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Arthroscopic Management of Rotator Cuff and Other Shoulder Pathology in Diabetics

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Abstract:

Background: Musculoskeletal disease is one of the most common complications in patients with diabetes, and yet it receives relatively little attention. The severity and the risks of musculoskeletal complications might not be well recognized as cardiovascular complications; however, the associated ailments certainly inflict both physical and psychological harm on people with diabetes. Among the various musculoskeletal diseases, shoulder painis one of the most common complaints. In general, it is characterized by pain and limited range of motion of one or both shoulders. Shoulder pain not only causes decreased quality of life, but also leads to disability in daily activities, and might interfere directly or indirectly with control of metabolic processes. Two of the most common shoulder disorders are frozen shoulder, also known as adhesive capsulitis‘ and rotator cuff disease. Aim and Objective: To evaluate shoulder arthroscopic surgery in management of rotator cuff and other shoulder pathology in diabetics. Methods: This was a prospective descriptive study which included 20 diabetic patients having rotator cuff and other shoulder pathology treated by shoulder arthroscopic surgery to evaluate its efficacy in management. Preoperative and postoperative evaluations were performed based on history, physical examination, and a modified University of California at Los Angeles (UCLA) score system. Results: At the end of the follow up period, on the modified UCLA shoulder rating scale, 17 of the 20 patients (85%) in this study achieved a satisfactory result and 3 (15%) were not. total UCLA score significantly improved from 15.3 ± 3.47 preoperatively to 30.6 ± 4.24 at the end of follow up ($p<0.001$). eight patients (40%) had excellent results, nine patients (45%) had good results, three patients (15%) had fair results and none of the cases were poor.

Keywords: shoulder arthroscopy, rotator cuff tear, frozen shoulder.

1. Introduction

Musculoskeletal disease is one of the most common complications in patients with diabetes, and yet it receives relatively little attention. The severity and the risks of musculoskeletal complications might not be well recognized as cardiovascular complications; however, the associated ailments certainly inflict both physical and psychological harm on people with diabetes. Among the various musculoskeletal diseases, shoulder pain is one of the most common complaints. In general, it is characterized by pain and limited range of motion of one or both shoulders. Shoulder pain not only causes decreased quality of life, but also leads to disability in daily activities, and might interfere directly or indirectly with control of metabolic processes. Two of the most common shoulder disorders are frozen shoulder, also known as adhesive capsulitis‘ and rotator cuff disease.[(1)]

The rotator cuff muscles are a group of four muscles including subscapularis in front, supraspinatus above and infraspinatus with teres minor from behind that fuse together to form a tendon which encompasses the humeral head. They are part of the intrinsic muscles of the shoulder joint.[(2)]

The cuff muscles have three functions: They rotate the humerus with respect to the scapula, compress the head into the glenoid fossa and they provide muscular balance. Its main function is to provid stability to the joint by pressing the humeral head on the glenoid.[(3)]

Factors related to the development of rotator cuff tears are classified as intrinsic, extrinsic or traumatic. Intrinsic tendinopathy due to changes in vascularity of the cuff or other metabolic alterations associated with aging may lead to degenerative tears. Extrinsic subacromial impingement as a result of narrowing of the supraspinatus outlet by abnormalities of the coracoacromial arch may cause partial tears by way of irritation of the cuff. An excessive tensile load of the cuff because of either a single traumatic injury or repetitive microtrauma may also result in such lesions.[(4)]

The morphology of the acromion and its relation to impingement as a cause of rotator cuff disease is controversial. Bigliani et al. defined subacromial impingement by classifying acromial morphology into three primary types: flat (type I) 17%, curved (type II) 43% and hooked (type III) 40%. The hooked acromion (type III) is most often associated with impingement and rotator cuff tears.[(5)]

Although the impingement may play some role, the pathologic effects of overuse appears to play more significant role in the development of rotator cuff tendinopathy. Overuse can cause imbalance between tendon degeneration and regeneration leading to increased tenocytes apoptosis and conversion of the tendon to the biomechanically inferior fibrocartilage. This can lead to attritional tears of the rotator cuff and mechanical failure. Also, aging appears to magnify the pathologic effects of overuse.[(6)]

The mechanism by which diabetes influences the development of frozen shoulder or rotator cuff disease has not been identified. The two diseases might share the same diabetes related mechanisms: (i) impaired microcirculation; and (ii) non-enzymatic glycosylation processes. In fact, hyperglycemia is linked to subsequent formation of non-enzymatic glycosylation products, and further gives rise to advanced glycosylation end-products (AGEs). These AGEs increase cross-linking in collagen, tendons and ligaments, making these structures stiffer and weaker. In addition, AGEs interact with their receptors on the surface of tenocytes and fibroblasts,

thereby inducing inflammatory changes. Furthermore, the unfavorable microvascular environment as a result of hyperglycemia occurs around the shoulder joint as well. The impaired circulation leads to tissue hypoxia, over production of free radicals, eventually leading to potential apoptosis. This collective damage might lead to joint tissue destruction and enhancement of degenerative changes.[7]

Diagnosis of rotator cuff tears depends clinically on impingement tests like Neer test, Hawkin test and rotator cuff muscles tests as Jobe test, lift-off test and external rotation stress test. Then the patient is evaluated by plain X-ray which may show the type of acromion, calcific deposits or glenohumeral arthropathy. But diagnosis depends mainly on MRI study of the shoulder joint, which demonstrates the cuff lesion, fatty infiltration of the muscles and bony structures of the joint. Ultrasound study of the shoulder is very useful but it is operator dependent. Also, arthrography has been replaced by MRI due to its invasive nature.[8]

2. Patients and methods

The material of this study included 20 diabetic patients presented to mostafa kamel military hospital, Alexandria during the duration from june 2020 to july 2021 having rotator cuff and other shoulder pathology treated by shoulder arthroscopic surgery.

The current study revealed that, half of the patients were males, and the other half were females. 3 (15%) had type 1 DM and 17 (85%) had type 2 DM. This study showed that, the MRI showed full RC tear in 6 (30%) patients, partial tear in 6 (30%), frozen shoulder in 4 (20%) patients, and impingement in 4 (20%) patients.

All Patients were subjected to clinical and radiological examination including full history taking, full Clinical examination including General examination, Shoulder examination that include:

[1]. Range of shoulder motion (both active and passive).

[2]. Tests for rotator cuff :

- Impingement tests: Neer Impingement Sign ,Neer Impingement test, Hawkins-Kennedy Impingement Test.
- Supraspinatus test :Jobe test, Lag test.
- Subscapularistests : Gerber's lift-off test ,Belly press test.
- Infraspinatustests : External rotation test.

Pre-operative radiological examination:

Plain X-ray for the shoulder: anterosuperior ,supraspinatous outlet view and axilary views. MRI : for the shoulder.

2.1Inclusive criteria:

Diabetic patients having rotator cuff and other shoulder pathology.

2.2Exclusive criteria:

Revision cases, Traumatic fractures, Neoplastic cases, Infected cases, Non human trials.

2.3Methods of treatment:

The study included diabetic patients with rotator cuff pathology and treated by shoulder arthroscopic surgery.

2.4. Operative technique:

Preoperative Considerations:

To avoid ‘‘wrong site’’ surgery, we always confirm with the patient which shoulder is to be operated on. This is done in the preoperative holding area and should be marked with surgical marking pen before the patient receives any sedation.

Anesthesia:

The procedure was performed under general anesthesia. Hypotensive anesthesia is recommended to minimize bleeding and to maximize visualization.

Patient Positioning:

The patient positioned in an upright (sitting) beach chair position (.figure 1)

Fig. (1) Patient positioning.

Arthroscopic portals placement

Once the patient was positioned, a surgical marking pen was used to accurately outline bone landmarks of the shoulder; the clavicle, acromion, coracoid process, and scapular spine. The most important landmark is the posterolateral corner of the acromion. We create the posterior portal which used for initial visualization1 cm inferior &1 cm medial to posterolateral corner of acromion. We do an incision, and we use a blunt trocar to penetrate the posterior cuff and capsule. We insert the camera, and an inspection of the glenohumeral joint begins.

Then we create anterior portal to allow probing of rotator cuff and other structures, placed in the rotator interval or triangle formed by the subscapularis, humeral head, and biceps tendon. By outside-in technique using a spinal needle that is placed just lateral to the coracoid through the rotator interval.

We create the anterolateral portal parallel and slightly below the undersurface of the anterolateral third of the acromion with the use of a spinal needle under direct visualization. (Figure 2)

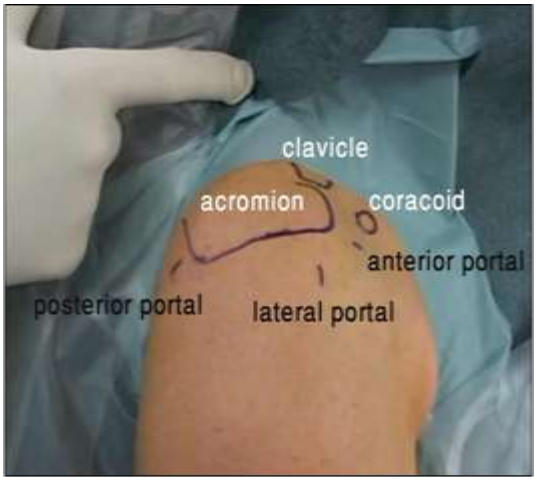

Fig. (2) Bony landmarks and arthroscopic portals**.**

Evaluation of glenohumeral joint:

In all patients, diagnostic glenohumeral arthroscopy was performed routinely starting with insertion of the arthroscope into the glenohumeral joint through the posterior portal. The first portion of this examination would be done before distention of the capsule with fluid. Upon entering the joint, the triangle formed by the biceps tendon superiorly, the humeral head laterally, and the subscapularis inferiorly identified which was the rotator interval.

Evaluation of the subacromial space

Use the same posterior skin incision to enter the subacromial space. The arthroscopic sheath and blunt-tipped trocar can be used to

clear the subacromial space before placement of the arthroscope. A gentle sweeping motion helps clear the space of the often thickened bursal tissue, creating a window for initial visualization.

Subacromial decompression

Routine subacromial decompression was done in all patients, starting by introducing the oscillating shaver or ablation device from the lateral portal positioning it midway between the acromion and the rotator cuff begin shaving the subacromial bursa to perform a partial bursectomy.(figure 3)

Fig. (3) subacromial decompression and acromioplasty.

In case of PTRCTS

Debridement of the partial-thickness tear alone, Debridement of the tear with subacromial decompression, and Arthroscopic repair (either repair in situ or conversion to full thickness tear and repair) combined with subacromial decompression.

In case of FTRCTS

Repair of tear by : the single row (SR) suture anchor technique. The double row (DR) suture anchor technique.(Figure 4)

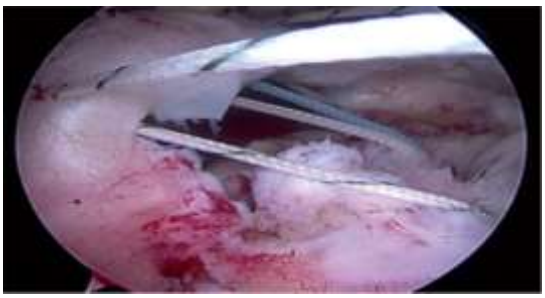

Fig. (4) Sutures through the tendon in a SR repair.

In case of frozen shoulder

Arthroscopic ccapsular release (ACR).

In cases of impingement.

Subacromial decompression

Postoperative care:

After recovery from anesthesia, neurovascular examination was done. Patients received an arm sling for comfort combined with exercise instructions. Patients were discharged on the second day. Analgesia, antiedematous and antibiotics were prescribed.

Methods of evaluation of the results:

The patients were evaluated pre and postoperatively according to a modification of the University of California at Los Angeles (UCLA) score system (9). This scoring system consists of five parts: pain with maximum score of 10 points, function with maximum score of 10 points, active forward flexion with maximum score of 5 points, strength of forward flexion with maximum score of 5 points and satisfaction of the patient with maximum score of 5 points.

The maximum score is 35 points. A score of 34 or 35 points is considered excellent; a score of 28 to 33 points is considered good; a score of 21 to 27 points is considered fair; and a score of 0 to 20 points is considered poor.

Excellent and good results will be considered satisfactory, while fair and poor results will be considered unsatisfactory.

3.RESULTS

Regarding the modified UCLA shoulder rating scale parameters preoperatively and at the end of follow up (table 1),Pain significantly improved from 3.3 ± 1.59preoperatively to 8.5 ± 2.04 at the end of follow up ($p < 0.001$).

Function significantly improved from 4.9 ± 1.65 preoperatively to 8.5 ± 1.7 at the end of follow up (p

<0.001).

Active forward flexion significantly improved from 3.75 ± 1.21 preoperatively to 4.7 ± 0.47 at the end of follow up (p <0.001).

Strength forward flexion significantly improved from 3.35 ± 0.49 preoperatively to 4.65 ± 0.49 at the end of follow up (p <0.001).

Satisfaction significantly improved from 0 preoperatively to 4.25 ± 1.83 at the end of follow up (p <0.001).(figure 5)

Total UCLA score significantly improved from 15.3 ±3.47 preoperatively to 30.6 ± 4.24 at the end of follow up (p <0.001).

The outcome at the end of follow up according to UCLA score was excellent in 8 (40%), good in 9 (45%), and fair in 3 (15%). None of the cases were poor. 17 (85%) patients were satisfied at the end of follow up and 3 (15%) were not.

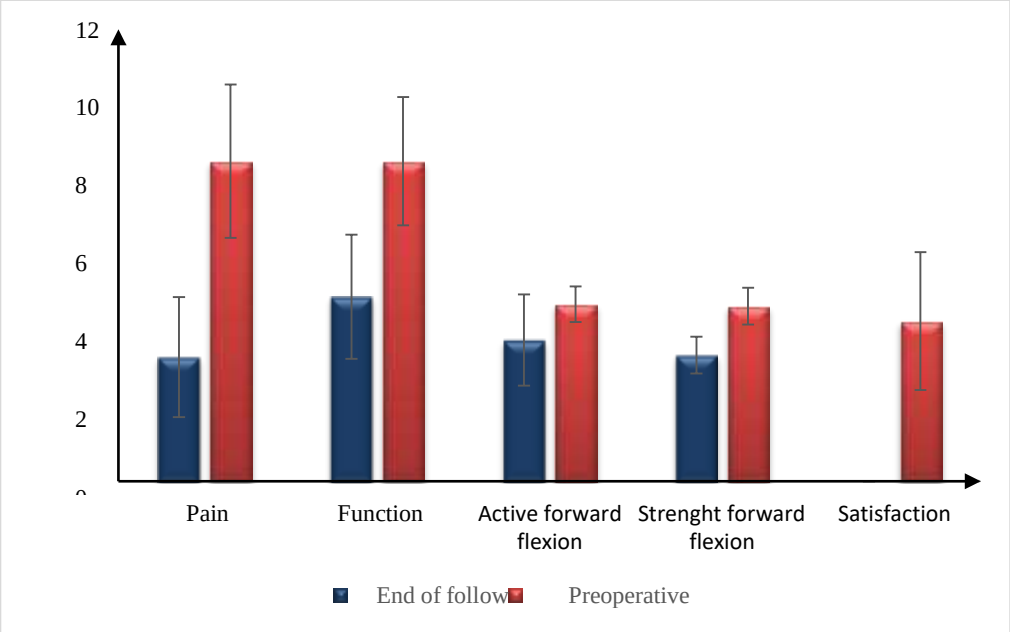

Fig. (5) Preoperative and end of follow up modified UCLA shoulder rating scale inthe study participants.

Table (1) Preoperative and end of follow up modified UCLA shoulder rating scale in the study participants.

		Preoperative(n =20)	End of follow up(n =20)	P value
Pain	**Mean ± SD**	3.3 ± 1.59	8.5 ± 2.04	**<0.001***
	Range	1 - 6	4 - 10	
Function	**Mean ± SD**	4.9 ± 1.65	8.5 ± 1.7	**<0.001***
	Range	2 - 8	4 - 10	
Active forwardflexion	**Mean ± SD**	3.75 ± 1.21	4.7 ± 0.47	**<0.001***
	Range	2 - 5	4 - 5	
Strength forwardflexion	**Mean ± SD**	3.35 ± 0.49	4.65 ± 0.49	**<0.001***
	Range	3 - 4	4 - 5	
Satisfaction	**Mean ± SD**	0 ± 0	4.25 ± 1.83	**<0.001***
	Range	0 - 0	0 - 5	
Total score	**Mean ± SD**	15.3 ± 3.47	30.6 ± 4.24	**<0.001***
	Range	9 – 21	22 – 35	

4. DISCUSSION

Rotator cuff tears are a common cause of pain and disability. Repair of these tears by open, mini-open, and arthroscopic procedures have yielded good results, with decreased pain, increased function, and high patient satisfaction. Diabetes mellitus affects approximately 17.9 million people in the United States, and this number continues to increase. The condition is frequently associated with various musculoskeletal disorders, which affect tendon and bone structure, healing, and vascularity. In addition, shoulder stiffness occurs at a higher rate in chronically insulin- dependent patients with diabetes compared with the general population. The frozen shoulder in patients with diabetes has similar histological and immunocytochemical findings as Dupytren‘s contracture of the hand and is thought to occur secondary to an autoimmune disorder [10].

Aprevious study [1`)] reported a higher incidence of

shoulder stiffness in patients with diabetes (36%) versus the general population (3%).

study wasRegarding the range of motion preoperatively and at the end of follow up, forward flexion significantly improved from 121.75 ± 22.2 ° preoperatively to 133.75 ± 23.67° at the end of follow up (p <0.001).

Abduction significantly improved from 68.75 ± 20.12° preoperatively to 110.75 ± 26.52° at the end of follow up (p <0.001).

Internal rotation significantly improved from 22.25 ± 6.58° preoperatively to 54 ± 11.19° at the end of follow up (p <0.001).

External rotation significantly improved from 30.25 ± 7.34° preoperatively to 72.75 ± 16.66° at the end of follow up (p <0.001).

Aprevious study [١٢] showed that there was no statistically significant correlation with range of motion after 1 year of observation in patients with diabetes after rotator cuff repair.

According to [14] reported a 4.9% (24 of 489) incidence of shoulder stiffness after arthroscopic repair of the rotator cuff.

According to [١5]performed arthroscopic surgery in 10 patients without large tears and with good control of diabetes. They reported no postoperative re- tears and no significant difference between the DM and non-DM groups for the range of motion, JOA score, and muscle strength.

Aprevious study [١٦] reported that, there was significant improvement in the ROM of forward flexion, abduction, external rotation, and internal rotation in arthroscopic release group when compared with conservative group. All patients of arthroscopic release group could attain full ROM whereas none of the case of conservative group could achieve full ROM by the end of the study. The improvement of ROM after arthroscopic release is consistent with the previous studies [17]

Regarding the modified UCLA shoulder rating scale parameters preoperatively and at the end of follow up, function significantly improved from 4.9 ± 1.65 preoperatively to 8.5 ± 1.7 at the end of follow up (p <0.001). Pain significantly improved from 3.3 ± 1.59 preoperatively to 8.5 ± 2.04 at the end of follow up (p <0.001). Active forward flexion significantly improved from 3.75 ± 1.21 preoperatively to 4.7 ± 0.47 at the end of follow up (p <0.001). Strength forward flexion significantly improved from 3.35 ± 0.49 preoperatively to 4.65 ± 0.49 at the end of follow up (p <0.001).

According to [١٨] who aimed to compare clinical outcomes and retear rates after rotator cuff repair in patients with and without diabetes. . They found that repair of the diabetic rotator cuff improved function, although postoperative clinical results were worse than in nondiabetic patients.

According to [10] reported that, at the 1-year follow-up, both cohorts noted significant improvements in functional capacity, shoulder mobility, and patient satisfaction. It is important to note that the patients with diabetes had lower preoperative function and ROM than the nondiabetic cohort, which is likely to account for the lower postoperative outcome.

According to [16] reported that, there was complete and consistent pain relief in arthroscopic release group by as early as 6 weeks and it persisted till last follow-up.

According to [19] reported maximum pain relief around 3.6 ± 2.1 months after arthroscopic capsular release (37% of the cases were diabetic).

In the present study, total UCLA score significantly improved from 15.3 ± 3.47 preoperatively to 30.6 ± 4.24 at the end of follow up (p <0.001).

In the current study, the outcome at the end of follow up according to UCLA score was excellent in 8 (40%), good in 9 (45%), and fair in 3 (15%). None of the cases were poor.

In a study of fifty-three arthroscopic subacromial decompressions performed for advanced stage-II or early stage-III disease (full-thickness tears of less than one centimeter), reported an 83% rate of good and excellent results, according to the rating scale of the University of California at Los Angeles. The average duration of follow-up was twenty months (range, twelve to twenty-six months). [٢٠]

According to [21] reported an 81 % rate of good and excellent results, according to the rating scale of the University of California at Los Angeles. The result was good or excellent after 86 % of the thirty-five procedures that were performed for a partial-thickness tear.At an average of twenty-three months (range, twelve to fifty months) after fifty-three arthroscopic subacromial decompressions performed for various stages of impingement.

In this study, 17 (85%) of patients were satisfied at the end of follow up and 3 (15%) were not.

According to [22]reported a satisfactory short term result in fifteen (75%) of twenty patients who had been managed with arthroscopic subacromial decompression and debridement for a partial-thickness tear. Tears involving the articular surface were found in twelve patients, the bursal surface in seven patients, and both sides of the tendon in one patient with a short followup period which was not documented.

No complications were reported among our study participants.

According to [23] found the risk of infection to be approximately 0.38% following arthroscopic RCR.

According to [10] reported that, no infections occurred in their study.

While, [24] demonstrated that diabetes is associated with a notable increase in postoperative complications following arthroscopic rotator cuff repair.

According to [13] found that patients with diabetes had an increased infection rate after open RCR compared with patients without diabetes (10% vs 0%).

According to [25] reported an incidence of infection after rotator cuff repair of 0.27%.

5. Conclusion

Arthroscopic management provides effective and rapid cuff improvements to shoulder motion and function in patients with rotator cuff and other shoulder pathology in the diabetic patients.

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