

Scapulothoracic Arthroscopy for Snapping Scapula Syndrome: Clinical Outcomes and Complications

Snapping Skapula Sendromu Tedavisinde Skapulotorasik Artroskopi: Klinik Sonuç ve Komplikasyonlar

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ABSTRACT

Background: Operative treatment of a snapping scapula is reserved for refractory patients who do not respond to conservative treatment. Although open techniques have provided significant symptomatic relief, arthroscopic techniques have gained popularity in recent years, and promising outcomes have been reported. The aim of our study was to evaluate the surgical outcomes and complications of patients with symptomatic snapping scapula treated with scapulothoracic arthroscopy.

Materials and Methods: Retrospective database scanning for patients with painful snapping scapula treated with the scapulothoracic arthroscopic approach between 2013 and 2022 was performed. Demographic information, clinical outcomes, and complication rates of the patients were reviewed. The QuickDASH, Constant-Murely, and Visual Analogue Scale (VAS) scores were used to assess the pain and function levels preoperatively and at the final follow-up.

Results: Nineteen individuals who met the inclusion criteria were included; the average age of the patients was 31±10 years. The study included 13 females and 6 males. At the final follow-up, five of the 19 patients reported no improvement after their operations. Although the remaining 14 patients were satisfied with the operation results, 4 patients continued to have pain, but to a lesser extent. A significant improvement was observed in the VAS, with a mean preoperative score of 7±0.9 and postoperative score of 2±2.4 ($p<0.001$). In addition, there was a significant improvement in the mean Quick-DASH Score and Constant-Murley Score From 43±11.3 and 53.3±10.2 to 16.3±17.7 ($p<0.001$) and 75.9±17.2 ($p<0.001$), respectively. Four patients had depressed fractures in the infraspinatus fossa of the scapula that did not require additional treatment.

Conclusion: Arthroscopy for snapping of the scapula is an effective, reproducible, and safe procedure. Simple depression fractures of the infraspinatus fossa of the scapula can occur during arthroscopy, especially when performed by less experienced surgeons. These fractures require no additional treatment and do not adversely affect surgical outcomes.

Keywords: Snapping scapula syndrome, scapulothoracic, arthroscopy, bursectomy, scapuloplasty, complications

ÖZ

Amaç: Snapping skapulanın cerrahi tedavisi, konservatif tedaviye yanıt vermeyen dirençli hastalara yönelik yapılmaktadır. Açık teknikler önemli oranda semptomatik iyileşme sağlasa da artroskopik teknikler son yıllarda popülerlik kazanmış ve ümit verici sonuçlar bildirilmektedir. Çalışmamızın amacı, skapulotorasik artroskopi ile tedavi edilen semptomatik snapping skapula hastalarının cerrahi başarısını ve komplikasyonlarını değerlendirmektir.

Gereç ve Yöntemler: 2013-2022 yılları arasında skapulotorasik artroskopik yaklaşımla tedavi edilen ağrılı snapping skapula hastalarına ait retrospektif veri tabanı taraması yapıldı. Hastaların demografik bilgileri, cerrahi detayları, klinik sonuçları ve komplikasyon oranları incelendi. Ameliyat öncesi ve son takipte ağrı ve fonksiyon düzeylerini değerlendirmek için QuickDASH Skoru, Constant-Murely Skoru ve Görsel Analog skoru kullanıldı. Ek olarak hastalara ameliyat sonrası krepitasyonun meydana gelmediği ve prosedürden genel memnuniyetleri soruldu.

Bulgular: Dahil edilme kriterlerini karşılayan 19 kişi çalışmaya dahil edildi. Hastaların yaş ortalaması 31±10 yıl, ortalama takip süresi 68,4±24,5 ay idi. Araştırmaya 13 kadın ve 6 erkek katıldı. Son takipte toplam 19 hastanın 5'i ameliyat sonrası herhangi bir iyileşme bildirmedir. Geriye kalan 14 hasta operasyon sonuçlarından memnun olmasına rağmen 4 hastada ağrı daha az da olsa devam etti. Görsel Analog skorunda ameliyat öncesi ortalama skor 7±0,9 ve ameliyat sonrası skor 2±2,4 ile anlamlı iyileşme gözlemlendi ($p<0,001$). Ayrıca ortalama Quick-DASH Skoru ve Constant-Murley Skorunda sırasıyla 43±11,3 ve 53,3±10,2'den 16,3±17,7'ye ($p<0,001$) ve



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75,9±17,2'ye ($p<0,001$) anlamlı bir iyileşme saptandı. Dört hastada skapula infraspinatus fossada çökme kırığı ameliyat sırasında gelişti ve herhangi bir ek tedavi gerektirmedi.

Sonuç: Snapping skapula tedavisi için artroskopi etkili, tekrarlanabilir ve güvenli bir prosedür olmaktadır. Artroskopi sırasında özellikle daha az deneyimli cerrahlar tarafından yapıldığında skapula infraspinatus fossada basit çökme kırıkları oluşabilmektedir. Bu kırıklar ek bir tedavi gerektirmemekte ve cerrahi sonucu olumsuz etkilememektedir. Bu potansiyel kırıklardan kaçınmak için dikkatli bir cerrahi teknik kullanılması ve anatomik olarak hassas bölgede kuvvetli manevralardan kaçınılması önerilir.

Anahtar Kelimeler: Snapping scapula sendromu, skapulotorasik, artroskopi, bursektomi, skapuloplasti, komplikasyonlar

Introduction

The scapulothoracic (ST) joint is an articulation between the volar concave surface of the scapula and the convex posterior thoracic cage. Congruent joint surfaces and smooth interposed soft tissue are necessary for the normal gliding motion of the scapula. Any conditions that interfere with smooth gliding may lead to disorders ranging from mild intermittent shoulder pain to persistent crepitus accompanied by considerable pain during attempts at overhead arm motion. Snapping scapula syndrome (SSS) is a disorder of the shoulder girdle. It is characterized by painful crepitation during ST movements (1). However, mechanical blocks, such as bony exostosis or muscular hypertrophy, may be the primary cause of SSS. Most patients present with no demonstrable anatomic lesions (2). Scapular dyskinesia resulting in an increased anterior tilt of the scapula, which compresses the superomedial border of the scapula against the ribs, is thought to be the cause of SSS with non-identifiable structural underlying lesions (3).

Regardless of underlying causes, available evidence supports initial non-surgical management (4). It is generally accepted that symptoms occurring without an anatomic lesion respond more favorably to non-operative management than do patients with an anatomic lesion. Surgical interventions are reserved for patients who do not respond to conservative treatment or those with structural abnormalities. Traditional open techniques have typically provided significant symptomatic relief (5), but the invasiveness of the approach by releasing trapezoid muscle insertions from the scapula, with consequent morbidity and slow rehabilitation, has shifted the preference of surgeons toward less invasive arthroscopic approaches.

Arthroscopic treatment of this disorder has gained popularity in recent years, and promising outcomes have been reported in the literature (3). However, many studies in this field have provided inconsistent recommendations for surgical treatment, and various studies have employed various arthroscopic procedures, such as bursectomy alone or superomedial angle scapuloplasty, with differing degrees of bone excision, which are customized to preoperative planning or arthroscopic findings. Apart from the reported

high rates of residual symptoms (6), only a few neurovascular complications during portal placement of ST arthroscopy have been reported (2).

Herein, we aimed to present the surgical outcomes of patients with symptomatic SSS without underlying structural abnormalities, describe our preferred arthroscopic technique, and report our experience with complications.

Materials and Methods

Following the approval of the Memorial Bahçelievler Hospital Ethics Committee (approval number: 129, date: 11.06.2024), the database of our institution and that of the senior author were scanned for patients with painful snapping of the scapula who underwent ST arthroscopic approach between 2013 and 2022. Patients with no history of trauma, absence of structural abnormalities (like osteochondroma, rib deformity, or tubercle of Luschka), and a minimum postoperative follow-up duration of 2 years were included in the study. However, the presence of inferior scapular pole symptoms, inaccessibility of medical records, interrupted follow-up, prior surgery on the ipsilateral shoulder, cervical spine pathology, and refusal to participate were the exclusion criteria. Informed consent was obtained from all participants. All patients were diagnosed by clinical examination and conventional X-ray followed by magnetic resonance imaging for better visualization, confirmation of bursal inflammation, and ruled out the presence of ST masses. Additionally, the diagnosis was supported by temporary symptom relief after the injection of a mixture of local anesthetic and corticosteroids. Each patient continued to complain of mechanical symptoms despite at least 6 months of conservative treatment, including completion of a physiotherapy-guided rehabilitation program. Demographic information, clinical outcomes, and complication rates of the patients were reviewed.

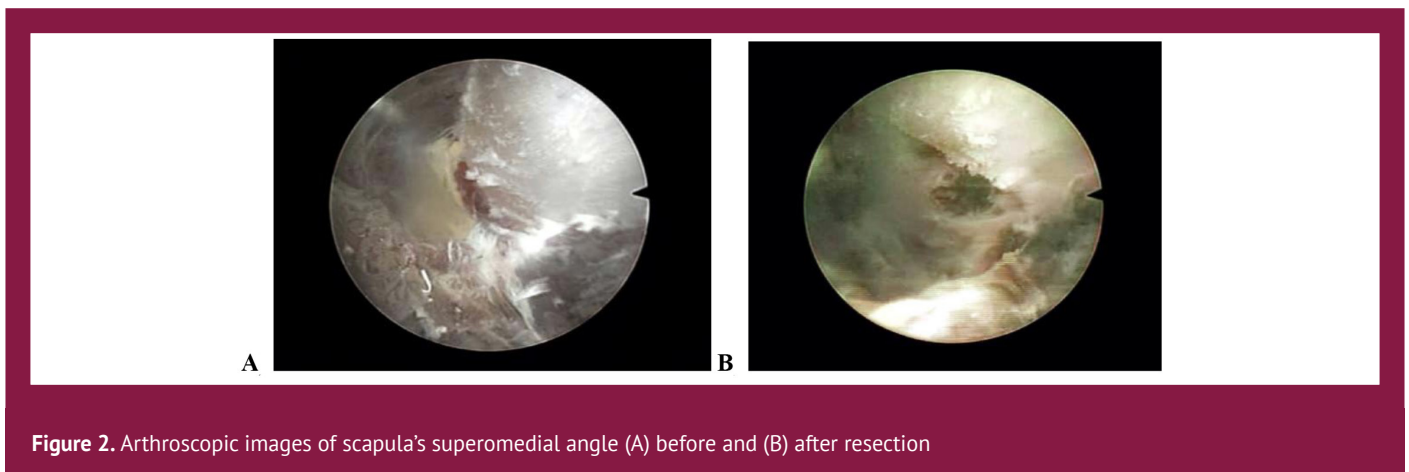
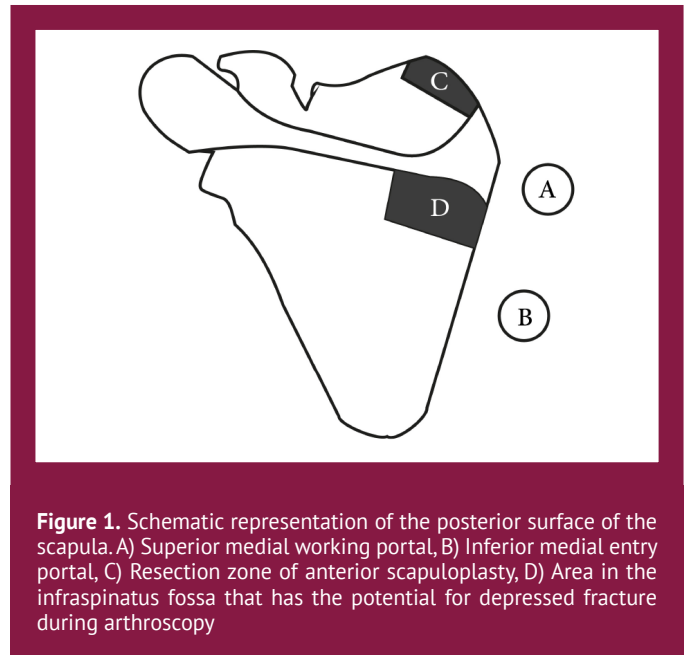
Currently, no specific score for evaluating SSS. To assess functional level and pain preoperatively and postoperatively, the QuickDASH and Constant-Murely Scores were utilized (7). The visual analog scale (VAS) was used to gauge pre- and postoperative pain levels. Additionally, patients were questioned about the incidence of postoperative clicking and their overall satisfaction with the procedure.

Surgical Technique

All patients were operated under general anesthesia. Patients were laid down prone, with their hands in a “chicken-wing” position in the middle of the back. All surgical procedures were performed using a two-portal technique for soft tissue debridement and superomedial scapuloplasty. The initial inferior portal was localized halfway between the scapular spine and the inferior scapular angle, 2-3 cm medial to the medial border of the scapula. The skin and subcutaneous tissue were incised vertically, and forceps were passed to the ST space by blunt dissection. The angle of view was increased by gentle blunt dissection after confirmation of the location of the trochar under the scapula. The superior working portal was placed by triangulation and localized 2-3 cm medial to the medial border of the scapula at the level of or just inferior to the root of the scapular spine (Figure 1). After adequate visualization, diagnostic arthroscopy was performed. The inflamed bursa and interposed soft tissues were removed using a shaver and radiofrequency ablation probe. After localization of the superomedial scapular angle using a spinal needle, a radiofrequency ablation probe was used to elevate the underlying muscular attachments, debride the soft tissue, and skeletonize the anterior surface of the superomedial scapular angle. All encountered fibrotic tissue was considered abnormal and debrided. Then, a high-speed burr was used to excise the undersurface prominence of the superomedial scapular angle. The cutting-block technique was used for bone resection progressing from the proximal to distal and medial to lateral (Figure 2). Meticulous attention was paid to avoid penetrating the dorsal surface of the bone to maintain the overlying muscle insertions. At the end of the operation, the following hemostasis and irrigation, the portals were sutured.

Postoperative Care

Postoperatively, no immobilization except arm sling was applied. Rehabilitation of the shoulder and ST joints was started on the second postoperative day by initiating active and passive motion of both the scapular and glenohumeral joints. Patients were enrolled in a supervised periscapular rehabilitation program administered by a physiotherapist. The objective of this program was to facilitate the achievement of full active shoulder movement within a week. Typically, isometric strengthening exercises for the glenohumeral joint are initiated in the third postoperative week, while periscapular strengthening exercises are initiated around the fifth postoperative week. After six weeks post-surgery, patients were permitted to resume their regular and sports activities as tolerated.





All patients were seen at the clinic within 4 weeks after their respective surgeries. Further clinic reviews were scheduled as necessary. To ensure complete follow-up, patients were invited to attend a clinical review at the appropriate time.

Statistical Analysis

Statistical analysis was conducted using SPSS version 22.0 (IBM, Inc., Chicago, Illinois, USA). All values are expressed as means \pm standard deviation and range. The preoperative and postoperative values of each pain and functional score were compared using the Wilcoxon signed-rank test. A p-value 0.05 was considered significant.

Results

During the study period, 28 patients diagnosed with SSS were treated with ST arthroscopy. Out of these patients, six were unreachable for follow-up, and three declined to participate, leaving 19 individuals for final evaluation. The average age of the patients at the time of surgery was 31 ± 10 (range, 19-52) years, and the mean period of symptoms

before surgical intervention was 16.8 ± 8 (range, 8-34) months. The average time of following up was 68.4 ± 24 (range, 26-108) months. The study included 13 females and 6 males. Symptoms were observed in the dominant limb of 13 and the non-dominant limb of 6 patients. The right side was affected in 12 patients and the left side in 7 patients. Baseline patient demographics and assessment scores are presented in Table 1.

At the final follow-up, five of the 19 patients reported no improvement after surgery. Although the remaining 14 patients were satisfied with the surgical results, 4 continued to experience pain to a lesser extent than their preoperative symptoms. Out of 19 patients, 11 reported persistent snapping at follow-up, and only 5 of them were painful and disturbing the patients. A significant improvement was observed in the VAS with a mean preoperative score of 7 ± 0.9 (range, 6-9) and a postoperative score of 2 ± 2.4 (range, 0-6) ($p < 0.001$). Additionally, there was a significant improvement in the mean Quick-DASH and Constant-Murley Score From 43 ± 11.3 (range, 36-66) and 53.3 ± 10.2 (range, 34-68) to 16.3 ± 17.7 (range, 2-46) ($p < 0.001$) and to 75.9 ± 17.2 (range, 53-95) ($p < 0.001$), respectively.

Table 1. Patients baseline demographics, characteristics and clinical outcomes

Patient	Age (years)	Gender	Side	Dominant limb	Symptom duration (months)	Follow-up duration (months)	Visual Analog Score		Quick-DASH Score		Constant Score		Satisfaction	Postoperative criptation	Complication
							Pre-op.	Post-op.	Pre-op.	Post-op.	Pre-op.	Post-op.			
1	24	F	R	Y	14	108	6	2	42	11	58	74	S	Y	N
2	32	F	R	Y	10	102	7	5	45	42	34	53	D	Y	N
3	20	M	R	N	9	102	9	4	36	14	66	62	S	N	Y
4	21	F	L	N	12	96	7	3	38	8	60	83	S	Y	N
5	47	M	R	Y	26	90	6	0	39	5	53	86	V	N	Y
6	24	F	L	N	33	78	8	0	46	3	62	91	V	N	Y
7	23	F	R	Y	22	75	6	3	43	22	55	66	S	Y	N
8	52	M	R	Y	15	72	6	5	55	44	50	55	D	Y	N
9	22	F	L	N	18	70	8	0	47	2	68	95	V	Y	Y
10	26	F	R	Y	23	69	6	0	35	4	52	87	V	N	N
11	26	M	L	N	34	66	7	0	42	6	63	86	V	N	N
12	31	F	R	Y	23	64	7	5	56	42	48	54	D	Y	N
13	43	F	R	Y	9	60	8	6	63	46	44	49	D	Y	N
14	29	F	L	Y	15	60	7	0	21	4	57	92	V	N	N
15	19	M	L	N	11	59	8	0	39	5	46	88	V	Y	N
16	37	M	R	Y	19	43	6	0	24	2	43	90	V	Y	N
17	45	F	R	Y	10	31	8	6	66	46	32	48	D	Y	N
18	30	F	L	Y	8	29	7	0	38	2	59	90	V	N	N
19	38	F	R	Y	8	26	6	0	42	2	64	94	V	N	N

F: Female, M: Male, R: Right, L: Left, Y: Yes, N: No, V: Very satisfied, S: Satisfied, D: Dissatisfied, Pre-op.: Pre-operative, Post-op.: Post-operative

Complications

A depressed fracture at the infraspinatus fossa, located just below the scapula, was encountered in four patients during the surgery. In each of these cases, surgery was completed only after the necessary debridement and scapuloplasty had been performed, and no further action was taken. Postoperative X-rays did not show a fracture line, and no symptoms related to the fracture were observed. Despite the presence of these fractures, all patients followed the standard rehabilitation protocol without any issues. Other complications, such as peripheral nerve or vascular injuries, were not reported.

Discussion

In the present study, we investigated the clinical outcomes and complications of ST arthroscopy in patients with resistant SSS. Our results demonstrated that despite a number of patients who did not respond to the surgical intervention, arthroscopic debridement of the ST space and superomedial scapuloplasty provided significant improvements in functional outcomes and remarkable pain relief in patients with recalcitrant symptoms. Our second finding was that ST arthroscopy was safe and did not encounter serious complications. However, depressed fracture can occur in the infraspinatus fossa of the scapula in a non-negligible number of patients who do not need extra measures other than following an ordinary postoperative rehabilitation protocol.

Literature shows conflicting evidence regarding the outcomes of arthroscopic procedures for patients with SSS. Studies reported that average postoperative functional scores remained lower than expected (8), while others reported that 100% of patients experienced improvement in symptoms (9). Our findings indicate that 26% of the patients did not experience any postoperative improvement. The multifactorial nature of SSS makes it difficult to determine specific reasons for variations in outcomes among patients undergoing surgery. Surgery only addresses a portion of the underlying structural cause, whereas other functional causes, such as psychologic and neurologic disorders, cannot be addressed (10). Therefore, selecting the right patient for ST arthroscopy is crucial, and ST arthroscopy should only be considered after a specific rehabilitation program has been attempted and failed to alleviate symptoms. Patients who rely solely on surgery without physical therapy are unsuitable candidates for this procedure.

Owing to the lack of clarity regarding the etiology and impact of any bone anatomy variation on the initiation of snapping scapula, we preferred to combine superomedial

angle scapuloplasty with bursectomy in our approach for all of these patients, regardless of preoperative images or intraoperative findings. We believe that a more extensive intervention can address potential undiagnosed structural abnormalities. However, a recent comparative study showed that both bursectomy alone and bursectomy with scapuloplasty had comparable pain levels, functional improvement, and additional shoulder operation demand (11).

Despite its potential for neurovascular complications, ST arthroscopy is a considerably safe procedure with no complications other than a few intraoperative neurovascular injuries reported in the literature (12). Among the 19 patients who underwent ST arthroscopy, four had depressed fractures in the infraspinatus fossa just inferior to the root of the scapular spine (Figure 1). Fortunately, these fractures did not affect the clinical outcome or alter the postoperative rehabilitation protocol. In the last follow-up, three of these cases were pain-free, whereas the other patient reported persistent pain, although it was reduced in severity. We propose that these fractures could occur during trochar insertion through the initial inferior portal. An anatomically weak region of the scapula located just anterior to the inferior entry portal when the trochar is forcefully propagated in an attempt to penetrate the bulk of subcutaneous tissue and muscles, resulting in depressed fractures. In addition, excessive forces applied to thrust the medial side of the scapula away from the thoracic wall might be a factor that facilitates this injury by allowing the anatomically weak part to be struck perpendicularly by the tip of the trochar.

To avoid such complications, we recommend using blunt-tip forceps to open the initial portal, ensuring that the portal is sufficiently wide for the trochar to be inserted without difficulty. The projection of the trochar should be parallel to the bony surface of the scapula upon entry, and debridement should be performed as gently as possible while avoiding aggressive maneuvers. All these fractures occurred in our early experience, but as our learning curve improved, we did not encounter any such complications. Therefore, beginners must be aware of this complication and know how to avoid it.

Our study has certain limitations that cannot be overlooked. First and foremost, the retrospective study design and the absence of a control group are significant limitations. The scarcity of information on the incidence rate of the syndrome hinders the planning of randomized studies that would generate more credible and consistent outcomes. However, despite these constraints, the current study provides valuable information about the safety, surgical outcomes, and complications of this approach.

Conclusion

In conclusion, despite the potential for complications, arthroscopy for snapping scapula appears to be an effective, reproducible, and safe procedure. Simple depression fractures at the infraspinatus fossa of the scapula can occur during arthroscopy, especially when performed by a less experienced surgeon. These fractures do not require additional treatment and do not adversely affect surgical outcomes. To avoid these potential fractures, a cautious surgical technique is recommended, and forceful maneuvers should be avoided in the anatomically vulnerable region.

Ethics

Ethics Committee Approval: This study approved by Memorial Bahçelievler Hospital Ethics Committee (approval number: 129, date: 11.06.2024).

Informed Consent: Informed consent was obtained from all participants.

Authorship Contributions

Surgical and Medical Practices: A.M.H., M.K., Concept: A.M.H., M.K., Design: A.M.H., M.K., Data Collection or Processing: A.M.H., M.K., Analysis or Interpretation: A.M.H., M.K., Literature Search: A.M.H., M.K., Writing: A.M.H., M.K.

Conflict of Interest: No conflict of interest was declared by the authors.

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