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ORIGINAL ARTICLE

Arthroscopic Supra Pectoral Biceps Brachii Tenodesis (Revisited)

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Abstract

Background: ***Tendinopathy of the long head of the biceps brachii (LHB), which is often caused by trauma, microinstability, increased activity, or an underlying inflammatory disease, is a common cause of anterior shoulder pain. Biceps tendon injuries are further complicated by the presence of pulley system lesions and associated risk factors, including a prior rotator cuff tear history and insufficient training.***

Objectives: ***This study aimed to evaluate the short-term functional outcomes of patients who underwent arthroscopic suprapectoral biceps tenodesis for symptomatic biceps tendinopathy, focusing on a technique that avoids complications associated with open tenodesis surgery.***

Methods: ***A prospective cohort study involved 20 individuals (20 shoulders) who underwent the arthroscopic suprapectoral biceps tenodesis procedure. Patient demographics, symptom duration, and functional outcomes were assessed.***

Results: ***The study cohort comprised 11 females (55%) and 9 males (45%), with a mean age of 44.4 years. The majority (70%) had the procedure performed on their dominant shoulder. The mean pre-operative symptom duration was 9.6 months, and patients were followed up for an average of 8.6 months. The technique's key advantage lies in its ability to remove the inflamed portion of the biceps stump, alleviating potential sources of postoperative pain during rehabilitation.***

Conclusion: ***One surgical option for symptomatic biceps tendinopathy is an arthroscopic suprapectoral biceps tenodesis. By targeting the root causes of inflammation and reducing tissue disruption, this method provides improved functional results in the short term, making it especially well-suited for individuals who engage in physical activity.***

Keywords: Arthroscopic suprapectoral biceps tenodesis; Biceps tendinopathy; Short-term functional outcome; Prospective cohort study

1. Introduction

Biceps tendinitis is an injury to the tendon that surrounds the biceps muscle's long head. In five percent of cases, the inflammation of the biceps tendon within the intertubercular (bicipital) groove is known as primary biceps tendinitis.[1]

A SLAP lesion, which refers to a rotator cuff tear or superior labrum anterior to posterior tear, is present in 95 percent of patients who do not have primary biceps tendinitis ,[2]

Individuals aged 18 to 35 who engage in athletic activities such as contact sports, throwing, swimming, gymnastics, or martial arts are at an increased risk of developing pathology in the biceps tendon.[3] Secondary impingement of the biceps tendon is frequently observed in these individuals. It may be ascribed to factors such as laxity of the anterior capsule, tightness of the posterior capsule, scapular instability, or shoulder ligament instability. When the biceps tendon is exposed to the coracoacromial arch, as might happen in rotator cuff or soft tissue labral injuries, secondary impingement can develop. [4]

Tendininosis, a sickness of overuse and degeneration, is another name for biceps tendinitis. Older adults (i.e., non-athletes over 65 years of age or athletes over 35 years of age) may have biceps tendinosis from prolonged use, or they may have acute biceps tendinitis from rapid overuse.

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Tenosynovitis or biceps tendinosis is most commonly caused by primary impingement syndrome (i.e., inflammation of the tendon sheath). [5]

When the acromial apophysis is not fused, when the coracoacromial ligament thickens, or when bone spurs form on the acromial ligament, primary impingement can occur. This mechanical impingement takes place beneath the coracoacromial arch. Additionally, osteoarthritic spurs that put pressure on the bicipital groove may also be responsible for this issue.[6] In contrast to younger athletes, those aged 35 and above who encounter primary impingement tend to exhibit a greater incidence of rotator cuff injuries. [7]

For a comprehensive view of the entire tendon, it is advisable to use ultrasonography. However, when it comes to visualizing the tendon within the joint and any related issues, computed tomography arthrography or magnetic resonance imaging are the preferred choices. [8]

Conservative treatment options for biceps tendinitis include medication to alleviate pain, physical therapy, ice, rest, and injections of corticosteroids into the tendon sheath. [9]

If conservative treatments do not yield results within three months or if the biceps tendon has suffered substantial damage, surgical intervention should be considered. [10]

If non-surgical treatments do not alleviate the problem after three months or if the biceps tendon damage is significant, surgical intervention, such as a tenotomy or tenodesis, may be explored.5 Tenodesis and biceps tenotomy are the two procedures that are carried out most frequently. The biceps tenotomy procedure is straightforward, easy to replicate, and yields reliable pain alleviation with minimal postoperative rehabilitation needs. Yet, issues like soreness and exhaustion after a tenotomy cosmesis are possible. Older patients who do not engage in manual labor, have modest expectations for aesthetic results, and are unable or unable to adhere to postoperative care after tenodesis are the usual candidates for tenotomy.

In order to keep the biceps muscle from atrophying after surgery and to keep it in its normal shape, biceps tenodesis keeps the biceps muscle's length-tension connection intact. Therefore, biceps tenodesis is best reserved for hyperactive, younger patients with LHB disease.

When treating sedentary patients aged 60 and up with torn biceps tendons, tonotomy is the treatment of choice. Patients under the age of 60, those who have busy lifestyles, and sportsmen may find tenodesis to be a more practical alternative. [5]

For this procedure, we use bioabsorbable interference screws spaced 7, 8, and 9 mm from the bicepital groove to perform bice tenodesis, ensuring that no tendon remains in the groove. The benefits of this effort are numerous: the precise placement of tenodesis and Neurovascular structures are located at a safer distance from the area of working tenodesis. This procedure has many benefits, such as keeping the tendon at the right length and tension, removing lesions from deep inside the biceps, doing away with knot tying, and protecting the coracoid and coracoacromial ligaments from knot irritation. [11]

This work's objective was to assess the clinical outcome of arthroscopic suprapectoral biceps tenodesis, analyzing its efficacy, safety, and possible complications.

2. Patients and methods

From January 2022 to April 2023 and a final follow-up on November 2023, a prospective cohort study investigating the functional outcome of Supra pectoral biceps tenodesis including 20 individuals (20 shoulders) with symptomatic shoulder pathology associated with biceps tendinopathy was conducted in AL Azhar Hospital.

Inclusion Criteria: A candidate for this procedure typically the ideal candidate is usually over 18 years and younger than 60 years old and is an athlete or highly active individual who experiences recurrent subluxations or biceps tendon snapping along with persistent and unmanageable pain in the bicipital groove. Additional symptoms that may be present include a "Popeye sign" in which the elbow is weakly flexed, ineffective conservative treatment of tendon problems that have persisted for more than three months, instability of the biceps, tendinopathy, partial tears of the biceps, comminuted SLAP lesions, pulley lesions of the biceps, and positive findings on the Speed, Yergason, and O'Brien tests.

Exclusion Criteria: AVN or arthritis of shoulder joint, extensive bone loss, active infection, age group above 60 years, massive irreparable rotator cuff tears, and very old age with little lifestyle needs.

Before surgery, patients had a battery of tests to determine their demographics, as well as a clinical examination, scoring (ASES shoulder score), and imaging study. Following arthroscopic biceps tenotomy and biceps suprapectoral tenodesis, the patient must deal with any related shoulder disease. Rehabilitation program.

Assessment at a later date: ROM and score.

Demographics: This prospective study aimed to assess the functional outcomes of arthroscopic suprapectoral biceps tenodesis in a group of 20 patients, each with symptomatic biceps tendinopathy. The study population was divided as follows: only 3 patients had isolated biceps tendinopathy, 6 had frozen shoulders, and 11 had varying degrees of rotator cuff tears. 5 patients with a history of diabetes and 3 with hypertension.

Patients did physiotherapy for 4 months with no improvement. There is no history of injection. Our series had an average follow-up duration of 8.6 months, ranging from 6 to 12 months. Among the patients, there were 8 females (making up 56.66% of the group) and 12 males (43.33%), with an average age of 44.4 years, ranging from 30 to 60 years. Among the shoulders involved, 12 were dominant (70%) and 8 were non-dominant (30%). The mean duration of preoperative symptoms was 9.6 months (range, 3-36 months).

Preoperative Evaluation:

History and Complaint Analysis: Thorough patient interviews were conducted, with particular attention paid to various aspects, including whether there was a specific traumatic incident involving the affected shoulder, the duration and progression of symptoms, any underlying medical conditions, the presence of night pain, prior attempts at physiotherapy, any sensations of snapping, subluxation, or past instances of dislocations, and the presence of muscle weakness.

Clinical Examination and Scoring: The physical examination commenced with a visual examination from both the front and rear to look for any previous scars, muscle wasting, or deformities. Following that, an assessment was made by comparing and analyzing the range of motion, strength, and neurovascular status of both upper limbs. Special emphasis was placed on ruling out any cervical factors that could be contributing to brachialgia.

General Examination: An examination of the neck and whole upper limb, with the intact shoulder, was conducted before the affected shoulder.

Inspection: Color of the skin, scars from a previous procedure, scapular winging (achieved by having the patient push against a wall and observe from behind), muscle atrophy, and symmetry swelling.

Range of Motion (ROM): Before passive ROM evaluation, active ROM was assessed to see if it was limited. The goniometer was utilized to measure and document the range of motion (ROM) of the subsequent movements, considering both the healthy and afflicted sides: elbow flexion, external rotation (ER) at the side, abduction, forward flexion (anterior elevation), and internal rotation (IR) at an abduction angle of 90°.

Palpation: The following structures were palpated for tenderness: AC joint, clavicle, acromion, scapular spine, long head of biceps, deltoid, trapezius, pectoralis major, supra and infra scapular fossae Muscle testing: Supraspinatus: Jobe test, infraspinatus: resisted ER with arm at side, teres minor: resisted ER with arm at 90° abduction, subscapularis: Liftoff, belly press, bear hug tests and biceps tendinitis and Superior labrum: Speed, Yergason's, O'Briens.

Scoring System: ASES Shoulder score (American Shoulder and Elbow Surgeons Score)

Imaging investigations: Preoperative plain X-rays and MRI were done for all patients.

Plain X-rays: AP and outlet views were done in all cases to exclude proximal migration of the head. MRI: The method was implemented in every single case, resulting in an average one-month interval between the MRI date and the operation. Nonetheless, it barely contributed to the ability to classify the severity of tendinopathy.

Surgical Technique of arthroscopic suprapectoral biceps tenodesis (Figure 1, 2): Patients undergoing general anesthesia under hypotensive conditions did so while seated in a beach chair. A probe is inserted via the anterosuperior portal, while a scope is positioned at the posterior portal to examine the glenohumeral joint. During the intra-articular LHBT evaluation, the Ramp test is utilized. Furthermore, to facilitate tendon examination, a suture manipulator clamp is employed to secure the LHBT at the entrance of the bicipital groove. In contrast, the tendon is drawn into the glenohumeral joint.

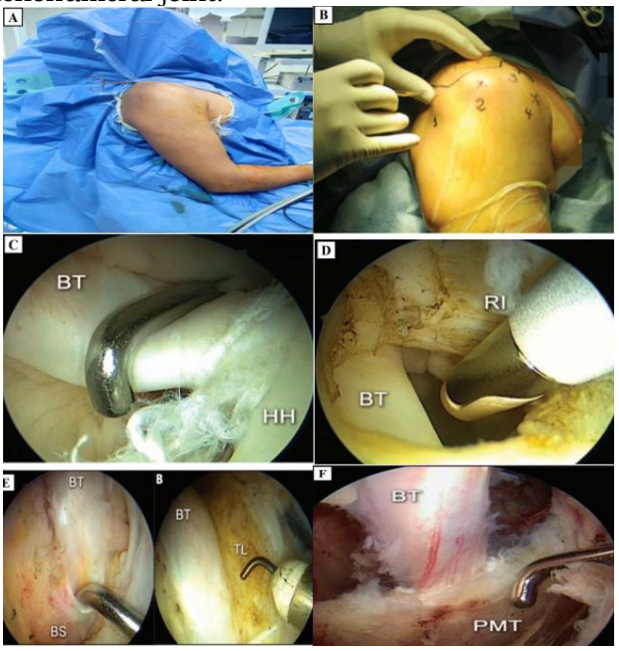

Figure 1. (A): The patients in the beach-chair position under hypotensive general anesthesia. (B) Right shoulder arthroscopic portals. (1) Posterior portal. (2) Lateral portal. (3 and 4) Anterosuperior and anteroinferior portals. (C): From the posterior portal. During the Ramp test, the LHBT looks frayed and degenerated. (D): Arthroscopic view of the subacromial space from the lateral portal. After opening the rotator interval. (E): The transverse ligament and the roof of the bicipital groove were detached with a radiofrequency device. (F): Proper debridement enables exposure of pectoralis major tendon

This exercise is performed in a distal to proximal direction, reaching the falciform ligament located at the uppermost portion of the pectoralis major tendon. Excision is performed on the tendon sheath, the transverse humeral ligament, and the roof of the bicipital groove. Site. Then, an adequate dissection of the bone undergoing LHBT should enable the surgeon to perform tendon manipulation without hindrance.

The tendon is retracted medially from the groove during the drilling procedure by passing a switching stick through the subscapularis. Following this, adjust the length-tension correlation: the mean tendon length, measured from the cartilage rim to the superior border of the pectoralis major tendon, is approximately 50 to 55 mm. Once the bone socket is positioned 10 mm above the pectoralis major tendon, the forked tip ought to contact the tendon at an elevation of around 20 to 25 mm above the socket level. Approximately at this angle, the pectoralis major tendon's upper margin intersects the articular cartilage's rim. The procedure subsequently entails tenotomy with an interference screw and fixation. Tenotomy, which utilizes radiofrequency to guide the tendon into the socket, is carried out just before inserting interference screws with forked tips. The tendon protrudes slightly ahead of the screw and remains within the bone next to it. The screw does not create a depression or recess, as further embedding the screw into the socket could potentially reduce its fixation strength.

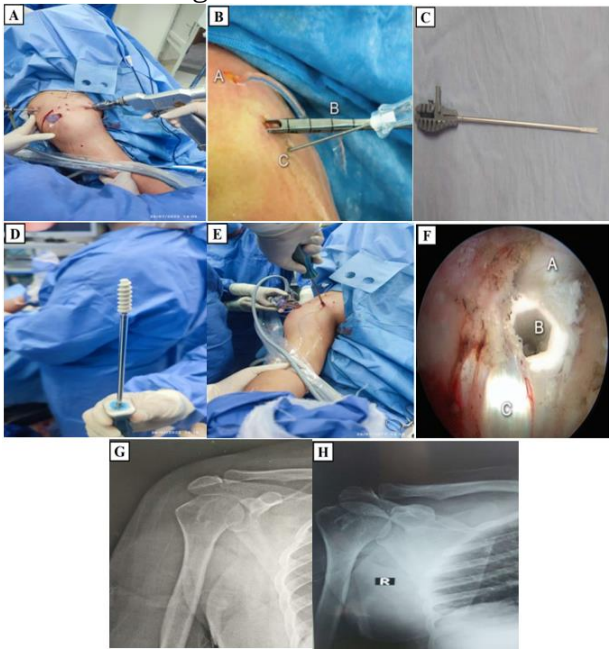

Figure 2. (A): Reaming the Bone Socket with a bullet tip reamer. (B): Anterosuperior portal with Forked Instrument and Spinal needle stabilizing the LHBT distal segment. (C): Forked instrument. (D): Tenodesis screw. (E): Putting the screw in the socket. (F): Flushed screw in the bone socket. (G, H): Postoperative x-ray 6 ms later showing tenodesis screw

Physical Therapy & Rehabilitation Protocol: Wearing shoulder braces for four weeks is recommended. After three weeks post-surgery, gradual range-of-motion activities can begin. However, it is advised to avoid forearm supination and resist elbow flexion for two months. It's important to highlight the need for patient compliance with the postoperative protocol, as symptom recovery tends to outpace the tissue-healing process. Before resuming physically demanding activities, it is crucial to confirm sufficient tendon healing through postoperative X-rays and MRI scans. For patients with frozen shoulders, tendinopathy, or irreparable SLAP tears, a gradual and progressive exercise regimen is initiated on the first day following surgery to prevent re-adhesions. In all cases, it was standard practice to restrict elbow extension for the initial six weeks. Strengthening exercises were only allowed once pain-free range of motion was fully restored, and patients were typically given clearance to resume their regular activities six months after the operation.

Follow-up evaluation:

ROM: Active anterior elevation, ER at the side, abduction, IR at 90° abduction [6 weeks, 8 weeks, 3 months, 6 months, and final follow-up at 12 months].

Scoring: ASES scores were calculated at the final follow-up, and scoring was done in 6 & 12 months.

3. Results

Illustrates master sheet and demographic distribution of 20 cases of this study. Table 1

Table 1. Illustrates master sheet and demographic distribution of 20 cases of this study

AGE	ASES		ACTIVE FORWARD ELEVATION		EXTERNAL ROTATION IN ADDUCTION		INTERNAL ROTATION IN ABDUCTION		ABDUCTION		DIAGNOSIS	GENDER	SIDE
	pre	post	pre	post	pre	Post	Pre	Post	Pre	Post			
60	46.6	74.9	116	180	56	84	43	61	145	170	RCT	male	left
41	61.6	86.6	140	180	69	82	62	88	156	171	RCT	female	right
43	58.3	83.3	144	180	67	79	57	75	149	168	RCT	female	right
30	73.3	95	155	180	74	85	70	85	160	170	RCT	female	right
57	44.9	73.2	114	178	55	84	44	62	156	170	RCT	male	right
44	56.6	81.6	140	180	64	79	58	76	147	169	FS	female	left
38	68.3	89.9	149	180	70	85	65	81	155	165	FS	male	right
45	54.9	79.9	138	180	63	78	54	73	159	167	RCT	female	right
49	53.2	78.3	136	180	62	76	55	73	140	169	RCT	male	right
37	68.3	89.9	145	180	72	86	66	82	157	169	FS	female	left
47	51.6	76.6	134	180	64	80	59	74	145	170	RCT	male	right
36	64.9	88.3	144	180	73	83	63	84	158	170	BT	female	right
40	61.6	86.6	143	180	70	81	64	79	152	168	FS	male	right
51	46.6	69.9	130	180	61	82	58	64	138	170	RCT	female	left
42	59.9	83.3	147	180	64	82	56	76	150	169	FS	male	left
57	48.2	68.3	131	180	59	79	49	63	136	166	RCT	male	right
33	74.9	95	154	180	75	85	71	84	159	169	BT	female	right
54	44.9	76.6	125	175	54	85	44	65	130	171	RCT	female	right
32	69.9	93.3	152	180	72	84	68	85	163	168	BT	female	left
53	43.2	73.2	115	177	54	83	42	63	150	169	FS	female	left
MEAN OF STUDY 44.45	57.585	82.185	137.6	179.5	64.9	82.1	57.4	74.65	150.25	168.9			

RCT: rotator cuff tear, FS: frozen shoulder, BT: biceps tendinopathy.

Description of age, operative time, and hospital stay among cases. The mean age among cases was 40 ±8.7; the mean operative time was 2.1 ±0.68 hours, and the mean hospital stay was 1.6± 0.5 days. Table 2

Table 2: It shows the mean age; mean operative time, and mean hospital stay

	MEAN	±SD	MINIMUM	MAXIMUM
AGE	40	8.74	30.00	50.00
OPERATIVE TIME (HOURS)	2.13	0.68	1.00	3.00
HOSPITAL STAYS (DAYS)	1.60	0.56	1.00	3.00

Description of pre and post-operative medical characteristics among cases. The average values measured before and after the surgery for all parameters, including ASES score, abduction, active forward elevation, and external and internal rotation during adduction simultaneously, were examined. Table 3

Table 3. The mean pre and post-operative values of all measured parameters; ASES, active forward elevation, external rotation in adduction, internal rotation in adduction, and abduction

	MEAN	±SD	MINIMUM	MAXIMUM
PRE ASES	57.70	9.74	43.20	74.90
POST ASES	82.27	8.39	68.30	95.00
ACTIVE FORWARD ELEVATION PRE	138.67	11.95	114.00	156.00
ACTIVE FORWARD ELEVATION POST	179.23	2.11	170.00	180.00
EXTERNAL ROTATION IN ADDUCTION PRE	65.03	6.44	54.00	75.00
EXTERNAL ROTATION IN ADDUCTION POST	81.87	2.45	76.00	86.00
INTERNAL ROTATION IN ABDUCTION PRE	57.53	8.83	42.00	71.00
INTERNAL ROTATION IN ABDUCTION POST	74.53	8.69	61.00	88.00
PRE ABDUCTION	149.30	9.70	130.00	163.00
POST ABDUCTION	168.80	1.52	165.00	171.00

Comparison between pre and post-operative medical characteristics among cases. There was an improvement in all of these parameters following surgery, with higher mean values post-operatively indicating a highly significant difference between pre and post-ASES, abduction, active forward elevation, and external and internal rotation during adduction simultaneously. Table 4

Table 4. It shows the difference between pre and post-ASES, active forward elevation, external rotation in adduction, internal rotation in adduction and abduction

	MEAN	±SD	P	SIG
PRE ASES	57.70	9.74	0.001**	HS
POST ASES	82.27	8.39		
ACTIVE FORWARD ELEVATION PRE	138.67	11.95	0.001**	HS
ACTIVE FORWARD ELEVATION POST	179.23	2.11		
EXTERNAL ROTATION IN ADDUCTION PRE	65.03	6.44	0.001**	HS
EXTERNAL ROTATION IN ADDUCTION POST	81.87	2.45		
INTERNAL ROTATION IN ABDUCTION PRE	57.53	8.83	0.001**	HS
INTERNAL ROTATION IN ABDUCTION POST	74.53	8.69		
PRE ABDUCTION	150.25	9.70	0.001**	HS
POST ABDUCTION	168.9	1.52		

Correlation between ASES percent of improvement and percent of improvement in each clinical assessment parameter. The highly substantial positive correlation that existed between the percent of change in ASES and the percentage of improvement in each of the following: internal rotation, abduction, external rotation in adduction, and active forward elevation. Table 5

Table 5. It shows the correlation between ASES percent of improvement and percent of improvement in each of active forward elevation, external rotation in adduction, internal rotation, and abduction

		FORWARD ELEVATION % IMPROVEMENT	EXTERNAL ROTATION % IMPROVEMENT	INTERNAL ROTATION % IMPROVEMENT	ABDUCTION % IMPROVEMENT
ASES % IMPROVEMENT	r	.875**	.820**	.586**	.700**
	p	0.0001	0.0001	0.0001	0.0001
	Sig	HS	HS	HS	HS

Only 3 patients were suffering from isolated biceps tendinopathy (BT) without associated pathology, 6 were suffering from frozen shoulder (FS), and 11 patients with different degrees of rotator cuff tears (RCT). The pre-operative and postoperative American Shoulder and Elbow Surgeons (ASES) scores were assessed for each diagnostic group. A substantial improvement in ASES scores was observed in the BT group, with a notable increase from 69.9 ± 5.00 to 92.2 ± 3.48. Patients with frozen shoulder (FS) similarly significantly enhanced ASES scores, rising from 59.6 ± 9.31 to 84.1 ± 6.31. Conversely, individuals with rotator cuff tears (RCT) experienced an improvement in ASES scores, albeit with a comparatively lower postoperative score of 78.4 ± 7.67. These findings suggested that patients with isolated biceps tendinopathy (BT) exhibit the best recovery, as evidenced by the highest postoperative ASES score. Table 6

Table 6. The pre-operative and postoperative American Shoulder and Elbow Surgeons (ASES) scores were assessed for each diagnostic group

DIAGNOSIS	N (%)	PRE ASES	POST ASES
BT	3 (15.0%)	69.9 ± 5.00	92.2 ± 3.48
FS	6 (30.0%)	59.6 ± 9.31	84.1 ± 6.31
RCT	11 (55.0%)	53.1 ± 8.69	78.4 ± 7.67

Intra and postoperative complications:

Two cases had post-operative frozen shoulders who underwent aggressive physiotherapy after subacromial space local anesthetic and anti-inflammatory injection.

4. Discussion

This study investigates the functional and clinical outcomes of a hardware-free suprapectoral biceps tenodesis procedure. The research focuses on assessing the functional results of suprapectoral biceps tenodesis, which is an arthroscopic surgical technique performed on a group of 20 patients involving 20 shoulders, all of whom presented symptoms of biceps tendinopathy—the follow-up period in our study ranged from six to eight months. The average age of the participants was 44.4 years, consisting of 11 females (55 percent) and 9 males (45 percent) within the age range of 30 to 60 years. The study observed an improvement in the patient's condition, as evidenced by an increase in the mean ASES score from 57.7 before the surgery to 82.27 after the procedure. [12]

The advantage of this technique is to ensure the maintenance of appropriate tendon length and tension, it can eliminate lesions buried in the biceps, it eliminates the need for knot tying, and it eliminates the possibility of knot irritation beneath the coracoid and coracoacromial ligaments.[11] In this work, biceps tenodesis, where the screw is placed below the bicipital groove in the suprapectoral area. This approach potentially decreases complications linked to open procedures and addresses issues that can arise with traditional arthroscopic tenodesis techniques, which typically position the tenodesis site inside the bicipital groove. [13]

In contrast to techniques that position the tenodesis site outside the bicipital groove, revision rates are greater for biceps tenodesis procedures that locate the tenodesis site within the groove. [14]

Although it has been reported that traditional open biceps tenodesis techniques are effective in treating biceps pathology, many of these procedures are associated with open surgery-specific complications.[15] Musculocutaneous neuropathy and deep wound infection were observed in a significant number of patients who underwent open biceps tenodesis because of the deep dissection. In addition, because of the wider incision, open surgery carries the potential for increased blood loss and compromised cosmesis. [16]

The all-arthroscopic suprapectoral approach presents numerous benefits in comparison to an open surgery. These include the potential for A minimally invasive method, enhanced cosmesis, and diminished hematological loss. Tendon removal from the bicipital groove is an additional advantage of the suprapectoral approach in comparison to the arthroscopic methods that were previously discussed. This procedure has the potential to reduce postoperative pain. [17]

Additionally, our all-arthroscopic technique can be utilized in conjunction with other arthroscopic procedures, such as labral or rotator cuff repairs. The implementation of an open tenodesis technique during an otherwise all-arthroscopic procedure frequently necessitated additional time in the operating room to close the wound and separate surgical trays for dissection instruments and retractors. [18]

In conclusion, a wide variety of biceps tenodesis methods have been documented in the literature. The tenodesis site has been positioned inside the bicipital groove using previously documented all-arthroscopic procedures, which may result in persistent shoulder pain. Open procedures have been associated with complications such as wound infection and nerve injury caused by soft-tissue dissection. We contend that our approach circumvents the risks and complications commonly associated with proximal tenodesis insertion, all the while generating exceptional clinical and biomechanical outcomes. [19]

In comparison to mini open subpectoral biceps tenodesis, Werner et al. 20 reported a considerably higher rate of postoperative shoulder stiffness following arthroscopic subpectoral biceps tenodesis (17.9 percent v 5.6 percent). Higher

subdeltoid bursectomy, increased soft-tissue dissection, increased subdeltoid bursectomy, and an increased risk of bleeding were all potential causes. Postoperative adhesions may develop if the natural sliding layer of the subdeltoid bursa is removed with considerable precision. Sight-direct visualization of pertinent anatomical characteristics improves both safety and efficacy.

When we examine the common techniques for biceps tenodesis, it becomes clear that interference screw and tunnel methods offer a stronger anchor compared to conventional anchors. When conducted arthroscopically, interference screws prove to be an effective method for securing biceps tenodesis. These screws are attractive due to their remarkable strength, which holds up well under stress. Interference screw fixation delivers a more robust initial anchoring in the bicipital groove and exhibits superior biomechanical properties when compared to metallic anchors. [20]

Some people are worried that arthroscopic biceps tenodesis procedures can cause tendinopathy and ongoing pain in the bicipital groove if the tendon is still partially inside the groove at the proximal tenodesis location. The presence of biceps tenosynovitis within the joint and its extension into the bicipital groove lend credence to the idea that there is inflammation within the groove. While this article describes an arthroscopic tenodesis procedure that is close to the pectoral tendon, the actual tenodesis location is further away from the bicipital groove. Because of the narrowing, the LHBT can no longer fit into the bony bicipital groove. Persistent postoperative discomfort may be less common if the tendon is not left in the groove. For tenodesis of the long head of the biceps tendon, this method for biceps tenodesis can be considered as an alternative. [20]

5. *Conclusion*

Opting for arthroscopic suprapectoral biceps tenodesis is a favorable decision, as it involves minimal tissue disruption, reduces surgical time, and eliminates the inflamed section of the biceps stump, which could otherwise cause lingering pain during the recovery and rehabilitation phases. ASBT is a worthwhile surgical procedure that is especially appropriate for young adults or athletes..

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Authorship

All authors have a substantial contribution to the article

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Conflicts of interest

There are no conflicts of interest.

References

1. Boileau P, Krishnan SG, Coste JS, Walch G. Arthroscopic biceps tenodesis: a new technique using bioabsorbable interference screw fixation. Arthroscopy. 2002;18(9):1002-1012.
2. de Sa D, Arakgi ME, Lian J, Crum RJ, Lin A, Lesniak BP. Labral Repair Versus Biceps Tenodesis for Primary Surgical Management of Type II Superior Labrum Anterior to Posterior Tears: A Systematic Review. Arthroscopy. 2019;35(6):1927-1938.
3. Murakami AM, Kompel AJ, Engebretsen L, et al. The epidemiology of MRI detected shoulder injuries in athletes participating in the Rio de Janeiro 2016 Summer Olympics. BMC Musculoskelet Disord. 2018;19(1):296.
4. Garving C, Jakob S, Bauer I, Nadjar R, Brunner UH. Impingement Syndrome of the Shoulder. Dtsch Arztebl Int. 2017;114(45):765-776.
5. Seo JB, Yoo JS, Ryu JW. Sonoelastography findings of biceps tendinitis and tendinosis. J Ultrasound. 2014;17(4):271-277.
6. Chalmers PN, Monson B, Frank RM, et al. Combined SLAP repair and biceps tenodesis for superior labral anterior-posterior tears. Knee Surg Sports Traumatol Arthrosc. 2016;24(12):3870-3876.
7. Alrabaa RG, Lobao MH, Levine WN. Rotator Cuff Injuries in Tennis Players. Curr Rev Musculoskelet Med. 2020;13(6):734-747.
8. Duchman KR, DeMik DE, Uribe B, Wolf BR, Bollier M. Open Versus Arthroscopic Biceps Tenodesis: A Comparison of Functional Outcomes. Iowa Orthop J. 2016;36:79-87.
9. Churgay CA. Diagnosis and treatment of biceps tendinitis and tendinosis. Am Fam Physician. 2009;80(5):470-476.
10. Griffin JW, Cvetanovich GL, Kim J, et al. Biceps Tenodesis Is a Viable Option for Management of Proximal Biceps Injuries in Patients Less Than 25 Years of Age. Arthroscopy. 2019;35(4):1036-1041.
11. Şahin K, Şentürk F, Ersin M, Arzu U, Chodza M, Erşen A. Repair Integrity and Functional Outcomes Between Knot-Tying and Knotless Suture-Bridge Arthroscopic Rotator Cuff Repair: A Prospective Randomized Clinical Trial. Orthop J Sports Med. 2021;9(4):23259671211002482.
12. Ahn J, Kim JH, Shin SJ. Arthroscopic suprapectoral biceps tenodesis provided earlier shoulder function restoration compared with open subpectoral biceps tenodesis during the recovery phase. J Shoulder Elbow Surg. 2024;33(3):678-685.
13. Gupta AK, Chalmers PN, Klosterman EL, et al. Subpectoral biceps tenodesis for bicipital tendonitis with SLAP tear. Orthopedics. 2015;38(1):e48-e53.
14. Gupta AK, Chalmers PN, Klosterman EL, et al. Subpectoral biceps tenodesis for bicipital tendonitis with SLAP tear. Orthopedics. 2015;38(1):e48-e53.
15. Hassan S, Patel V. Biceps tenodesis versus biceps tenotomy for biceps tendinitis without rotator cuff tears. J Clin Orthop Trauma. 2019;10(2):248-256.
16. Mardani-Kivi M, Keyhani S, Ebrahim-Zadeh MH, Hashemi-Motlagh K, Saheb-Ekhtiari K. Rotator cuff tear with concomitant long head of biceps tendon (LHBT) degeneration: what is the preferred choice? Open subpectoral versus arthroscopic intraarticular tenodesis. J Orthop Traumatol. 2019;20(1):26- 89.
17. Nair R, Kahlenberg CA, Patel RM, Knesek M, Terry MA. All-Arthroscopic Suprapectoral Biceps Tenodesis. Arthrosc Tech. 2015;4(6):e855-e861.
18. McCrum CL, Alluri RK, Batech M, Mirzayan R. Complications of biceps tenodesis based on location, fixation, and indication: a review of 1526 shoulders. J Shoulder Elbow Surg. 2019;28(3):461-469.
19. Patel KV, Bravman J, Vidal A, Chrisman A, McCarty E. Biceps Tenotomy Versus Tenodesis. Clin Sports Med. 2016;35(1):93-111.
20. Werner BC, Pehlivan HC, Hart JM, et al. Increased incidence of postoperative stiffness after arthroscopic compared with open biceps tenodesis. Arthroscopy. 2014;30(9):1075-1084.