypothesis that Tight Rope approach will yield better outcomes as compared to clavicular hook plate technique.

Methodology

This randomized control trial was conducted at PAEC General Hospital Islamabad, Pakistan from January 2019 to December 2021. A total of 50 patients were selected. Patients presenting with acute acromioclavicular joint dislocations of Rockwood type III and V diagnosed on clinical examination and radiography, both genders included and having age 18 to 50 were included in the study. Patients presenting with type I or type II injuries, Acromioclavicular joint arthritis, and distal clavicle fractures were not included in the study.

In two groups, patients were divided equally using consecutive random sampling, twenty five in

each group. Group A was treated with the Tight-rope technique and Group B with the clavicular hook plate technique. Group A patients received general anesthesia and seated on a beach chair for arthroscopic examination and also treated for glenohumeral abnormalities. From intraarticular damage, to protect the base of the coracoid bone, the anterosuperior and anteroinferior portals were employed. After making a 2-centimeter-long skin incision on the superior surface of the lateral clavicle, the AC joint was reduced with the aid of an image intensifier. Next, a guide pin was drilled from the clavicle to the base of the coracoid with the aid of a special guide system, and a Tight-Rope system was then inserted. The Tight-Rope was pulled tighter, and the wounds were layered closed. Group B patients went under general anesthesia, positioned in a beach chair. There was a skin incision with about 8 centimetres in between lateral clavicle and the AC joint. Following clavicular reduction, the wound was patched up in layers with the clavicular hook plate in place on the lateral clavicle. Three months following surgery, the implants were removed.

The outcome was assessed by two orthopedic surgeons having more than five years of experience. Clinical examination and radiography were performed after one month and six months postoperatively. The outcomes were measured in terms of constant score¹⁷ and VAS pain score. The outcomes were noted after 6 months of the final assessment.

The sample size was calculated using an open epi sample size calculator taking CMS score of 89.3 ± 4.2 in Tight-rope technique group, and 83.3 ± 8.8 in clavicular hook plate group,¹⁷ power of test 80%, and Confidence interval 95%.

Data were analyzed using IBM SPSS 23. The Mean $\pm$ Standard deviation was calculated for age, CMS, and VAS pain score. Frequencies and percentages were calculated for gender and Rockwood type. In both groups, CMS and VAS pain scores were measured by utilizing independent sample T-test with a significance level <0.05 .

The ethical approval was obtained from the Ethical Committee of PAEC General Hospital Islamabad vide reference PGHI-IRB(DMe)-RDC-06-023.

Results

A total of 50 patients were enrolled in our study. To each treatment group 25 were allocated. The mean age in group A (Tight-rope technique) was 30.72 ± 9.5 years and 32.88 ± 10.07 in group B (Clavicular hook plate technique). The baseline

characteristics are shown in Table-1. Most of the patients in both groups were males. Rockwood type III was the most prevalent type in both groups followed by type V. The traffic accident was the most prevalent mechanism of injury in both groups.

Table 1: Baseline characteristics.

Variables		Group A N (%)	Group B N (%)
Gender	Male	21 (84)	22 (88)
	Female	4 (16)	3 (12)
Rockwood	Type iii	14 (56)	13 (52)
	Type v	11 (44)	12 (48)
Mechanism of injury	Traffic accident	15 (60)	14 (56)
	Athletic injury	7 (28)	8 (32)
	Other	3 (12)	3 (12)

The mean postoperative VAS in group A (Tight-rope technique) was 1.76 ± 0.77 and 2.32 ± 1.03 in group B (Clavicular hook plate technique). Significant difference was observed in both groups. The mean CMS score in group A was 88.92 ± 2.3 and 84.6 ± 3.4 in group B, which is statistically significant (Table-2).

Table 2: Postoperative VAS and CMS scores comparison.

	Groups	Mean	SD	p value
Postoperative VAS score	Group A (tight-rope)	1.76	0.779	0.03
	Group B (clavicular hook plate)	2.32	1.030	
Postoperative CMS score	Group A (tight-rope)	88.92	2.397	0.0001
	Group B (clavicular hook plate)	84.60	3.440	

Discussion

The most notable conclusion of this study was that the Tight Rope system's arthroscopically aided fixation in dislocation of acute AC joint patients outperformed clavicular hook plate's results. The Tight Rope approach proven to be considerably better for treatment than the clavicular hook plate due to being convenient and a durable surgical procedure having minor side effects. Traumatic injuries to the AC joint accounts 9% of all shoulder injuries in people, and traffic accidents and falling are the most frequent causes of AC joint separations.¹⁸ Treatment for AC joint separations is still in dispute, and many patients receiving conservative treatment report significant persistent discomfort. After experiencing persistent shoulder

problems for weeks or months, these patients may decide to have surgery. There are more than 150 methods for treating dislocations of AC joint that have been documented in the literature, but none of them have global acceptance for medical care due to observed variability. Each operating technique has a different complicated list of profile.^{19,20}

Several investigations have reported the surgery to treat superior AC dislocation injuries because it produces better results than nonsurgical treatment like tendon grafts or suture-button designs.²¹ Conversely, subsequent studies have found that rate of complex outcomes after AC ligament restoration ranges from 27 percent to 52 percent, with 20 percent of patients experiencing broken collarbone fracture complications.²² Suture-button configuration failure brought on by knot slippage or button migration might result in failure of tendon grafts and remodelling stretch. A study²³ discovered that AC ligament replacement has a 29 percent early failure rate. The two buttons are now joined by tape to form a self-propelled Tight-Rope system that can alter reconstruction length and has been demonstrated to withstand heavier loads.²⁴ With a substantial variations between before and after the procedure constant scores and VAS scores, our study found that patients undergoing arthroscopic aided fixation treatment utilizing a Tight-Rope approach had effective short-term clinical outcomes. Vast majority of subjects had recovered their normal range of motion and were extremely pleased with the function of shoulder during the assessment in follow-up.

Our study revealed that the Tight-rope technique had improved outcomes in terms of postoperative VAS and CMS scores in comparison to clavicular hook plate. The mean VAS score in the Tight-rope technique group and clavicular hook plate group was 1.76 ± 0.7 and 2.32 ± 1.03 ($p < 0.05$). Mean CMS score in the Tight-rope group recorded was 88.92 ± 2.39 and 84.60 ± 3.44 in the clavicular hook plate group ($p < 0.05$). Our results are comparable with Nie et al.,¹⁷ who reported that VAS pain score and CMS score were considerably better in the Tight-rope group as compared to the clavicular hook plate group. Shen G et al.²⁵ also found that the Tight-rope group had better VAS scores and CMS scores as compared to the clavicular hook plate group. Gunnar et al.¹⁸ confirmed that the Tight-Rope approach, which is arthroscopically aided, has advantages over clavicular hook plate fixation in the reduction of acute AC joint separations. In keeping with previous studies, patients in the Tight-Rope group showed considerable betterment in the Constant as well as in VAS score after follow-up compared to those under going clavicular hook plate technique.

In comparison to open invasive procedures, evidence suggests that the all-arthroscopic method is preferable for treatment since it is a minimally invasive technique which permits for effective reduction in the infection hazard, and a large scar.^{26,27} The Tight-Rope approach is a minimum incision arthroscopic technique that removes the second surgery requirement for the implant removal, fixation failure, or reduction loss after removal of plate, leading to a quicker recovery and enhanced function of shoulder.²⁸

The Tight-Rope approach in comparison to the clavicular hook plate approach, is a better option since it is a minimally invasive operation along with few complication and a better proven outcome.

Conflict of interest: None declared.

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