



## Akromiyoklaviküler Eklem Dislokasyonunun Sentetik Bağ ile Tedavisinin Klinik Sonuçları\* Clinical Outcomes in Treatment of Acromioclavicular Joint Dislocation by Synthetic Bonds

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### Öz

**GİRİŞ ve AMAÇ:** Bu çalışmanın amacı akromiyoklaviküler eklem dislokasyonu nedeniyle sentetik bağlarla tedavi ettiğimiz hastaları değerlendirmek ve farklı bağ seçeneklerinin klinik sonuçlarına etkilerini karşılaştırmaktır.

**MATERYAL VE METOD:** Kliniğimizde 2011-2018 yılları arasında akut veya kronik akromiyoklaviküler eklem çıkığı nedeniyle sentetik bağ kullanarak cerrahi uyguladığımız 18 hasta retrospektif olarak çalışmaya dahil edildi. Hastaların 14'ü erkek (%77.8), 4'ü kadındı (%22.2), ortalama yaşları 36.5 (19-52) idi. Hastalar kullanılan bağa göre iki gruba ayrıldı. Hastaların 11'i LockDown® (%61.1), 7'si ise Tight-rope® (%38.9) sistemi ile tedavi edilmişlerdi. Hastaların klinik değerlendirilmesi Q-DASH skorlamasına göre yapıldı. İstatistiksel değerlendirme ortalama, oran, yüzde olarak yapıldı. İki grubun ortalamalarının farkını değerlendirmek için Mann Whitney-U testi kullanıldı.

**SONUÇLAR:** Hastaların ortalama takip süreleri 19.72 aydı. Hastaların genel Q-DASH skorları ortalama 6.94 (0-20.45) idi. Yapılan istatistiksel değerlendirmede iki grup arasında Q-DASH skorları arasında anlamlı fark yoktu (p:0.771, p>0.05). Hastalarımızda implant yetmezliği, clavikula osteolizi ve akromiyoklaviküler eklemde instabilite gelişmedi. Tüm hastalar eski işlerine geri dönebildiler.

**ÇIKARIMLAR:** Akromiyoklaviküler eklem çıkıklarının sentetik bağlar ile tedavisi klinik olarak iyi sonuçlar vermektedir. Ancak farklı iki sentetik bağ arasında fark yoktur.

**Anahtar Kelimeler:** Akromiyoklaviküler eklem, dislokasyon, sentetik bağ

### Abstract

**INTRODUCTION:** The aim of this study is to evaluate the patients treated with synthetic ligaments due to acromioclavicular joint dislocation and to compare the effects of different ligaments on clinical outcomes.

**MATERIALS AND METHODS:** Eighteen patients who underwent surgery using synthetic ligaments in our clinic between 2011-2018 due to acute or chronic acromioclavicular joint dislocation were included in the study retrospectively. A total of 18 patients were included in the study. 14 of the patients were male (77.8%) and 4 were female (22.2%). Their average age was 36.5 (19-52). The patients were divided into two groups according to the synthetic bonds that were used. Eleven of the patients were treated with LockDown® (61.1%) and 7 were treated with Tight-rope® (38.9%) system. Clinical outcomes were evaluated according to the Q-DASH scores. Statistical evaluation was made as average, rate, percentage. Mann Whitney-U test was used to evaluate the difference of the averages of the two groups.

**RESULTS:** The mean follow-up time of the patients was 19.72 months. The overall Q-DASH scores of the patients were 6.94 (0-20.45) on average. In the statistical evaluation, there was no significant difference between the two groups between the Q-DASH scores (p:0.771, p>0.05). Implant failure, clavicle osteolysis and instability in the acromioclavicular joint did not develop in our patients. All patients were able to return to their old jobs.

**CONCLUSION:** Treatment of acromioclavicular joint dislocations with synthetic ligaments gives good clinical results. However, there is no difference between two different synthetic bonds.

**Keywords:** Acromioclavicular joint, dislocation, synthetic bond

### INTRODUCTION

Acromioclavicular joint injuries are one of the most frequent shoulder problems, generally affecting patients at a young age. Fifty percent of

shoulder injuries due to athletic activities are acromioclavicular joint injuries (1). They may occur due to falling on a closed arm or a direct strike.

There are various types of trauma according to intensity and direction. Rockwood defines six different types (2). There is consensus that type I and II dislocations should be treated with conservative treatment (3). General opinion in types IV, V, and VI is application of surgical treatment (4). Type III dislocations are debatable. There are publications that report that conservative treatment and surgical stabilization override each other, as well as the ones noting no difference between them (5).

Many methods are defined for surgical treatment. Closed reduction and indication via K wire and screw system (Bosworth) stabilizing between distal clavicle and coracoid are two of them. Transfer of coracoacromial ligament to clavicle in stabilization of acromioclavicular joint is defined by Weaver-Dunn (6). However, there are studies only concerning incapability of ligament transfer in biomechanical terms (7, 8). Therefore, this technique had been modified in recent years, and coracoclavicular indication is added to the ligament transfer (9, 10).

Synthetic ligament systems have been utilized more recently. In acromioclavicular joint dislocations, synthetic ligaments are used to connect coracoid and clavicle. The main objective here is improvement of the acromioclavicular joint capsule and remodeling of coronoid and trapezoid ligaments while the synthetic ligament carries the load. Some synthetic ligaments may act as a scaffold. Tight-rope®, and LockDown® are some of these. (11, 12). In this study, we discuss the results of patients whose acromioclavicular ligaments are reconstructed using synthetic bounds.

## PATIENTS AND METHODS

18 patients who were treated for acromioclavicular joint injury and for whose reconstruction synthetic ligaments was used in our clinic between 2011 and 2018 are included in the study. 14 were male (%77.8), four were female (%22.2), and the mean age was 36.5 (19-

52) years. Radiological evaluation was done according to Rockwood system. Preoperatively, there was type V dislocation in 14 of the patients (%77.8) and type IV dislocation in four of them (%22.2) (Table I). 13 of the dislocations were acute (%72.2) and five were (%27.8) chronic dislocation. Distal clavicle resection was performed for six (%33.3) patients. Evaluation of the dislocations in the early postoperative period and in follow-up graphies was also done according to the Rockwood system. 11 of the patients treated with LockDown® (%61.1) and seven of them Tight-rope® (%38.9) synthetic bound systems.

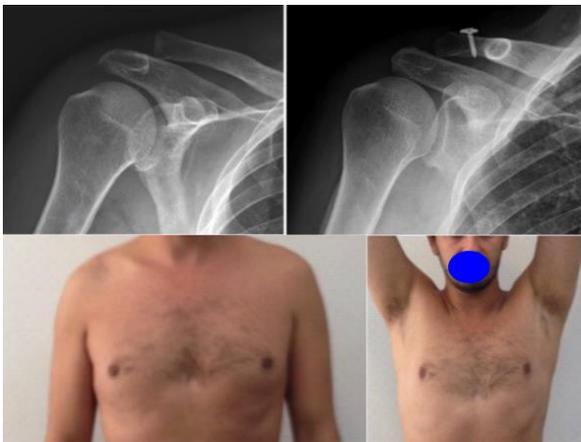
For the operative technique, incision was done through the acromioclavicular joint by longitudinal incision. With this incision, both the acromioclavicular joint and coracoid process can be reached. Synthetic bounds was carried out between coracoid process and distal clavicle. For LockDown® distal clavicular fixation carried out with screw and coracoid with loop system. For Tight-rope®, both distal clavicular and coracoid fixation carried out with endobutton (Figure 1). Then, reduction was controlled with fluoroscopy. Acromioclavicular ligament and primer fascia on clavicle were repaired (Figures 2,3).



**Figure 1.** Synthetic bounds. LockDown® on the left and Tight-rope® on the right side.



**Figure 2.** (clockwise): preoperative and post operative images of acromioclavicular dislocation treated with the Tight-rope® system. Intraoperative image of the system and repair of the acromioclavicular joint capsule. Final clinical result of the patient.



**Figure 3.** (clockwise): pre and post operative images of acromioclavicular dislocation treated with the Lock Down system. Image of the both shoulders and full elevation of the arm.

Patients were monitored with shoulder-arm strap for 3 weeks. First week, no movement was given to the shoulder joint whereas hand, wrist and elbow movements were allowed. Second week, passive movements supported with aid were given. Patients with little complaints of pain during controls and who were able to tolerate were given active exercises without straining. On postoperative 3 weeks, all patients were given active and strengthening exercises. Weights less than 2 kilograms were allowed. At the end of the 6th week, 5-kilograms weights were allowed. Weight limitation was repealed at the postoperative 3rd month.

Clinical and radiological exams of the patients were done at regular intervals. Functional results

of the shoulder joints of the patients were evaluated according to Q-DASH (Quick Disabilities of Arm and Shoulder and Hand) scoring. Radiologic evaluation of the patients was performed by shoulder AP (Antero-posterior) x-rays (Figure 2,3). Reduction loss, recurrent dislocation, and screw disfunction were evaluated in direct graph.

In statistical analysis, mean and standard deviation values were used for the measurement values. Rate and percentage values were used for categorical data. The data of the patients were uploaded to Microsoft Excel program and statistical evaluation was done with SPSS 17 program. Mann Whitney U test was used to evaluate the difference of means between two independent groups. Statistical significance level was accepted as 95% confidence level and p value was accepted as 0.05. When  $p < 0.05$ , statistically significant difference was accepted between the two groups.

## RESULTS

Average period for follow-up of the patients was 19.72 (12-27) months. Implant deficiency, clavicular osteolysis, clavicle fracture, and instability were observed in none of the patients. None of the patients had infection or wound site problems. Average Q-DASH score of the patients was 6.94 (0-20.45). All patients could return to previous activity levels and business lives. General demographic data were given at the Table I.

Whether there was a difference between the Q-DASH score averages of the patients treated with Lock Down and Tight Rope was evaluated by Mann-Whitney U test (Table II). No statistically significant difference was found in the statistical evaluation ( $p: 0.771, p > 0.05$ ).

## Discussion

In recent years, synthetic ligament systems have been developed for coracoclavicular stabilisation

(11-14). The main aim of these systems is to provide stability until the development of fibrosis in coracoclavicular ligament system. This is similar to syndesmosis healing of ankle injuries. In some synthetic ligament systems, the system behaves as a scaffold and can function later on. The LockDown® and Tight-rope® systems applied in our patients provides stability until coracoclavicular ligament system is built and is designed to behave as scaffold. Another advantage of the synthetic ligament systems is that they are biomechanically stable. Moreover, the coracoacromial ligament and superior stability of the humerus are protected. In this system, as in hook plate or Bosworth screw, there is no need for the implant to be removed.

Treatment results with synthetic bonds are generally good. In a study of chronic cases, a coracoid fracture was detected in one patient. Secondary operation was required in two patients. One patient underwent arthroscopic subacromial decompression due to impingement and the other patient underwent distal clavicle resection and screw removal. In that study, patients were previously operated for failed Weaver Dunn. Our patients had no previous history of operation. This is why we have not encountered such complications. The authors found the results of the synthetic ligament satisfactory. (12). In another study conducted in patients with high activity levels, joint instability occurred in the follow-up of two patients. In our study, there were no high activity patients. Therefore, we may not have encountered such a complication. The authors reported that the results of the synthetic ligament were good (13). However, in a synthetic ligament reconstruction performed in the normal patient group, two patients had complications. One of them was subacromial bursitis, which required arthroscopic decompression, and the other was redislocation of the joint. However, the mean age of patients in this study was 43 (23-76). The age of our patients was younger, with an average of

36.5 (19-52). There was no such complication in our patients. The authors found the results successful (14). In another comparative study, three different methods (Tight-rope®, LockDown® and GraftRope) were compared. Average Q-DASH scores were 12.5, 4.2 and 5.0, respectively. Authors stated that all three techniques proved to be reliable in providing good clinical outcomes, although none of the studied techniques demonstrated reliability in maintaining anatomical reduction after surgery (15). In our study, the mean Q-DASH scores of patients who underwent Tight Rope and Lock Down were 6.61 and 7.47, respectively. In our study, although there was no statistical difference between the two groups, synthetic grafts were successful in restoring anatomy and maintaining stability.

There are also authors who state that only synthetic bond will be insufficient and that it should be combined with biological bonds for long-term success (16). In the study of Fauci et al., the clinical results of patients treated with synthetic ligaments in their 1st and 4th year controls were worse than those treated with biological bonds. The radiological results were the same. However, in chronic acromioclavicular joint dislocations, both clinical and radiological results were better in the biological group.

Coracoclavicular retaining might not be sufficient in surgical treatment of the acromioclavicular joint injuries. It has an important place in primary stability of the acromioclavicular joint (21). In type V injuries, the delto-trapezoidal fascia also gets damaged. We treated acromioclavicular ligaments primarily in all our patients. Also, fascia is repaired primarily in the patients with fascia laceration. We think that these repairs are effective in our good clinical results.

The limitations of our study are the small number of patients, short-medium follow-up period and retrospective design.

**Tablo 1.** Demographic datas of the patients

Patient no	age	gender	side	control		fixation type	distal		Q-DASH score
				time (months)	type		clavícula resection	duration	
1	39	male	left	27	5	Lock Down	yes	chronic	6,82
2	37	male	right	21	4	Lock Down	none	acute	2,27
3	36	male	left	18	5	Lock Down	yes	chronic	20,45
4	31	male	right	22	5	Lock Down	none	acute	0,00
5	33	female	right	19	5	Lock Down	yes	chronic	11,36
6	52	male	right	17	5	Lock Down	none	acute	9,09
7	39	male	right	24	4	Tight Rope	none	acute	0,00
8	46	male	left	24	5	Lock Down	none	acute	6,82
9	36	male	right	18	5	Tight Rope	none	acute	0,00
10	48	female	right	24	5	Tight Rope	yes	acute	20,45
11	42	male	left	18	5	Tight Rope	yes	acute	20,45
12	40	male	left	12	5	Tight Rope	yes	chronic	11,36
13	28	female	right	18	5	Tight Rope	none	acute	0,00
14	29	male	right	24	5	Tight Rope	none	acute	0,00
15	36	male	right	12	4	Lock Down	none	acute	4,55
16	19	female	right	24	5	Lock Down	none	acute	9,09
17	22	male	left	18	5	Lock Down	none	acute	2,27
18	44	male	right	15	4	Lock Down	none	chronic	0,00

**Tablo 2.** Statistical evaluation of two groups

	Q-DASH score	Std. deviation	p value
Lock down	6.61	+/- 5.96	0.711
Tight Rope	7.47	+/- 9.79	

Synthetic ligaments provide coracoclavicular anchoring until trapezoid and conoid ligaments heal. It is method with low complication rates and a high rate of clinical patient satisfaction. Acromioclavicular ligament system should also be repaired in patients who had coracoclavicular anatomic retaining. Even though full anatomic reduction during ligament reconstruction cannot be provided, if stability is obtained, then the patients do not have clinical complaints.

**Informed Consent:** Written consent was obtained from the participants.

**Conflict of Interest:** Authors declared no conflict of interest.

**Financial Disclosure:** Authors declared no financial support.

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