Appendix 6.5 Manipulation under anaesthesia

Study	Inclusion/exclusion criteria and diagnosis of FS	Participant characteristics (age, sex, diabetes)	Condition-related characteristics (duration and stage of FS, previous treatments, secondary FS)
Amir-us-Saqlain 2007[84] RCT *Country, setting and treatment provider:* Pakistan; orthopaedic outpatients department	*Inclusion criteria:* History of pain and stiffness of the shoulder joint for which no cause could be identified, restriction of glenohumeral motion of < 50% of abduction and < 50% of external rotation compared with the motion of the contralateral shoulder joint and normal radiography finding in the shoulder joint. All symptoms had to be of 3 weeks' duration *Exclusion criteria:* Intrinsic problems with the shoulder, such as recent surgical repair of soft tissue of the shoulder, history of fracture around shoulder joint, instability and recurrence following previous manipulation, significant osteopenia, tear of the rotator cuff, arthritis involving the glenohumeral or acromioclavicular joint, sympathetic dystrophy and abnormality of plain radiography of the shoulder joint. Extrinsic problems such as a neuromuscular disorder (Parkinsonism) or referred pain from an associated condition, such as extrusion of cervical disc with radiculopathy *Method of diagnosis:* Standardised physical examination in upright position; active and passive range of movement of both shoulders was measured using a standard goniometer. Shoulder radiographs were taken *Terminology used:* FS; adhesive capsulitis	*Age (years), mean (range):* Total: 54 (38 to 65) *Female:* 61% *Any participants with diabetes?* Unclear/ NR	*Duration of FS at baseline (weeks), mean (range):* Total: 10 (3 weeks to 10 months) *Stage of FS at baseline:* 67% pain and stiffness, 12% pain, 21% stiffness *Previous treatments for FS:* NR *Participants with secondary FS:* None reported

Intervention 1	Intervention 2	Intervention 3	Control	Concomitant treatment and details of home exercise
MUA + steroid injection + manipulated extremity kept in abduction and external rotation + PT: Local injection of 80 mg Kenacort combined with 2% Xylocaine in shoulder joint 1 cm distal and 1 cm lateral to coracoid process. Manipulated extremity was kept in 160° of abduction, with 90° of external rotation, using a cotton bandage secured to the wrist and tied to the back of the bed for 24 hours. Patients were allowed to untie their extremity for toileting only. All patients were discharged after 24 hours with daily physiotherapy sessions of 30 minutes for 3 weeks	*MUA + steroid injection + PT:* Local injection of 80 mg Kenacort combined with 2% Xylocaine in shoulder joint 1 cm distal and 1 cm lateral to coracoid process. All patients were discharged after 24 hours with daily physiotherapy sessions of 30 minutes for 3 weeks			NR

Study	Inclusion/exclusion criteria and diagnosis of FS		Participant characteristics (age, sex, diabetes)	Condition-related characteristics (duration and stage of FS, previous treatments, secondary FS)
Jacobs 2009[85] RCT *Country, setting and treatment provider:* UK; MUA performed by orthopaedic surgeon. MUA patients shown exercises by physiotherapist. Distension with steroids performed in hospital orthopaedic outpatient department	*Inclusion criteria (including definition of FS):* Consecutive patients who presented to the upper limb service at the Royal Oldham Hospital with primary FS *Exclusion criteria:* Type 1 or 2 diabetes and other medical conditions known to be associated with FS; steroid injection in the affected shoulder before referral *Method of diagnosis:* Medical history; clinical examination including radiography *Terminology used:* FS; adhesive capsulitis		*Age (years), median:* MUA: 56.5; steroid injection + distension: 57 *Female:* 66% *Any participants with diabetes?* No	*Duration of FS at baseline (weeks), median:* MUA: 19; steroid injection + distension: 16 *Stage of FS at baseline:* Most patients were in 'freezing phase' of FS (based on duration of symptoms) *Previous treatments for FS:* NR *Participants with secondary FS:* No
Intervention 1	**Intervention 2**	**Intervention 3**	**Control**	**Concomitant treatment and details of home exercise**
MUA: Anaesthetised patients were positioned on the opposite side to that being manipulated. The assistant placed the heel of the hand on the lateral border of the ipsilateral scapula to stabilise it. Using a short lever arm, the patient's arm was manipulated into full adduction and forward flexion, full external rotation, full internal rotation and, finally, full abduction. All patients were treated as day cases *Home exercise*	*Steroid injection + distension:* Three steroid and distension treatments at 6-week intervals. The injection consisted of 1 ml of triamcinolone (40 mg), 5 ml of 2% lidocaine, 10 ml of 0.25% bupivacaine and 5 ml of air and was given by the posterior route. The needle was inserted 1–2 cm below the corner of the acromion into the 'soft spot' and directed towards the index finger, entering the glenohumeral joint. The air provides a palpable and occasionally audible 'squelch' confirming that the injection is in the glenohumeral joint and that the joint capsule has not been ruptured by the injection *Home exercise*			NR *Home exercise:* For MUA as shown by the physiotherapist; the steroid injection group was given a sheet detailing the same exercises

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Study	Inclusion/exclusion criteria and diagnosis of FS	Participant characteristics (age, sex, diabetes)	Condition-related characteristics (duration and stage of FS, previous treatments, secondary FS)
Kivimaki 2007[39] RCT *Country, setting and treatment provider:* Finland; three regional hospitals in southern Finland; a physician performed MUA and physiotherapists gave physiotherapy advice	*Inclusion criteria:* Adult patients with gradually increasing shoulder pain and stiffness; shoulder mobility of no more than 140° in elevation and 30° in external rotation *Exclusion criteria:* Arthritis, osteoarthritis or traumatic bone or tendon changes in the affected shoulder; in patients with weak external rotation or abduction ultrasound examination was performed and patients with verified rotator cuff rupture were excluded *Method of diagnosis:* Specialists in physical medicine and rehabilitation diagnosed FS by radiography and measuring range of movement *Terminology used:* Frozen shoulder	*Age (years), mean (SD):* MUA: 53 (8.4); control: 53 (8.6) *Female:* 68% *Any participants with diabetes?* Yes. 18 patients (reported as equal in both groups)	*Duration of FS at baseline:* Mean duration of shoulder pain was 7 months in both groups (range 3 to 22 months) *Stage of FS at baseline:* Stiff and painful *Previous treatments for FS:* In the 3 months before randomisation no differences were reported between groups regarding reported physiotherapy, massage or chiropractic manipulations, and patients had used analgesics for 36 days equally in both groups *Participants with secondary FS:* None reported

Intervention 1	Intervention 2	Intervention 3	Control	Concomitant treatment and details of home exercise
MUA + PT: Manipulations were performed < 2 weeks after randomisation under short general anaesthesia. Patients were supine and, after confirming the capsular contracture, the physician lifted the affected extremity and pushed the upper arm into flexion and abduction while supporting the scapula against the thoracic cage. After the shoulder was stretched into flexion the elbow was raised to a right angle and the upper arm was gently rotated into internal and external rotation. Any cracking sound in the shoulder joint during manipulation was recorded. Normal or near-normal mobility was achieved. The patients received physiotherapy advice in two sessions and written instructions for a daily training programme (home exercise)			*Home exercise:* The patients received physiotherapy advice in two sessions and written instructions for a daily training programme (home exercise)	The most frequently used treatment was a prescription for analgesics. *Home exercise:* Daily training programme that included pendulum exercises for the arm and stretching exercises for the shoulder joint

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Study	Inclusion/exclusion criteria and diagnosis of FS	Participant characteristics (age, sex, diabetes)	Condition-related characteristics (duration and stage of FS, previous treatments, secondary FS)
Quraishi 2007[38] RCT *Country, setting and treatment provider:* UK; MUA performed by consultant orthopaedic surgeon; arthrographic distension performed by radiologist	*Inclusion criteria:* Aged > 18 years, stage II adhesive capsulitis, global loss of active and passive shoulder movement, restriction of rotation < 50% of normal and normal anteroposterior and axillary lateral radiography of the glenohumeral joint *Exclusion criteria:* Post-traumatic or other extrinsic cause, suspected osteoporosis, unfit for general anaesthesia *Method of diagnosis:* Clinical assessment by consultant surgeon *Terminology used:* Adhesive capsulitis	*Age (years), mean (range):* MUA: 54.5 (36 to 69); arthrographic distension: 55.2 (44 to 70) *Female*: 58% *Any participants with diabetes?* Yes. Total: $n=6$; MUA: $n=3$ (18%, all type 1); arthrographic distension: $n=3$ (16%, all type 1)	*Duration of FS at baseline (weeks), mean (range):* MUA: 39.8 (16 to 102); arthrographic distension: 37.4 (12 to 76) *Stage of FS at baseline:* Stage II primary adhesive capsulitis *Previous treatments for FS:* Physiotherapy: $n=16$; steroid injection: $n=22$; physiotherapy + steroid injection: $n=11$ *Participants with secondary FS:* None reported

Intervention 1	Intervention 2	Intervention 3	Control	Concomitant treatment and details of home exercise
MUA + steroid injection: Restoration of shoulder movement following a specific protocol to ensure safe breakage of adhesions by using a short lever arm. 2 ml of 2% lidocaine and 0.75 ml (30 mg) of triamcinolone acetonide was injected anteriorly into the glenohumeral joint without guidance *Home exercise*	*Arthrographic distension:* Needle inserted into glenohumeral joint using anterior approach. Position of needle was checked by image intensifiers before and after injection of radio-opaque contrast material. Normal saline (10–55 ml) was then injected to progressively distend the capsule until it ruptured, which was usually through the subscapularis bursa, but occasionally down the biceps sheath *Home exercise*			NR *Home exercise:* Self-exercise programme of pendular exercises and wall-climbing movements

FS, frozen shoulder; NR, not reported; PT, physiotherapy.

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