

## Treatment of frozen shoulder by distension and manipulation under local anaesthesia

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**Summary.** We report the results of hydraulic distension of the glenohumeral joint with manipulation using local anaesthesia and radiographic control in 24 frozen shoulders in 22 patients. In a prospective study, the pre- and postoperative range of movement in 3 planes was measured by an electronic digital inclinometer. At 3 months, the range compared with the unaffected shoulder was abduction 93%, glenohumeral abduction 84%, forward flexion 94%, backward extension 96%, internal rotation 75% and external rotation 73%. The procedure was repeated once in 3 patients. One also had a manipulation under general anaesthesia and was classed as a failure. The subjective outcome was good in all the other patients. This investigation shows that the technique is safe, reliable and effective treatment for frozen shoulder.

**Résumé.** Nous rapportons les résultats de la distension hydraulique de la scapulo-humérale avec manipulation sous anesthésie locale dans 24 épaules (22 patients) qui présentaient un syndrome d'épaule gelée idiopathique. Dans une étude prospective a été mesurée la mobilité pré et post-opératoire mesurée dans les 3 plans de l'espace grâce à un système électronique. La comparaison avec l'épaule contro-latérale saine de la mobilité 3 mois après l'intervention, montrait une récupération de 93% de l'abduction globale, 84% de l'abduction scapulo-humérale, 94% de l'antéépulsion, 96% de la rétropulsion, 75% de la rotation interne et 73% de la rotation externe. Pour 3 patients la procédure a dû être répétée une fois. L'un

*deux, a dû avoir une manipulation sous anesthésie générale et de ce fait, a été exclu de l'étude comme échec du traitement initial. Le résultat subjectif fut bon chez tous les patients. Notre étude montre que cette technique est efficace et sans danger dans le traitement du syndrome de l'épaule gelée.*

### Introduction

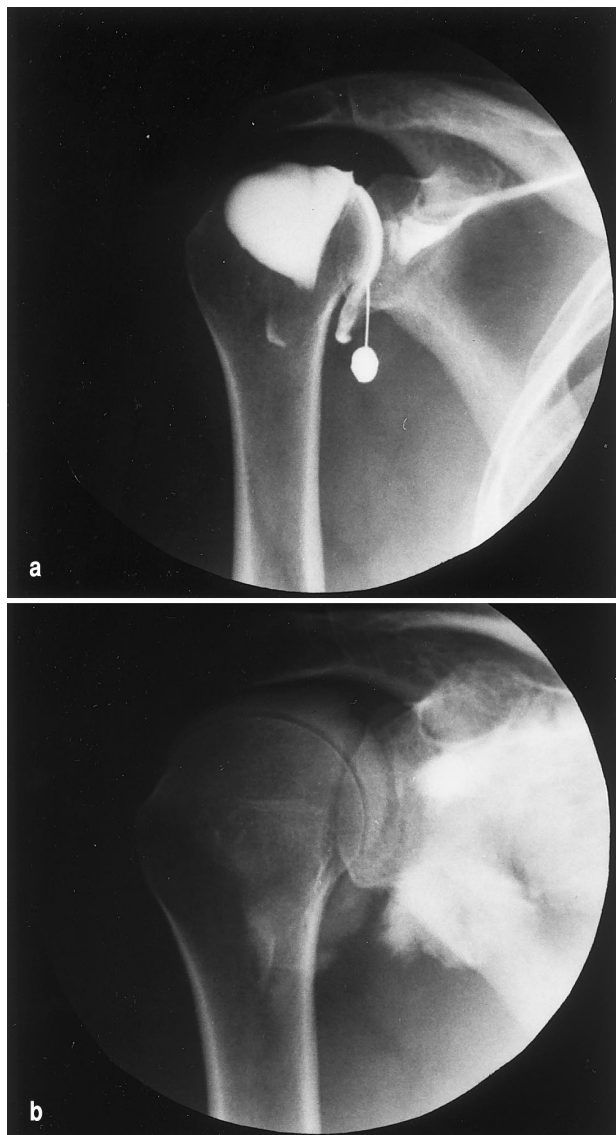
Frozen shoulder has an insidious onset with severe pain and restriction of glenohumeral abduction and rotation [11]. Passive manipulation is often recommended when conservative treatment fails, but this carries a risk of serious complications [4, 17].

A combination of hydraulic distension and manipulation using local anaesthesia and radiographic control offers rapid and effective treatment. We report our results with this technique.

### Patients and methods

Twenty-two consecutive patients with 24 idiopathic frozen shoulders present for more than 3 months were treated by hydraulic distension and manipulation under local anaesthesia during a period of 6 months. There were 15 women and 7 men with an average age of 48 years (range 32 to 62 years). The right shoulder was affected in 10, the left in 14, and both in 2 patients. The dominant shoulder was involved in 11. The average duration of symptoms was 8.1 months (range 3 to 24 months).

Every patient had received physiotherapy, nonsteroidal anti-inflammatory drugs and local cortisone injections without improvement. In each case all movements of the glenohumeral joints were restricted and abduction could only be achieved by rotation of the scapula around the chest wall. Two patients had diabetes mellitus.



**Fig. 1.** **a** Arthrography in a frozen shoulder showing the characteristic loss of the axillary recess and the diminished capacity of the joint. **b** After treatment, the recess is distended, and the contrast medium in the soft tissues indicates that maximal distension has taken place

The patients were examined immediately before and at 2, 6, and 12 weeks after treatment. In 20 patients with unilateral frozen shoulder, the opposite side was used as a reference to assess the degree of restriction of movement. In the 2 patients in whom the condition was bilateral, only the pre- and post-operative values could be assessed.

The passive range was measured with the Cybex electronic digital inclinometer (EDI 320, Lumex Inc, Ronkonkoma, New York, US) in 3 planes with 6 possible movements [6]. Forward flexion and backward extension were measured with the patient standing with the arms in the neutral position and the palms facing the body. The device is placed on the proximal part of the anterior surface of the forearm parallel to the radius. Abduction and glenohumeral abduction, defined as the maximal abduction without scapular rotation, was assessed stand-

ing with the arms externally rotated and the palms forward, the instrument being placed on the lateral surface of the forearm parallel to the radius. Internal and external rotation are measured in the transverse plane in the supine position with the humerus abducted to 90°, or with maximal abduction and the elbow flexed 90°, with the device on the dorsal or palmar surface of the distal forearm and parallel to the length of the forearm.

Arthrography and hydraulic distension were carried out using local anaesthesia in strict aseptic conditions. The patient was supine with the arm by the side and externally rotated. A 22-gauge spinal needle was inserted anteriorly into the glenohumeral joint under radiographic control and left in place during the procedure. With an extension tube connected to the needle, 5 ml of the contrast medium, jopromide (Ultravist 300, Schering AG, Germany), was injected into the joint. Arthrography excluded lesions of the antero-inferior labrum or rotator cuff. A bolus of 10 ml of 0.5% bupivacaine solution was injected into the joint, followed by 1 ml Depomedrol (methyl-prednisolone acetate 40 mg). After allowing time for local anaesthesia, the joint was distended after connecting the extension tube to a 50 ml syringe containing refrigerated sterile saline. Distension arthrography was controlled under the image intensifier. The amount of saline injected depended on the distension possible with firm pressure or by rupture of the capsule. The shoulder was then gently manipulated into abduction, then flexion, and then combined with internal and external rotation. In most patients, rupture of adhesions could be heard during this manoeuvre.

Nonsteroidal anti-inflammatory drugs were given to relieve pain after the procedure. The patients were instructed in active and passive range of movement exercises by a physiotherapist. This regime continued for 2 days and subsequently as an outpatient. The patients were asked to do the exercises 5 times a day and were seen in the physiotherapy department once a day, 5 times a week for 2 weeks, and then 3 times a week for the next 2 weeks.

## Results

In 19 patients (21 shoulders) there was immediate improvement in the range of movement after manipulation, and 15 had no pain or discomfort. Arthrography before manipulation showed obliteration of the medial axillary recess and diminished capacity of the joint in every case, but no other abnormality (Fig. 1 a, b). The average volume of maximal distension by local anaesthetic, contrast medium and saline, before rupture was  $55 \pm 6.5$  ml. Rupture did not occur in 8 cases. Late rupture of the capsule with penetration of contrast medium, mostly medially and in the subcoracoid recess, occurred in 13 of the 24 shoulders and was unrelated to improvement in movement. Early rupture was found in 3 patients without any improvement in the range of movement and the procedure was repeated once. Two improved, but one bilateral case showed no increase in range; manipulation was carried out under general anaesthesia and she was classed as a failure and excluded.

**Table 1.** Range of movement in the treated shoulders

	Normal degrees N = 20	Pre-operative degrees N = 23	12 week follow-up degrees N = 23	Improvement degrees N = 23	return of range of movement in % N = 20
Abduction	165,9 ± 14,6	74,3 ± 22,1	156,0 ± 19,0	86,8 ± 23,3	93,4 ± 9,8
Glenohumeral abduction	77,3 ± 9,4	32,2 ± 14,0	69,0 ± 16,3	36,8 ± 16,2	84,4 ± 16,8
Forward flexion	167,2 ± 12,0	85,8 ± 31,6	157,5 ± 18,1	71,5 ± 37,0	93,9 ± 9,4
Backward extension	58,6 ± 7,6	28,7 ± 11,3	56,1 ± 8,8	27,6 ± 15,2	95,5 ± 12,1
Internal rotation	74,2 ± 16,4	18,3 ± 15,1	56,1 ± 19,5	38,8 ± 25,6	74,6 ± 22,5
External rotation	82,7 ± 11,0	13,6 ± 14,8	61,6 ± 20,5	48,9 ± 25,9	72,7 ± 21,8

There were no complications.

The overall improvement in the range of movement at 3 months in every plane was good and the results are summarised in Table 1. All the patients, except the single failure, had relief of pain and normal function when they were discharged. Fourteen patients were working before the onset of their symptoms, but 6 had been given a disability allowance. They were all able to return to work after treatment.

## Discussion

There is still dispute about whether a frozen shoulder is self-limiting or whether treatment is needed [7, 14, 16]. Pain and economic pressures make it important to establish a programme of treatment which will enable patients to recover a full range of painless movement. Regimes used include physiotherapy, arthroscopic release [9, 13] and manipulation under general anaesthesia [3, 8].

Hydraulic distension of the glenohumeral joint has been proposed as a means of reducing morbidity without the need for general anaesthesia [2, 5, 12, 15]. Good results have been reported with distension without arthrography [5, 15], but we consider that the diagnosis should be confirmed by arthrography before treatment.

The range of movement of the shoulder has usually been measured as an angular displacement using a goniometer. Incliniometry has recently been introduced as a more accurate and reliable method [1, 10]. These measurements are made in a plane affected by gravity and the device has to be calibrated to 0° before each measurement. The range should be compared with the normal shoulder, if possible, to detect minor degrees of restriction.

Our results show that arthrography, distension and manipulation can provide a sufficient gain in the range of movement without general anaesthesia and without complications. The range, compared with the normal shoulder, was abduction 93%, glenohumeral abduction 84%, forward flex-

ion 94%, backward extension 96%, internal rotation 75% and external rotation 73%. In every patient, there remained slight to moderate restriction in 3 of the 6 movements, but this did not prevent normal function.

Although our follow up was only for 3 months, we believe that the relief of pain and recovery of movement is unlikely to be lost and there was no need to see these patients further. Nevertheless, a longer follow up of the outcome of this method of treatment is advisable. The method is more time-consuming than manipulation under general anaesthesia, but the psychological effect of increased movement immediately after distension and local anaesthesia is important and motivated the patients to carry out their exercises. This is a safe, reliable and effective method of treating idiopathic frozen shoulder.

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