International Orthopaedics (SICOT) (2003) 27:107–109
DOI 10.1007/s00264-002-0397-6

ORIGINAL PAPER

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# Manipulation under anaesthesia for the treatment of frozen shoulder

Accepted: 13 June 2002 / Published online: 13 September 2002


**Abstract** We studied prospectively 100 patients (110 shoulders) with primary (idiopathic) frozen shoulder, of whom 22 (22%) were diabetics (30 shoulders). Eighty-eight patients (98 shoulders), whose shoulders had failed to improve after conservative treatment, were then managed either by manipulation under anaesthesia (MUA) alone, or MUA with one of two types of intra-articular injection (methylprednisolone, or a large volume [50–100 cc] of normal saline), followed by physiotherapy. Patients were followed for an average of 6–8 months. Our findings showed that patients who had MUA with an intra-articular normal saline injection had better results than those who had MUA either alone or with an injection of steroid. We also noticed a high incidence of failure among diabetic patients with frozen shoulder. The manipulative procedure combined with injection of normal saline was safe and effective, and all materials required are readily available and inexpensive.

**Résumé** Nous avons étudié de façon prospective 100 malades (110 épaules) présentant une épaule gelée primaire, 22 d'entre eux (22%) étaient diabétiques (30 épaules). Quatre-vingt-huit malades (98 épaules) non amélioré après le traitement conservateur ont eu une mobilisation sous anesthésie (MUA), seule ou avec deux modalités d'injection intraarticulaire (methylprednisolone ou grand volume (50–100 cc) de sérum salé), et suivie par de la physiothérapie. Les malades ont été suivis en moyenne 6 à 8 mois. Les malades qui avaient eu une mobilisation sous anesthésie avec injection saline avaient de meilleurs résultats que ceux ayant eu une mobilisation seule ou avec injection de stéroide. Nous avons aussi noté qu'il y a une grande fréquence d'échec parmi les malades diabétiques. La méthode mobilisatrice avec sérum salé est efficace et toutes les matières exigées sont disponibles et bon marché.

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## Introduction

The term "frozen shoulder" was first used by Codman [5] in 1934. He described the common features of slow onset of pain near the insertion of the deltoid, inability to sleep on the affected side and painful and incomplete elevation and external rotation of the arm, together with a normal radiological appearance. In 1945, Neviaser [12] adopted the term "adhesive capsulitis". There is also evidence of spontaneous recovery occurring within 18–24 months [10, 22].

A variety of regimens have been used for the treatment of frozen shoulder, which include non-steroidal anti-inflammatory drugs, local intra-articular steroid injection, stretching exercises, manipulation under anaesthesia (MUA), distension and manipulation under local anaesthesia, arthroscopic release and – as a final resort – open capsulotomy [1, 14, 20].

The aims of this study were to establish any association between frozen shoulder and diabetes mellitus and to assess the efficiency of MUA alone or in association with either intra-articular injection of normal saline or with methyl-prednisolone acetate.

## Patients and methods

Between 1995 and 1997, 100 consecutive patients with idiopathic frozen shoulder (110 shoulders) of at least 3 months duration were treated at Basrah University Teaching Hospital. Eighty-eight of these patients (98 shoulders) who failed to improve with non-manipulative treatment underwent MUA either alone or with steroid or normal saline injection. There were 61 women and 39 men, with an average age of 49 (range 35–70) years. The left shoulder was affected in 61 patients, the right shoulder in 29 and both shoulders in ten. The dominant shoulder was involved in 24 patients and the non-dominant in 66.

Physical examination was performed in all patients using a goniometer to determine the active range of motion of both shoulders. Haemoglobin, erythrocyte sedimentation rate, fasting blood glucose, blood urea and ECG were recorded in all patients, but an oral glucose tolerance test was performed in ten only. An A/P radiograph of the shoulder and A/P and lateral views of the cervical spine were performed routinely, but shoulder arthrography was

done in six only and all of these revealed typical findings of a frozen shoulder.

The patients were divided into three groups: The first group was treated by MUA, the second by MUA combined with local steroid injection, and the third group by MUA with injection of 50–100 ml normal saline. All patients received post-manipulation physiotherapy.

Under anaesthetic, pure glenohumeral abduction was produced by fixing the scapula with one hand and abducting the humerus with the other, placing the manipulating hand at mid-shaft of the humerus rather than at the elbow in order to avoid fracturing the humerus. During this procedure, the adhesions could be felt and heard to tear, and the manipulation continued until 'pure' glenohumeral abduction of 90° was obtained and external rotation with further abduction was achieved. Internal rotation was performed last. The patient was then transferred directly to bed with the shoulder abducted to 90° and externally rotated to the same extent as obtained at manipulation. Physiotherapy began the same day and the arm was kept 'permanently' above 90° for at least 3 weeks post-MUA in order to avoid approximation of the dependent fold [13, 15].

After the manipulation, all patients were examined twice a week for the first 2 weeks, once a week for another 2 weeks, then once every 3 weeks for 2–3 months, following which all underwent the same programme of daily pendulum exercises. The final assessment was made 4–5 months after manipulation and the results were graded as good, fair or poor. A good result implied improvement in the range of active shoulder motion, pain relief and return to daily activities; a fair result included a little increase in the range of active motion; while a poor result was indicated by no improvement or even worsening of shoulder motion.

## Results

At presentation, all patients experienced pain over the deltoid muscle mainly at night, were unable to sleep on the affected side and had tenderness over the humeral head. Only two patients showed deltoid wasting due to disuse atrophy. Of the 110 shoulders, 88% had limitation of abduction to less than 90° and 90% had limitation of forward flexion to less than 60°. All had severe limitation of internal rotation and 93% had external rotation of less than 30°.

Associated medical problems are shown in Table 1. Diabetes mellitus was present in 22 patients and cervical spondylosis in 15. Twenty patients had a history of previous painful and stiff shoulder (eight in the same shoulder and 12 in the opposite side). Thirteen patients had been treated by MUA (eight on the same shoulder and five on the opposite side). Eight patients were diabetics. At presentation, ten patients had bilateral shoulder involvement, and seven of those were known diabetics. The disease was diagnosed for the first time in one patient, and two others had an abnormal glucose tolerance test (GTT).

Ten patients (12 shoulders) were lost to follow-up, so the final results were determined 4–5 months post-MUA for 78 patients (86 shoulders). Results are shown in Table 2. The best results were seen in 25 shoulders treated by MUA combined with instillation of normal saline. Fifteen patients (21 shoulders) had a poor result; of these, nine were diabetic, and both shoulders were involved in six. In addition, two patients had an abnormal GTT; four only were non-diabetic. Ten patients required a second MUA (seven were diabetic, two had an abnormal GTT and one was non-diabetic). In our series, therefore, diabetic patients did not do well with MUA.

**Table 1** Associated illnesses in patients with frozen shoulder

| Associated illness | No. of cases |
|---|---|
| Diabetes mellitus | 22 |
| Cervical spondylosis | 15 |
| Carpal tunnel syndrome | 3 |
| Rheumatoid arthritis | 1 |
| Hypertension | 4 |
| Ischaemic heart disease | 5 |
| Bronchial asthma | 1 |
| Dupuytren's disease | 1 |

**Table 2** Results after manipulation under anaesthesia (MUA)

| Patient group | Shoulders | Good | Fair | Poor |
|---|---|---|---|---|
| MUA with normal saline | 29 | 25 | 3 | 1 |
| MUA with steroid | 28 | 14 | 5 | 9 |
| MUA alone | 29 | 13 | 6 | 10 |

Radiologically, 15 patients showed an osteopenia in the humeral head while two had sclerosis in the region of the greater tuberosity. Cervical spine X-rays revealed cervical spondylosis in 75 patients of whom only 15 had positive clinical findings.

Complications included two patients with a post-manipulation simple undisplaced crack fracture of the surgical neck of the humerus. The shoulders of two other patients required immediate reduction of an anterior dislocation resulting from the MUA.

## Discussion

Frozen shoulder is also known as peri-arthritis or adhesive capsulitis [5, 12] and usually occurs in the sixth decade of life. It affects women more than men and frequently involves the non-dominant shoulder. It can occur bilaterally, especially affecting patients with diabetes.

The pathology is unknown and usually no precipitating cause is found. However, there are a number of predisposing factors such as diabetes mellitus, cervical spine disorders, trauma, ischaemic heart disease and rheumatoid arthritis [15, 18, 20]. The strong association between idiopathic frozen shoulder and diabetes mellitus has been well documented by Bridgman [2], Lequesne et al. [11], Fisher et al. [6] and Pal et al. [17].

In our series, 22% of patients were diabetic and 5% of these were discovered during pre-operative investigations. It could be said, therefore, that a frozen shoulder might be considered as one of the presenting features of diabetes mellitus, and that frozen shoulders in diabetic patients do not respond well to manipulation and saline injection. This agrees with the reports of Hawkins and Janda [7, 8].

Previous shoulder involvement was confirmed in 54% (12 patients) of the diabetic group, but only 10% (ten patients) of those without diabetes had such a history. MUA for a previous frozen shoulder had not helped eight diabetic patients, whereas this occurred in five patients only without diabetes.

Because of the high failure rate in diabetics, we suggest they be treated either with open surgical release or excision of a thickened contracted coraco-humeral ligament and rotator interval of the capsule, as has been by Bunker and Anthony [3]. More recently, Ogilvie and Myerthall [16] advised arthroscopic release.

In 1995, Bunker and Anthony [3] stated there is a high incidence (about 58%) of Dupuytren's disease in association with frozen shoulder and that both Dupuytren's disease and frozen shoulder are 'fibrosing' conditions rather than inflammatory in nature. They also noted that the general history and immunocytochemistry of Dupuytren's disease and frozen shoulder are identical. Although the two are associated with a raised serum triglyceride level (Sanderson et al. [19] and Bunker and Esler [4]), in our series, only one patient had Dupuytren's disease, which was in the hand.

For frozen shoulder, MUA should be advised for every patient who does not respond to daily physiotherapy. From our series, we believe that the injection of a large volume of sterile physiological saline (50–100 ml) into the joint in order to distend and rupture the adhesions of the capsule before manipulation will result in a better outcome. It may also help restore passive and active shoulder motion after manipulation and increase the speed of return to normal daily activities. Post-manipulation physiotherapy is of great importance, as it helps in achieving a good range of active shoulder movement. It should include daily pendulum and stretching exercises.

On radiological examination, 60 of our patients with painful stiffness of one or both shoulders but without clinical signs of cervical spondylosis had evidence of spondylosis of their cervical spines, with either narrowing of the disc spaces or osteophyte formation. In addition, a further 15 of our patients had clinical evidence of cervical spondylosis, and so we agree with Kamieth [9] and Wright et al. [23] that there is a strong association between frozen shoulder and cervical spondylosis [7, 20, 21]. Thus, there are two common clinical conditions associated with primary frozen shoulder, namely, cervical spondylosis and diabetes mellitus (22%). Diabetic patients usually present with bilateral shoulder involvement and show a high failure rate with treatment by manipulation. For these patients, we advise daily intensive physiotherapy, local steroid injection in a large volume of normal saline for capsular distension and capsular rupture, but no MUA. For the non-diabetic frozen shoulder, we advise MUA combined with the intra-articular injection of a large volume of normal saline as the treatment of choice as it is safe, effective and relatively inexpensive.

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