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ORIGINAL PAPER

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Manipulation under anaesthesia for frozen shoulder

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Abstract Following manipulation of frozen shoulders under general anaesthesia, we reviewed 74 shoulders at an average of 3 weeks and again at an average of 33 months following the manipulation. We used an adjusted Constant score by excluding the abduction strength measurement. The maximum score was therefore 75 points. The average pre-manipulation score was 24.7 points. At 3 weeks after manipulation this score improved to 54.9 points. At the last follow-up (average 33 months) the score was 72.4 points. We have shown that manipulation under general anaesthesia speeds up recovery of frozen shoulders, and the range of movement improves rapidly.

Résumé Nous avons manipulé des épaules gelées sous anesthésie générale. Nous avons examiné 74 épaules à une moyenne de trois semaines et une moyenne de 33 mois qui suivent la manipulation. Nous avons utilisé le score de Constant ajusté en excluant la mesure de la force d'abduction avec, en conséquence, un score maximal de 75 points. Le score moyen avant manipulation était 24.7 points. Trois semaines après la manipulation il était amélioré à 54.9 points. Au dernier examen (moyenne 33 mois) il était de 72.4 points. Nous avons montré que la manipulation sous anesthésie générale accélère la récupération et l'amplitude des mouvements s'améliore rapidement.

Introduction

The natural history of frozen shoulder was once suggested to be a self-limiting disorder with expectation of full recovery within 2 years. However. we found that many cases can continue to have symptoms for many years if left untreated. The purpose of this study is to evaluate the short- and long-term outcomes of manipulation of frozen shoulder combined with intra-articular injection of local anaesthetics and steroids. Manipulation of frozen shoulder is a relatively simple procedure and can improve the function of the shoulder in a relatively short time.

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Material and methods

We reviewed the records of 69 consecutive patients (79 shoulders) who underwent manipulation of frozen shoulders between 1991 and 1999. Other causes of shoulder pain were excluded. Patients were assessed and scored according to the Constant Score [5], the Oxford system [6] and the adjusted Constant score (Constant score after excluding the 25 points allocated for assessment of muscle strength). Abduction strength was assessed at follow-up using a spring scale fixed to the floor and attached to an adjustable broad strap as suggested by Constant and Murley [5]. Strength was measured in pounds with the belt proximal to the wrist joint, the forearm pronated and the shoulder at 90° abduction. Fifty-one patients attended our clinic for review and examination. Thirteen patients (with a total of 14 treated shoulders) were interviewed by telephone. We were unable to contact five patients.

All patients had either physiotherapy or steroid injection or both arranged by the family doctor or rheumatologist before referral to our unit. Duration of symptoms prior to manipulation was an average of 7.2 (1–20) months. Criteria for selection for the diagnosis of frozen shoulder were slightly modified from that chosen by Shaffer et al. [13]. It consisted of: (1) at least a one-month history of pain and stiffness of the shoulder for which no other cause could be identified; (2) documented restriction of passive glenohumeral and scapulothoracic motion of 100° of elevation or less, and less than 50% of external rotation as compared with the motion of the contralateral shoulder; and (3) the intraoperative characteristic feeling of tissue breakdown during manipulation. If any patient had full range of movement in the

shoulder under general anaesthesia prior to manipulation this was not considered a frozen shoulder and an alternative diagnosis was considered. No patients had sustained significant trauma to the shoulder prior to the onset of symptoms.

The technique used for manipulation consisted of gradual alternate elevation and abduction followed by external rotation. Care was taken not to fracture the humerus during elevation. This was achieved by holding the upper arm close to the shoulder with one hand and stabilising the scapula with the other hand, thus reducing lever force on the arm. External rotation forces were applied very carefully. A full range of movement was always achieved. The shoulder joint was injected with 10 ml of 0.5% bupivacaine plus 40 mg of depomedrone in the early part of the series. We later increased the dose to 20 ml of 0.5% bupivacaine for better pain control. We ensured that the arm was held overhead as the patient awoke so that the patient realised the range of movement of the shoulder had improved. All patients then had immediate intensive physiotherapy initially on the ward and then daily as an outpatient until the range of movement was satisfactory.

There were 37 women and 27 men patients. The dominant side was affected in 22 patients; the non-dominant in 32 patients. Ten patients had both shoulders involved but on different occasions. Average age of patients at the time of presentation was 52.9 (33–83) years, with 67% older than 50 years. Five patients were diabetic – three being insulin dependant. One of these patients had bilateral frozen shoulder. One patient had chronic renal failure, and all patients had either normal radiographs or mild arthritic changes consistent with age. The pre-manipulation adjusted Constant score (scored out of 75 points excluding the 25 points for abduction strength) was on average 24.7 (10–38) points. The early follow-up period averaged 3 (2–4) weeks while the late follow-up period ranged from 6 to 88 (average 33.4) months.

Results

The adjusted Constant score at the early follow-up was on average 54.9 (28–75) points. Twenty-six shoulders scored less than 50 points; forty-eight shoulders scored 50 points or more. Adjusted Constant score at the late follow-up was on average 72.4 (52–75) points. Fifty-five shoulders (74.3%) scored the maximum 75 points. Analysis of the elements of the adjusted Constant score is shown in Table 1. Full Constant score, inclusive of the muscle strength element, was carried out on 51 patients (60 shoulders) at the late follow-up. The average score was 89.3 (66–100) points. Three shoulders scored between 66 and 75 points, 18 shoulders between 76 and 85, 39 shoulders between 86 and 100, and nine scored 100.

We asked every patient if they could remember how long the affected shoulder took before they were satisfied as regard to pain and function. Of the 64 patients, 48 (50 shoulders) were able to answer that question, and the range was from 1 day to 3 years (average 4 months). Six shoulders took 1 year or longer before the patient was satisfied with the outcome, which most likely represented a natural resolution and failure of manipulation. Also, we noticed that this group did not show immediate improvement in range of movement after manipulation.

Table 1 Average adjusted Constant scores before and after manipulation

	Pain 15	Activities 20	Range of motion 40
Before	4.3	8.2	12.8
After – at average 3 weeks	10.6	13.7	30.3
After – at average 33 months	13.9	19.4	39.4

One patient, a 54-year-old woman, had anterior subluxation during manipulation, which was reduced immediately. However, this did not cause any further problems and the patient improved. Two patients needed repeat injection of the shoulder at 1 month after manipulation as their shoulders were stiffening up after an initial improvement. Both achieved a satisfactory outcome at 3 months following the second injection. One patient has a repeated manipulation at 1 year following the first manipulation, although at a visit 2 weeks following the first manipulation he scored 75 out of 75 on the adjusted Constant score. Six patients failed to recover within 1 year after manipulation; however those patients achieved more than 68 points according the adjusted Constant score in a period ranging between 21 and 84 months.

Discussion

Frozen shoulder forms a small percentage of patients presenting with painful shoulders. Bunker [3] reported an incidence of just 5% in 1,324 consecutive new patients attending his shoulder clinic. Pollock et al. [12] reported satisfactory results in 25 of 30 patients (83%) with frozen shoulders treated by manipulation under general anaesthesia and arthroscopy. Andersen et al. [1] reported similar results. Van Royen and Pavlov [14] showed good results of treatment by distension and manipulation under local anaesthesia. Ogilvie-Harris et al. [10] compared the outcome between two different treatment techniques concluding that patients treated with arthroscopy and manipulation did as well as those treated with arthroscopic division. We agree with Neviaser and Neviaser [9] that arthroscopy is not necessary for diagnosis or treatment of frozen shoulder, and manipulation alone is sufficient for the majority of patients. We reserve arthroscopy for cases when the diagnosis is uncertain. Dodenhoff et al. [7] reported a significant improvement in early shoulder function after manipulation under anaesthesia in primary frozen shoulder. We would like to emphasise the importance of the characteristic feeling of tearing during manipulation as a diagnostic tool. We also

feel it is important that the patient's arm is kept overhead until he or she wakes up. An immediate aggressive postoperative physiotherapy regime is also essential.

All our patients had either intra-articular injection or physiotherapy before referral to our unit with no gain. We are unable to comment on the effectiveness of this method of treatment, as some patients may have settled with this regime and therefore not been referred. We have seen patients who have started to improve by the time of clinic attendance, and these patients were managed conservatively. Jacobs et al. [8] recommended repeated injections to the shoulder joint with a local anaesthetic, steroids and air, of up to three injections at 6-week intervals. However, the follow-up was only at 6 weeks.

Birch et al [2] reported three cases of brachial plexus palsy after manipulation, which caused significant disability and needed further surgery and tendon transfer. We did not see any brachial plexus palsy following manipulation. However, many patients had numbness in the arm that resolved a few hours later. We believe the numbness was due to leakage of the local anaesthetic out of the shoulder causing a partial brachial block.

Although we found the Constant scoring system to be of great help in assessing shoulder function, we agree with Patel et al. [11] that measurement of the abduction strength is difficult. Assessment of muscle strength prior to manipulation is almost impossible, as most of the patients cannot abduct their shoulder to 90 . Therefore, inclusion of strength may result in false inferior scores. The Constant score does not correlate well with the Oxford score, unless the strength component is excluded. Conboy et al. [4] stated that the accurate measurement of power proved difficult, as they encountered several normal subjects, all women, in whom they were unable to obtain a normal score for power. Also, they raised the point that shoulder movement is so complex that measurement of power in a single arc is unlikely to be representative of the full functional potential.

We appreciate that scores recorded at the long-term follow-up (6–88 months) can represent spontaneous recovery. Therefore, we were very careful when comparing results taken at 3 weeks post-manipulation to the long-term results. This comparison showed maintenance of the outcome or limited improvement. We are unable to answer the question: What would happen to these patients if they had been left alone without intervention? This would need a controlled trial, which would be very difficult to organise. However, we have demonstrated that manipulation does speed up recovery from frozen shoulder and that this recovery is maintained.

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