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Diabetic and non-diabetic patients report equal symptom relief after arthroscopic capsular release of frozen shoulder

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ABSTRACT

Background: Frozen shoulder is a painful joint disease. Patients with diabetes seem to have worse clinical symptoms and surgery in this patient population is believed to be more common.
The objective postoperative evaluation indicates inferior results when surgically treating diabetics, but no previous studies have investigated exclusively the subjective patient satisfaction with arthroscopic capsular release.
Materials and methods: A total of 93 patients were included. All had persistent symptoms despite conservative treatment for at least six months. The patients were retrospectively divided into two groups based on diabetes status: Group 1 consisted of patients with type 1 or type 2 diabetes (18) and group 2 consisted of the remaining patients (75). Evaluation was performed prior to arthroscopic capsular release and at six months follow-up. The web-based questionnaire consisted of two different evaluation forms: The Oxford Shoulder Score (OSS) and a visual quality scale (VQS).
Results: Both groups reported a statistically significant improvement in both evaluations. OSS in group 1 improved by 11.5 [95% CI: 6.2 ; 16.4] and by 15.8 [95% CI: 13.6 ; 17.9] in group 2. The improvement was more pronounced in group 2, though not statistically significant ($p = 0.09$). The VQS improved 39.6 in group 1 and 44.5 in group 2, ($p = 0.50$).
Conclusion: Diabetic and non-diabetic patients reported equal symptom relief after arthroscopic capsular release of frozen shoulder when selected for operation without considering diabetic status. We will continue to select patients for arthroscopic release without differences in preoperative counseling between diabetics and non-diabetics.

1. Introduction

Frozen shoulder, or adhesive capsulitis, is a painful joint disease of uncertain origin characterized by pain and a global loss of both active and passive mobility in the glenohumeral joint.

The prevalence is estimated to be 2–5 % in the general population (primary frozen shoulder).[1,2] Among diabetic patients a prevalence of 10–32 % has been reported.[1–6] Approximately 10 %[7] of all patients have persisting symptoms despite extensive conservative treatment; in these patients surgical treatment may be performed. Patients with comorbidities, especially diabetes, seem to have worse clinical symptoms[8] and respond less readily and consistently to conservative treatment.[8–13] Thus, surgical treatment in patients with diabetes is believed to be more common.[9–12]

Numerous studies have investigated the effect of surgical treatment of frozen shoulder based on parameters like range of motion (ROM), the Constant score, the American Shoulder and Elbow Surgeons Score (ASES) and the Simple Shoulder Test (SST). Generally, results are inferior when evaluating diabetics by these partly objective measurements.[9,10,14–18] However, patients with diabetes are often treated earlier and more aggressively due to lack of response to conservative regimens.[17] Obviously, counseling of this patient group displays difficulties.

Using patient reported outcome measures (PROM) exclusively, our aim was 1) to investigate the patient reported effect of arthroscopic capsular release when conservative treatment of frozen shoulder for a minimum of six months did not relief

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symptoms and 2) to evaluate how diabetic patients perceived the effect of surgery compared to non-diabetic patients.

2. Materials and methods

2.1. Patient selection

The patients were included as a part of an internet-based research database prospectively between November 2012 and May 2015. An orthopedic shoulder specialist evaluated and informed all patients. All patients had objective signs of shoulder contracture and no radiographic signs of tumor or arthritis. The evaluation furthermore secured that the typical course of the disease with spontaneous remission was clear to the patient, and that all patients were treated conservatively by at least one corticosteroid injection and physiotherapy during the initial six months after onset of symptoms. The shoulder specialist introduced the possibility of surgery and rehabilitation if duration of symptoms exceeded six months. At the specialist evaluation, the diabetic status of the patient was generally known before the option of surgery was introduced; however, diabetics were informed and advised in the same way as non-diabetics. During the preoperative planning, diabetic status was confirmed.

The study was approved by the Central Denmark Region Committee on Health Research Ethics and the permission to apply the scoring tools was granted by Isis Innovation Ltd for the University of Oxford. All patients gave informed written consent prior to inclusion.

2.2. Exclusion

Patients were excluded after arthroscopy in case of normal passive ROM under anesthesia, cartilage defects, rotator cuff defects, fracture complications and if other procedures were needed during the surgical procedure.

2.3. Surgical technique

We evaluated loss of passive mobility compared to opposite shoulder in general anesthesia. If the patient had normal passive glenohumeral movement, the patient was excluded from the study. We performed arthroscopy of patients in beach chair position. The arthroscope was inserted via the posterior portal. After visualization all hypertrophic synovial tissue was cleared with an electrocautery through an anterior portal. Contracted capsular structures in the rotator interval regions were debrided with electrocautery and the anterior capsule was cut to the 6 o'clock position. Special attention was focused on not to damage the subscapularis tendon. Finally, the arthroscope and other instruments were repositioned for posterior capsulotomy if needed. In case of contracture, the posterior capsule was released with electrocautery through the posterior portal. We manipulated the shoulder to a ROM comparable to the opposite shoulder. Continuous subacromial infusion of a local anesthetic was administered for 60 h postoperatively to enhance mobilization of the joint.

At the day after the surgery the patients were seen by a physiotherapist and a 4–8 weeks program with maximum active and passive movements was initiated. The patients were followed-up by the surgeon eight weeks after surgery.

2.4. Evaluation

Evaluation was performed prior to surgery and at six months follow-up using a web-based questionnaire (Procordo Software, www.Procordo.com) consisting of two different evaluation forms: The Oxford Shoulder Score (OSS)[19] and a visual quality scale (VQS). The OSS is a five-grading questionnaire on pain (worst pain, usual pain, pain at night) and daily activities (hair brushing, dressing, transportation, using knife and fork at same time, personal hygiene, shopping, housework). In this study, the revised OSS was used with a score range between 0 (worst possible pain) and 48 (least possible pain).[20] The VQS is a visual scale of 0–100 indicating the subjective satisfaction with function of the affected shoulder. In case where patients had no web access, a hardcopy of the questionnaire was handed out. We divided patients according to diabetic status retrospectively after follow-up.

3. Statistics

All statistical analyses were carried out with STATA 13 (StataCorp. 2013. Stata Statistical Software: Release 13. College Station, TX, USA: StataCorp LP).

All data processing was conducted retrospectively.

We performed a student's *t*-test to determine whether there was a significant difference between the two groups. Assumptions were checked by histograms and qq-plots to secure normal distribution of data and a standard deviation test was computed.

A Pearson's correlation coefficient was used to determine the correlation between the OSS/VQS differences.

A p-value of <0.05 was considered statistically significant.

4. Results

Demographic characteristics of patients are presented in Table 1. (Mean age at time of surgical intervention).

Patients who did not complete the questionnaires were excluded (17 patients); 40 patients were excluded in accordance with the exclusion criteria.

OSS data is presented in Fig. 1 as medians of the preoperative and the six-month postoperative evaluation. Both groups reported statistically significant improvements (diabetic: 11.5 [95% CI: 6.2 ; 16.4] and non-diabetic: 15.8 [95% CI: 13.6 ; 17.9]). The non-diabetic

Table 1
Patients characteristics.

Table 1	Diabetics	Non-diabetics
Number of shoulders	18	75
Side (left/right)	7/11	28/47
Sex (male/female)	13/5	30/45
Age (years)	55.2	56
Type of diabetes, T1DM/T2DM	6/12	

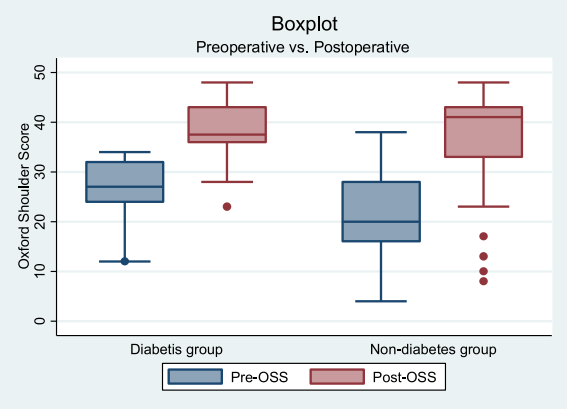

Fig. 1. Box plot of preoperative and postoperative Oxford Shoulder Scores presented as medians.

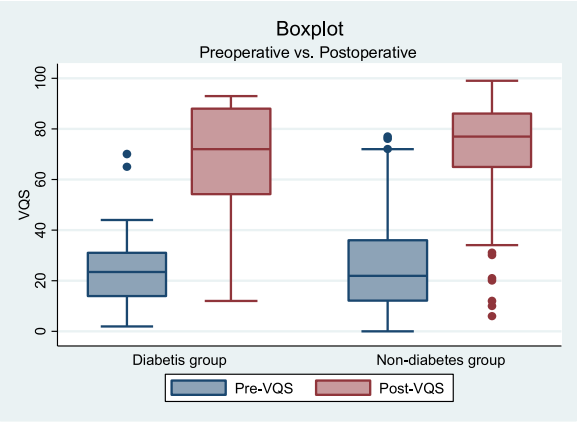

Fig. 2. Box plot of preoperative and postoperative Visual Quality Scales presented as medians.

group had a worse prescore, and the improvement was more pronounced, though not statistically significant, compared with the diabetic group (p = 0.09); 25% and 75% percentiles are shown, as are outliers. The results are similar concerning the VQS (Fig. 2).

The VQS improvement of 39.6 at six months follow-up in the group of diabetic patients is not statistically significantly different from the improvement of 44.5 seen in the non-diabetic group (p = 0.50). A Pearson correlation between the OSS and the VQS differences showed a correlation of 0.69.

5. Discussion

We present patients' self-reported results using two web-based questionnaires on the effect of arthroscopic capsular release and postoperative satisfaction. Previous studies have found an inferior postoperative improvement in diabetic patients compared to non-diabetic patients.[7,13,16] Using solely PROM, our study indicates that diabetic and non-diabetic patients report equal symptom relief after arthroscopic capsular release of frozen shoulder.

Our study is pragmatic and describes our current practice. Subjective symptoms are the most important indication for surgery and therefore we find it extremely important to use subjective questionnaires to investigate the PROM of the procedure. This seems to differentiate our study from earlier studies.

Mehta et al.[21] also investigated the subjective outcome of surgical treatment in a group of diabetic patients compared to a matched control group. They reported a post-operative improvement in the modified constant score in both diabetics and non-diabetics. However, at six months follow-up the scores in diabetics were significantly worse than in non-diabetics. The modified constant score used by Mehta et al. includes subjective data on pain and activities of daily living, which is comparable to the OSS used in our study.[22,23] The evaluation method, however, also implies an objective evaluation by a doctor, which might mask any similar postoperative patient-reported satisfaction as in our study.

Cho et al. [24] used the ASES score in their recent published study on clinical outcome after arthroscopic capsular release for frozen shoulder in diabetics and non-diabetics. The ASES score is a subjective questionnaire with no objective measurements containing similar, but more elaborate, parameters as the OSS used in our study. At three months and six months postoperatively and at the final follow up after 44 months the two groups were fully comparable. At 12 months though, the diabetic group showed lower ASES score, which the authors suggest support the evidence, that diabetic patients have slower postoperative functional recovery.

Generally, the study by Cho et al. and our data both indicates, that the diabetes patients are just as satisfied six months after the operation as non-diabetics when evaluating subjectively.

In accordance with previous findings of 10–32 % of diabetic patients undergoing surgery, we report 19.3% in the present study.[1–6,25] This suggests that our current practice is comparable to worldwide practice despite a possible different patient selection method. The number of diabetic patients in our study may be a limitation, although the number is comparable to previous studies. A power test was not performed. Hypothetically, a higher number of patients could result in a statistical difference. Furthermore, it must always be considered that even internationally recognized PROMs as used in our study might have difficulties in detection of any investigated difference.

6. Conclusion

Our study indicates that diabetic patients are equally satisfied following arthroscopic capsular release for frozen shoulder as non-diabetic patients when we in our daily clinical practice select patients for operation with no regard for their diabetic status. We will continue to select patients for arthroscopic release without differences in preoperative counseling between diabetics and non-diabetics.

Conflict of interest

None.

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Contribution

SJH, CMJ, SRD have included the patients, gathered the data and participated in designing the study. JRJ has been doing the statistics. JML and SRD together have processed the discussion. JML wrote the article. All authors have read and approved the manuscript.

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