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Prospective Study

Arthroscopic findings after manipulation under anesthesia in idiopathic capsulitis of the shoulder: A prospective study

Sai Krishna Mlv, Ravi Mittal, Nitin Chauhan

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Abstract

BACKGROUND

Manipulation under anesthesia (MUA) of the shoulder joint is a commonly used method for the treatment of adhesive capsulitis. Though it has been known to be associated with a variety of complications, there is a paucity of studies describing the arthroscopic findings after MUA.

AIM

To describe the arthroscopic findings in patients with idiopathic adhesive capsulitis of the shoulder after MUA.

METHODS

We recruited 28 patients with idiopathic adhesive capsulitis who underwent arthroscopic capsular release. Manipulation of the shoulder was performed under anesthesia in all of these patients before capsular release. Intra-articular findings were recorded during arthroscopic capsular release in these patients.

RESULTS

All patients showed the presence of synovitis. Twenty-seven patients showed tears in the capsule on the anterior aspect. One patient had an avulsion of the anterior rim of the glenoid and labrum following the manipulation. Four patients had partial rotator cuff tears, and one patient showed a superior labrum anterior posterior lesion, which was not diagnosed preoperatively on magnetic resonance imaging.

CONCLUSION

MUA leads to rupture of the capsule, which is the desired outcome. However, the site of rupture of the capsule is dependent on the maneuvers of MUA. In addition,

partial tears of the rotator cuff and osteochondral fractures of the glenoid can also occur.

Key Words: Frozen shoulder; Arthroscopy; Manipulation under anesthesia; Prospective study

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Core Tip: Manipulation under anesthesia for a frozen shoulder can lead to damage to other intra-articular structures besides the rupture of the capsule, which is the main aim of this procedure. In most cases, it leads to rupture of the anterior capsule. This is the same area where arthroscopic releases are most often performed. Rupture of the posterior and inferior capsule can also occur depending on the rotational and adduction manipulation of the shoulder.

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INTRODUCTION

Adhesive capsulitis, popularly known as ‘frozen shoulder’, is a common cause of shoulder pain and stiffness of the glenohumeral joint. It is thought to afflict between 2% and 5% of the population[1]. The condition has been described by some as self-limiting, lasting on average for a period of 2-3 years[2-4]. However, some studies have shown that between 20% and 50% of the patients still experience discomfort and stiffness beyond 3 years[5,6]. Although it is a self-limiting condition, patients find it impractical and challenging to wait for such a long period as it interferes with everyday life tasks. Most of the studies have reported manipulation under anesthesia (MUA) to be efficacious[7,8] and at least equivalent compared to other methods such as steroid injection and hydrodilatation[9,10].

Iatrogenic injuries to the upper limb including humeral fractures, glenohumeral dislocations, rotator cuff tears, glenoid fractures, brachial plexus injuries, labral tears, and hematomas pose the biggest risk and challenge during MUA[11]. Even though MUA is a very commonly practiced modality of treatment of adhesive capsulitis of the shoulder, there is not enough literature that documents the intra-articular changes after MUA. We could find only three published reports that described the arthroscopic findings post MUA[12-14], and only two publications have described the imaging of the shoulder after MUA[15,16]. Our study documented the arthroscopic findings after MUA of the shoulder in patients with idiopathic adhesive capsulitis of the shoulder.

MATERIALS AND METHODS

The study was performed after obtaining institutional ethical committee clearance. Twenty-eight patients were included in this study for arthroscopic capsular release for idiopathic adhesive capsulitis of the shoulder. All patients included in the study had idiopathic stiffness of the shoulder with global restriction of shoulder movements for the prior 6 mo. Patients with a prior history of trauma or surgery to the shoulder were excluded. Any patient who received any form of treatment other than physiotherapy was also excluded. There were 20 females and 8 males. The ages ranged from 42 years to 62 years with an average age of 49.7 years. All patients had complaints of spontaneous onset of pain and stiffness of the shoulder. The opposite shoulder was normal.

All the patients had preoperative X-rays and magnetic resonance imaging (MRI) scans completed to rule out any secondary cause of adhesive capsulitis of the shoulder. The MRI was performed with the patient in a supine position and arms by the side. The images were obtained in axial, coronal oblique, and sagittal oblique planes. The protocols used were T1-weighted and T2-weighted with fat saturation and inversion recovery sequences.

The patients did not show improvement in their symptoms with physiotherapy and analgesics for at least 6 mo. After the administration of general anesthesia, manipulation of the shoulder was performed in a supine position. Manipulation was first done in flexion. Following this, the limb was manipulated in abduction. During the MUA, the proximal humerus was held with one hand close to the axilla and the other hand stabilized the scapula. Gentle pressure was used to manipulate. An increase in flexion and abduction was associated with a crackling sound, palpable crepitus, and a feeling of sudden giving way. Manipulation was not performed in external rotation, adduction, or internal rotation to avoid any iatrogenic fracture of the humerus.

The patient was then placed in a semi-lateral position and the arm was abducted using a traction tower for arthroscopic global capsular release. Intra-articular findings were recorded before proceeding with capsular release. Entering the shoulder joint with sheath and trocar through the posterior portal was difficult compared to a non-stiff shoulder. The presence of blood and blood clots in the joint was the first arthroscopic finding. This required repeated joint lavage to clear all the blood and blood clots. When all the clots and blood were removed from the joint, the intra-articular struc-

tures could be visualized.

To make the anterior portal, the rotator interval was identified. The rotator interval had shrunk in size and had the presence of synovitis. A needle was passed from the outside to locate the site of the anterior portal within the rotator interval. The two portals were used alternately to pass the instruments and arthroscope to evaluate all the corners of the shoulder joint and perform a global capsular release. After surgery, patients were provided adequate analgesia and began active and passive range of motion exercises of the shoulder. The patients were followed at monthly intervals up to 5 mo, and all patients had significant relief in pain and improvement in range of motion.

RESULTS

Out of the twenty-eight patients, 27 had global synovitis, and 1 patient had synovitis localized to the rotator interval. Twenty-seven patients had thickening of the middle glenohumeral ligament, while one patient had normal ligaments. There were tears in the anterior capsule in 27 patients, whereas 1 patient had an anterior glenoid rim avulsion. The avulsed fragment was not repaired, and the patient had no complaints during follow-up. There were no instances of humeral head fracture or posterior capsular tear. Four patients experienced partial rotator cuff tears, which were not evident in the preoperative MRI. Since the tear involved less than 50% of cuff thickness, it was only debrided. There was also an instance of superior labrum anterior posterior tear that was not evident in preoperative MRI in 1 patient. It was not repaired, and the patient had an uneventful follow-up (Table 1).

DISCUSSION

Manipulation under general anesthesia is a widely practiced method of treatment of a frozen shoulder. In this technique, the shoulder joint capsule is gently stretched by moving the humerus after stabilizing the scapula into flexion and abduction, and finally (optionally) moving the adducted humerus into external rotation. It is an effective method for the treatment of adhesive capsulitis of the shoulder but with a potential for significant intra-articular and rotator cuff injuries.

Atoun *et al*[16] evaluated the rotator cuff by ultrasound before and after MUA. They did not find any rotator cuff lesions on ultrasound examination after shoulder manipulation. We found four partial articular-sided rotator cuff tears in our study during arthroscopy after manipulation. None of these tears were evident on preoperative MRI. Loew *et al*[14] also found 4 cases with partial subscapularis tears. This difference could be due to the difficulty in the detection of partial thickness cuff tears on ultrasound.

Sasanuma *et al*[15] performed MRI examination before and after MUA. They found tears in the inferior capsule either in the mid-substance or near the humeral insertion of the inferior capsule. They reported anterior and posterior tears of the inferior capsule but did not report any tears in the anterior capsule. This was quite different from the results of our study where we found only anterior tears. This could be due to the difference in the method of manipulation of the shoulder. Unlike these authors, we did not aim to achieve a range of motion equal to the opposite side. We applied gentle force and stopped short of forceful manipulations. In addition, we did not perform any rotational movements of the shoulder during MUA.

Gerber *et al*[17] described a correlation between the limb position and tension in the articular capsule. They reported tension in the posterior capsule in the position of internal rotation and adduction. These movements were not performed in the manipulation in our study, and this may explain the lack of posterior capsular tears in our patients. A combination of abduction/external rotation and forward flexion tightened the anterior inferior capsule. The presence of anterior injuries in our study can be explained by the flexion and abduction manipulation of the joint. Sasanuma *et al*[15] also reported four labrum tears occurring in patients with mid-substance tears of the inferior capsule and the absence of any new rotator cuff tears. However, Loew *et al*[14] described MUA quite similar to that performed by Sasanuma *et al*[15], and they found capsular ruptures all around the shoulder.

Wiley *et al*[12] in their landmark paper presented the arthroscopy findings of frozen shoulder. They described the arthroscopy findings in 37 patients, and most of the patients had patchy synovitis, which was in contrast to the findings of our paper. They also noticed a subset of patients having tears in the labrum and partial tears in the cuff. The paper also discussed tears in the subscapularis and attributed them to the manipulation maneuver for regaining external rotation as observed by Depalma. In our technique, we have not used manipulation in rotations.

Uitvlugt *et al*[13] presented arthroscopy findings of frozen shoulder patients. They described 21 patients before manipulation and post-manipulation in 10 patients. In all the patients the entry into the shoulder was difficult due to the reduced volume before manipulation, and there was synovitis in all of the patients. The synovitis was anterior in most patients followed by in the axillary pouch and near the rotator cuff. Post manipulation the entry into the shoulder was easier, and there were capsular tears in the anterior and inferior walls in most of the patients[13].

Loew *et al*[14] documented arthroscopic findings after manipulation in 30 patients. They found anterior capsule ruptures in 24 patients, posterior ruptures in 16 patients, and superior capsule ruptures in 11 patients. They showed anterior labral detachment in 4 patients, superior labrum anterior posterior lesions in 3 patients, partial ruptures of the subscapularis in 2 patients, an osteochondral defect in 1 patient, and a tear of the medial glenohumeral ligament in 2 patients. They performed MUA to gain internal and external rotations, flexion, and abduction. However, they did not aim to achieve range of motion equal to the normal side.

Table 1 Arthroscopic findings after manipulation under anesthesia, $n = 28$

Sample number	Arthroscopic finding	Patients, n
1	Global synovitis	27
2	Synovitis limited to rotator interval	1
3	Anterior capsular tears	27
4	Anterior glenoid rim avulsion	1
5	Thickened middle glenohumeral ligament	27
6	Normal middle glenohumeral ligament	1
7	Superior labrum anterior posterior tears	1
8	Rotator cuff tears	4

We have noticed anterior capsular tears post-manipulation in our patients. As the MUA for a frozen shoulder has a risk of iatrogenic fractures, we have not attempted rotational manipulation. Hence, we performed arthroscopic global capsular release in all of our patients post-manipulation.

Our strict inclusion and exclusion criteria during the patient recruitment is a strength of our study, and a low sample size is our limitation. Arthroscopic findings of the shoulder both before and after the MUA can provide better insight and should be considered as a potential area for future research.

CONCLUSION

MUA leads to rupture of the capsule, which is the desired outcome. The site of rupture of the capsule depends on the maneuver of manipulation. In most cases, it leads to rupture of the anterior capsule. This is the same area where arthroscopic releases are most often performed. Rupture of the posterior and inferior capsule can also occur depending on the rotational and adduction manipulation of the shoulder. In addition, partial tears of the rotator cuff and osteochondral fractures of the glenoid can occur.

ARTICLE HIGHLIGHTS

Research background

Manipulation under anesthesia (MUA) of the shoulder joint is a commonly used method for the treatment of adhesive capsulitis. Though it has been known to be associated with a variety of complications, there is a paucity of studies describing arthroscopic findings after MUA.

Research motivation

Even though MUA is a very commonly practiced modality of treatment of adhesive capsulitis of the shoulder, there is not enough literature that documents the intraarticular changes after MUA.

Research objectives

The object of this study was to document the arthroscopic findings after MUA of the shoulder in patients with idiopathic adhesive capsulitis of the shoulder.

Research methods

This was a prospective study to describe the arthroscopic findings in patients with idiopathic adhesive capsulitis of the shoulder after MUA.

Research results

All patients showed the presence of synovitis. Most patients had global synovitis, while 1 patient had synovitis limited to the rotator interval. A majority of patients post manipulation showed tears in anterior capsule, whereas only 1 patient had avulsion of the anterior labrum post manipulation.

Research conclusions

MUA leads to the rupture of the capsule, which is the desired outcome. However, the site of rupture of the capsule is dependent on the maneuvers of MUA. In addition, partial tears of the rotator cuff and osteochondral fractures of the glenoid can occur.

Research perspectives

MUA for a frozen shoulder can lead to damage to other intra-articular structures besides the rupture of the capsule, which is the main aim of this procedure. In most cases, it leads to rupture of the anterior capsule.

FOOTNOTES

Author contributions: Mlv SK and Chauhan N contributed to the data acquisition, initial manuscript drafting, and incorporating revisions of this manuscript; Mittal R participated in the conception, supervision, and critical analysis and was the primary surgeon of this study.

Institutional review board statement: The study was approved by the institutional ethical committee (IESC/T-300/02.08.2013).

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