Table I. Study characteristics of the trials included in the systematic review (n = 30). This table provides information regarding the participants, study aims, interventions, main outcomes and findings.

Study Country Number of participants	Aim	Intervention	Main outcome measures	Summarized main results
Ali & Khan 2015 (62) Pakistan *n* = 44	To evaluate the effectiveness of exercise with manual therapy vs exercise alone.	Two groups. Both had home exercise programme (daily). Exercise and manual therapy group (*n* = 22) = general exercises (flexion, abduction, cross body, internal and external rotation stretches, pendulum exercises) and Maitland mobilizations (grade II and III, 2–3 oscillations per s for 30 s and 5 sets of each); exercise group (*n* = 22) = general exercises. Dose: 45-min sessions 3 times a week for 5 weeks.	Pain visual analogue scale, range of motion, Shoulder Pain and Disability Index (SPADI) Assessments: Baseline, 5 weeks	Within-group significant improvements in all outcomes at 5/52 ($p < 0.01$). Intra-group analysis showed no significant difference between 2 groups ($p > 0.05$).
Badalamente et al. 2016 (63) USA *n* = 60 Study 1, *n* = 50 Study 3	Aim 1. Does a collagenase clostridium histolyticum injection lyse shoulder capsule collagen, and at what dose? Aim 2. Not related to SR. Aim 3. Do (CCH) injections result in better scores for pain and function than exercise?	Study 1. 1 CCH injection vs saline injection: a single injection of placebo (*n* = 15) or 0.145 mg (*n* = 16), 0.29 mg (*n* = 15), or 0.58 mg (*n* = 14) of CCH dissolved in sterile buffer (0.9% saline and 2 mmol/l Ca^{2+}). The volume for all injections was 0.5 ml. Study 3. CCH dose range-volume (plus exercise) vs controls (exercise only). Dose: varied. Exercise: home exercise programme ROM, pulleys, stretches, pendulum 3× day).	Primary: active forward flexion. Secondary: active range of motion (ROM), passive ROM, pain (VAS), and ASES (American Shoulder and Elbow Surgeons Standardized Shoulder Assessment Form) function. Assessments: 1 = Baseline and 1, 2, 4, 7, 14, 30 days. 3 = Baseline, day 92 (mid-assessments varied between cohorts)	1. No between-group differences. 3. CCH 0.58 mg//1 ml and 0.58 mg/2 ml more effective than exercise in AFF only.
Bae et al. 2014 (64) South Korea *n* = 64	To evaluate the clinical effects of a fluoroscopy-guided capsular distension (anterior approach) vs ultrasound guided capsular distension (posterior approach).	2 groups: Ultrasound-guided (*n* = 33) postero-lateral approach capsular distension (2% lidocaine (5 ml), triamcinolone (40 mg), and normal saline (14 ml), for a total 20 ml fluid OR fluoroscopy-guided (*n* = 31) posterolateral capsular distension (2% lidocaine (5 ml), contrast dye (5 ml), triamcinolone (40 mg), and normal saline (9 ml), in a total fluid volume of 20 ml). All received physiotherapy (×4 week 1, ×2 week's 2–8) of heat, electrical therapy and therapeutic exercise.	Shoulder Pain and Disability Index (SPADI), PROM, VNS (pain), hand power (grip, pinch). Assessments: Baseline, 1, 5, 9 weeks.	No between-group differences.
Balci et al. 2016 (65) Turkey *n* = 53	To compare the immediate effects of scapular proprioceptive neuromuscular facilitation (PNF) & modalities, exercise & modalities, and modalities alone.	3 groups: 1 (*n* = 18) = PNF & modalities (hot pack, TENS (transcutaneous electrical nerve stimulation), ultrasound), Group 2 (*n* = 18) = exercise group (stretching, strengthening, pendulum exercises 20 reps)+modalities, Group 3 (*n* = 17) = modalities. Single session.	Pain visual analogue scale, Lateral Scapular Slide Test, ROM and Simple Shoulder Test. Assessment: Baseline, post-session.	Groups appear different at baseline. No between-group differences at post-intervention.
Celik & Mutlu 2015 (28) Turkey *n* = 30	To assess the effectiveness of joint mobilization combined with stretching exercises	2 groups: Joint mobilization (*n* = 15) (4 directions – progressing from Gr I/II to III and IV) and stretching (total of 20 min of cyclic stretching – 20 s and 10 s rest applied 10× times; flexion, scapular plane abduction, internal & external rotation) vs stretching exercises alone (*n* = 15). Both groups performed home exercise programme (stretches, strengthening). Duration: 6 weeks (18 sessions).	Primary outcomes: Disabilities of the Arm, Shoulder and Hand score, Constant score. Secondary outcomes: pain (visual analogue scale), range of motion. Assessments: baseline, post-treatment (6 weeks), 1 year.	SD increases in abduction (91.9° [CI: 86.1–96.7] to 172.8° [CI: 169.7–175.5]), external rotation (28.1° [CI:22.2–34.2] to 77.7° [CI: 70.3–83.0]) and Constant score (39.1 [CI: 35.3–42.6] to 80.5 [75.3–86.6]) at 1-year follow-up in favour of the joint mobilization combined with stretching exercise group. Effect sizes: flexion 0.16; abduction 0.44; external rotation 0.29; internal rotation 0.13; VAS 0.13; Constant 0.35; DASH 0.03.
Do Moon et al. 2015 (66) South Korea *n* = 20	To compare Maitland mobilization and Kaltenborn mobilization techniques for improving pain and range of motion	Maitland group (*n* = 10): Grade III anteroposterior oscillation. Kaltenborn group (*n* = 10): Grade III posterior translation. 12 therapy sessions 3 times per week for 4 weeks	Pain (visual analogue scale), range of motion: external and internal rotation (in degrees) pre- and post-intervention in both groups. Assessments: Baseline, 4 weeks.	No significant between-group differences. Significant within-groups differences for pain and rotation. Pre- and post-pain (VAS): Kaltenborn: pre-VAS- 5.58 ± 0.8, post- 2.65 ± 0.67 ($p < 0.05$). Maitland pre- VAS 6.05 ± 1.12, post 3.12 ± 0.98 ($p < 0.05$). Internal rotation: Kaltenborn pre- 31.98 ± 6.17, post 37.32 ± 7.76 ($p < 0.05$). Maitland pre- 31.74 ± 6.77, post 36.84 ± 6.90 ($p < 0.05$). External rotation: Kaltenborn: pre- 38.8 ± 5.75, post 49.64 ± 5.17 ($p < 0.05$). Maitland pre- 40.85 ± 7.51, post 49.76 ± 8.64 ($p < 0.05$).

Table I. *Cont.*

Study Country Number of participants	Aim	Intervention	Main outcome measures	Summarized main results
Doner et al. 2013 (67) Turkey *n* = 40	To compare Mulligan techniques for relieving pain and improving functional capacity of the shoulder with conventional passive stretching exercises in the stiffness phase	Two groups. All had home exercise programme. Group 1 (*n* = 20) = hot pack, transcutaneous electrical nerve stimulation (TENS) 20 min 100-Hz pulse duration abduction (scapular plane), internal and external rotation 30 s each with 15 s rest). Group 2 (*n* = 20) = hot pack, TENS (transcutaneous electrical nerve stimulation) rotation – 3 sets of 10 repetitions with 30-s rest between sets). Duration: 5 days per week for 3 weeks.	Pain (visual analogue scale), goniometric, Range of motion (ROM) (active and passive) Constant score, Shoulder Disability Questionnaire, patient and physiotherapist satisfaction. Assessments: B/L, post-treatment, 3 months.	($p = 0.018$) and during activity ($p = 0.003$) at 3 months than Group 1. Group 2 also had flexion, internal rotation and abduction $p = 0.001$, external rotation ($p = 0.041$). Constant scores were greater in group 2 than 1 at 3 months ($p = 0.001$).
Elhafez & Elhafez 2016 (68) Egypt *n* = 59	To compare axillary ultrasound, laser, and post-isometric facilitation technique with standard care in the management of frozen shoulder	3 groups. Standard care Group (A) (*n* = 20): "traditional" physical therapy: pulsed ultrasound, scanning laser, supervised exercise program, and home exercise program. Group B (*n* = 19) received the same except that ultrasound and scanning laser were applied to the axillary region of the painful shoulder. Group C (*n* = 20): same as B plus isometric contraction (10 progressing to 20 s) followed by stretching (20 s). Each isometric and stretching session lasted 9–13 min. Duration = 12 sessions (3× week for 4 weeks)	Pain (visual pain scale), range of pain-free rotation. Assessments pre- and post-treatment and 4 weeks post-treatment.	treatment, time, and treatment × time interaction effect ($F 8.071$, $p = 000$). Between- abduction, external rotation, and pain levels with A and B post-treatment and at 4 weeks follow-up ($p < 0.05$). Improvements reported in group B is more than in group A, and C is more than in groups A and B. At 4 weeks: Flexion (A = 106.13º, B = 112.8º, C = 118.33º) Abduction (A = 71.73º, B = 72.66º, C = 10º.66º) External rotation (A = 25.26º, B = 34.93º, C = 50.6º) Pain (A = 4.86, B = 4.1, C = 2.56º)
Ghosh et al. 2012 (69) India *n* = 72	To compare manipulation under anaesthesia, peri-articular injection and physiotherapy treatments	Three groups. All provided with home exercise programme. 1 (*n* = 24) = manipulation under anaesthesia external rotation). 2 (*n* = 24) = intra-articular injection (methylprednisolone 40 mg, a mean of 3 doses with 3 weeks intervals). 3 (*n* = 24) = active and passive mobilization exercises, shoulder wheel and pulley exercises, ultrasound.	Pain, tenderness, muscular atrophy, range of movement, all combined and graded together after clinical examination as good, fair or poor. Minimum follow up = 6 months post-treatment.	Group 1 = 79.2% good and 20.8% fair. Group 2 = 82.6% fair, 17.4% good. Group 3 66.6% good, 12.5% fair and 20.8% poor.
Gutiérrez Espinoza et al. 2015 (30) Chile *n* = 57	posterior mobilization vs modalities for improving external rotation ROM.	Group 1 (*n* = 29) = glenohumeral posterior mobilisation techniques (Kaltenborn: axial distraction type III followed by posterior glide 1 min ×15 with 1-min rest periods) after 15 min training with a cycle ergometer. Group 2 (*n* = 28) = ultrasound (1 MHz, 1.5 W/cm², 10 min, continuous), exercises. Duration: 10 sessions, 2–3 times per week.	Primary outcome: range of passive movement in external rotation. (VAS), Constant-Murley Score. Assessments: Session 1, 10.	external rotation with a mean difference of 46.3 degrees (SD = 8.7) compared with 18.1 (SD = 7.2) in Group 2 ($p < 0.0001$). Group 1 improved ROM compared with Group 2. VAS pain decreased ($p = 0.0002$) of 2.7 cms in the Group 1 compared with 1.4 cms in Group 2; and improved function in favour of Group 1 ($p < 0.0001$). Constant-Murley score increased by 38.9 points in Group 1 compared with 18.1 in Group 2 ($p < 0.0001$).
Ibrahim et al. 2014 (31) USA *n* = 60	To compare a static progressive stretch device plus hot pack, home exercise programme (HEP) and manual therapy with hot pack, HEP and manual therapy alone.	Two groups. Both groups received 3 treatment sessions (heat pack, mobilizations) per week, for 4 weeks. All asked to do pulley, wand and pendulum exercises at home 10 reps each 3 times per day. Group 1 (*n* = 30) Group 2 (*n* = 30) = static progressive stretch device 30 min per day week 1, 2 × 30 min per day weeks 2–3 and 3 times per day in week 4.	Primary outcome: Active and passive abduction, passive external rotation. Secondary: function (DASH), pain (visual analogue scale) Assessments: Baseline, 4, 12, 24, 52 weeks.	< 0.05) differences between the groups, favouring Group 2, for all outcomes at all time-points. At 12 shoulder passive external rotation (95% CI 43.5–52.3), 44.9º for shoulder passive abduction (95% CI 36.0–53.8), and 94.3º for shoulder active abduction (95% CI 87.0–101.7).

Table I. *Cont.*

Study Country Number of participants	Aim	Intervention	Main outcome measures	Summarized main results
Ji et al. 2015 (70) China $n=132$	To compare sharp-hook acupuncture plus acupoint analgesic injections vs acupoint analgesic injections alone	2 groups. Group 1 ($n=66$): Sharp-hook acupuncture using Feng Gou Zhen device at 5 acupoints (A-Shi point, Jianyu (LI15), Jianliao (SJ14), Jianzhen (SI9), and Jianqian (Ex-UE) plus acupint injection ($=1$ ml mixture of 2% lidocaine+0.5 mg B_{12}+0.9%wv NaCl) at each point. Group 2 ($n=66$) = acupoint injection. Duration: single session.	Primary outcome: Pain (visual analogue scale). Secondary: function (physical examination score) and pain (McGill questionnaire). Assessments: Baseline, 1 and 4 weeks.	Significnt differences, favouring Group 1, for all outcomes at 4 weeks ($p<,0.001$): Group 1 VAS = 1.15+0.3, Group 2 = 6.05+1.31. Group 1 McGill = 3.32+1.18, Group 2 = 25.48+3.92. Group 1 shoulder function score = 208.65+12.95, Group 2 = 116.52+9.86.
Joo et al. 2013 (71) South Korea $n=28$	To compare the effects of intra-articular botulinum toxin Type A with triamcinolone acetate	Two groups. Group 1 ($n=15$) = single intra-articular BoNT-A (Dysport; 200 IU) injection. Group 2 ($n=13$) = intra-articular (triamcinolone acetate 20 mg 1 ml and 1 ml of 0.9% NaCl) injection. Injections under fluroscopic guidance.	Pain (numerical rating scale), active flexion and abduction range of motion and passive flexion, abduction, internal and external rotation. Assessments: Baseline, 30 min after injection and at 2, 4, 8 weeks.	Group 1 greater active abduction than Group 2 (22º vs 6º) $p<0.05$. Greater passive abduction in Group 1 than Group 2 (22º v 7º) (all $p<0.05$). No other significnt differences between groups. No severe adverse events.
Kim et al. 2015 (47) South Korea $n=92$	To compare the effectiveness of a 2-staged and conventional GH injection and exercise	Two groups. All received home exercise programme 2 weeks post-injection (for 3 months). Group 1 ($n=46$) = 2 ml of 1% lidocaine injection into the subacromial space by sonographic imaging guidance. Participants were then asked to simulate the pain-evoking position and report % pain reduction. If pain reduction > than 50%, then a second injection of triamcinolone acetonide (TA) 1 ml 40 mg mixed with 4 ml of 1% lidocaine) was applied (same site). If pain reduction < 50%, the same amount of steroid was injected at the GH joint. Group 2 ($n=46$) received GHJ steroid injection, no lidocaine.	Pain (ordinal scale 0 = not improved, 2 = much improved). Passive range of motion (flexion, abduction, internal and external rotation). Assessments: Baseline, 2, 12 weeks.	Subjective differences were reported between the groups. There were no significnt differences between groups.
Kwak et al. 2016 (72) South Korea $n=121$	To develop a clinical protocol for the treatment of frozen shoulder using applied hydraulic distension plus manual therapy	Two groups, all received home exercise programme. Group 1 ($n=60$) = hydraulic distension plus manual therapy (Kaltenborn-Evjenth approach, 30 min 3 times a day for 4 weeks). Group 2 ($n=61$) = hydraulic distension alone.	Pain and satisfaction (VAS – Visual Analogue Scale – and active range of motion of the shoulder (flexion, internal and external rotation). Assessments: pre-treatment, 2, 6, 12, 24 weeks and 1 year.	No significnt differences in VAS observed between groups at finl follow-up. Pain decreased more rapidly in Group 1 – between-group difference maintained until 12 weeks ($p<0.05$). Satisfaction increased more rapidly in Group 1 – between-group difference maintained until 6 weeks ($p<0.05$). Flexion, external and internal rotation increased more rapidly in Group 1 – between-group difference maintained until 6 weeks ($p<0.05$).
Lee et al. 2016 (73) South Korea $n=64$	To compare whether capsule-preserved hydrodilatation with corticosteroid improves pain and function better than intra articular CS injection (IACS) alone	Two groups. Group 1 ($n=32$) = ultrasound-guided IACS alone with 1 ml of 40 mg/ml triamcinolone acetonide and 3 ml of 1% lidocaine. Group 2 ($n=32$) = ultrasound-guided capsule-preserved hydrodilatation with corticosteroid with a mixture of 1 ml of 40 mg/ml triamcinolone acetonide, 6 ml of 1% lidocaine, and normal saline.	Primary outcome: Shoulder Pain and Disability Index score. Secondary outcomes: pain VAS (visual analogue scale) and passive range of motion (flexion, abduction, extension, external and internal rotation. Assessments: pre-treatment and 3, 6, and 12 weeks.	No significnt differences between groups. Rupture occurred in 2 (6.25%) of Group 2. No serious complications.

Table I. *Cont.*

Study Country Number of participants	Aim	Intervention	Main outcome measures	Summarized main results
Lee et al. 2015 (74) South Korea $n=81$	To compare hypertonic (3% NaCl) saline with normal saline (0.9% NaCl) in capsule-preserved hydrodilatation.	Two groups. Group 1 ($n=40$) = ultrasound-guided hydrodilatation with hypertonic saline (3% NaCl) and 4 ml lidocaine (1%) and 1 ml triamcinolone (10 mg). Group 2 ($n=41$) = ultrasound-guided hydrodilatation with hypertonic saline (0.9% NaCl) and 4 ml of lidocaine (1%) and 1 ml triamcinolone (10 mg). The injection was stopped at the point at which US showed no further capsule distension.	Passive range of motion (flexion, abduction, extension, external and internal rotation. Shoulder Pain and Disability Index score. Assessments: Baseline, 2 weeks.	Mean injection volume was 20.2+5.2 ml for Group 1, 19.5+5.9 ml for Group 2. Group 1 showed greater improvement (27.8+21.4) than Group 2 (13.3+18) for flexion ($p=0.005$), and abduction (Group 1: 30.5+24.0, Group 2: 17.3+25.7 $p=0.039$) and internal rotation (Group 1: 20.9+19.8, Group 2: 11.7+14.6 $p=0.038$), and external rotation (Group 1: 17.3+14.1, Group 2: 8.6+10.7 $p=0.04$). SPADI: Group 1 greater improvement than Group 2 (Group 1: 29.6+19.3, Group 2 14.7+15.9 $p=0.001$).
Lorbach et al. 2010 (75) Germany $n=40$	To compare oral and intra-articular injections of cortisone	Two groups. Group 1 ($n=20$) = fluroscopically controlled intra-articular injections. Injection consisted of 5 ml of bupivacaine (0.5%), 5 ml mepivacaine (0.5%), and 40 mg triamcinolone at beginning, 4 and 8 weeks. Group 2 ($n=20$) = oral application of prednisolone beginning with 40 mg daily and decreasing the dose to 5 mg (at 20 days for a further 5 days) together with 40 mg pantoprazole.	Constant-Murley (CM) score, the Simple Shoulder Test (SST) and VAS for pain, function, and satisfaction. ROM: passive external and internal rotation, flexion. Assessments: Baseline, 4, 8, 12, 26, 52 weeks.	Superior results in CM score for Group 1 than 2 at all timepoints at 12 months Group 1: 62.7±16, Group 2: 45.6± 8 ($p=0.001$). SST scores at 8 weeks were superior for Group 1 (Group 1: 5.9±3.4, Group 2: 2.9±2.8, $p=0.006$) and 12 weeks (Group 1:6.3±3.8, Group2: 3.6±3.3, $p=0.037$) timepoints only. VAS scores for pain and functional showed no significant differences at all follow-ups. Satisfaction VAS: significant difference at 8 (Group 1 7.3±2.6, Group 2: 5.3±2.7, $p=0.035$),12 (Group1:7±2.7, Group 2: 5±2.3 $p=0.026$) and 52 weeks (Group1: 7.9±2.6, Group 2: 4.7±1.6 $p=0.003$).
Ma et al. 2013 (27) South Korea $n=30$	To compare modalities and joint mobilization vs whole-body cryotherapy (WBC) combined with modalities and joint mobilization	Two groups. All had modalities: hot pack (15 min), ultrasound (5 min 1 MHz, 1.5 W/cm^2 continuous) Interferential (15 min, 25 mA), Gr III and IV mobilizations and stretches (10 min). Duration 3 times week for 4 weeks. Group 1 ($n=15$) = 2 sessions of WBC (of 6 4-min exposures, 2 temperatures (−50º and −110º C) 3 times a week for 4 weeks (no less than 24 treatments in total). Group 2 ($n=15$) = modalities and joint mobilisation (no less than 12 treatments).	Visual analoge scale (VAS), active range of motion- flexion, abduction, internal and external rotation, the American Shoulder and Elbow Surgeons Standardized Shoulder Assessment Form (ASES). Assessment: Baseline, post-intervention (4 weeks).	Interaction terms between the pre-intervention and experimental groups were not significant in full factorial models. Main effect models found Group 1 improved more than Group 2. VAS ($F_{1,27}=57.86$, $p<.01$), flexion ($F_{1,27}=44.08$, $p<.01$), abduction ($F_{1,27}=55.94$, $p<.01$), internal rotation ($F_{1,27}=51.62$, $p<.01$), and external rotation ($F_{1,27}=33.1$, $p<.01$), ASES scores ($F_{1,27}=83.88$, $p<.01$). At 4 weeks flexion (Group 1: 162º+5.3, Group 2: 149º+5.9 degrees, $p=<0.01$), Abduction (Group 1: 158º+5.3, Group 2:145º+5.4 $p=<0.01$), internal rotation (Group 1: 53º+2.7, Group 2: 44º+3.3 $p=<0.01$), external rotation (Group 1: 80º+2.6, Group 2: 75º+2.3 $p=<0.01$), VAS (Group 1: 2.5+0.5, Group 2: 3.7+0.6 $p=<0.01$), ASES (Group 1: 24+1.4, Group 2: 20+1.2 $p=<0.01$)

Table I. *Cont.*

Study Country Number of participants	Aim	Intervention	Main outcome measures	Summarized main results
Ohta et al. 2014 (76) Japan $n = 70$	To compare the efficacy of celecoxib and loxoprofen	Two groups. Group 1 ($n = 37$) = celecoxib was administered at a dose level of one 100 mg tablet/dose twice daily. Group 2 ($n = 33$) = loxoprofen was administered at a dose level of one 60 mg tablet/dose 3 times daily. The dosing period was 1–2 weeks.	Pain (Visual analogue score 0–5), M and Japan Society Shoulder Sports Score. Assessment: Baseline, post-treatment (1–2 weeks).	Celecoxib is comparable to loxoprofen in terms of analgesic efficacy. No between-group differences. Reduction in nocturnal pain was greater in the celecoxib group ($p = 0.03$). $n = 2$ in the celecoxib Group and $n = 6$ patients in the loxoprofen Group developed adverse events. Test drug treatment was discontinued due to adverse events in 1 patient in the celecoxib Group and 3 in the loxoprofen Group.
Park et al. 2012 (77) South Korea $n = 48$	To compare the short-term effects and advantages of sono-guided capsular distension with fluoroscopically guided capsular distension	Two groups. Group 1 ($n = 23$) = sono-guided capsular distension, posterolateral approach 9 ml lidocaine (0.5%)+10 ml contrast dye+triamcinolone (20 mg). One injection every 2 weeks for 6 weeks. Group 2 ($n = 25$) = fluoroscopically guided capsular distension (same medications). Participant in prone position. Both groups given self-directed exercise.	Visual numeric scale (VNS), Shoulder Pain and Disability Index (SPADI), active and passive range of motion (ROM) (flexion, abduction, external rotation) Incremental cost-effective ratio (ICER), satisfaction, complications, effectiveness, preference, and procedure duration. Assessments: Baseline, 2, 6 weeks.	No between-group differences in changes of VNS, SPADI, ROM, and effectiveness. Patients preferred ($p = 0.005$) sono-guided to fluoroscopically guided capsular distension due to differences in radiation hazards and positional convenience. Procedure time shorter for sono-guided (119.04 ± 12.17 s) than fluoroscopically guided capsular distension (294.08 ± 24.30 $p < 0.05$). Costs: to acquire the treatment effect of VNS 0.44 units with sono-guided, the cost was an additional 98,926 Korean won, compared with the fluoroscopic-assisted method.
Park et al. 2013 (78) South Korea $n = 100$	To compare the efficacy of ultrasound-guided intra-articular hyaluronic acid injection with capsular distension with steroid injection alone	Two groups. All received 3 US guided IA injections every 2 weeks (a total of 3 injections), posterior approach. Both received an exercise programme of pendulum exercise and isometric scapular setting. Group 1 ($n = 50$) = 0.5% lidocaine (4 ml) plus triamcinolone (40 mg/ml; 1 ml). Group 2 ($n = 50$) = 0.5% lidocaine (18 ml) for capsular distension with high molecular weight sodium hyaluronate (10 mg/ml; 2 ml).	The Shoulder Pain and Disability Index (SPADI), Verbal Numeric Scale (VNS), and passive range of motion of the shoulder (flexion, abduction, external rotation). Assessments: Baseline, 2, 6, weeks after last injections (i.e. 12 weeks after B/L).	No between-group differences for SPADI, VNS, flexion, abduction. External rotation improved more in Group 2 than 1 at 2 (Group 1: 42.9º+7.6, Group 2: 50º ±8.7 $p < 0.05$) and 6 weeks (Group 1: 44.5º ±7.7, Group 2: 56º ±8, $p < 0.05$). $n = 2$ Group1 and $n = 1$ Group 2 experienced pain because of needle contact to the labrum, and $n = 12$ Group 2 reported pain during capsular distension. No severe complications.
Park et al. 2014 (79) South Korea $n = 53$	To compare the synergistic effect of intensive mobilization techniques combined with capsular distension.	Four groups. Group 1 ($n = 16$) = intensive mobilization after one steroid injection with capsular distension (IMSID). Group 2 ($n = 14$) = intensive mobilization (IM). Group 3 ($n = 12$) = one steroid injection with capsular distension (SID). Group 4 ($n = 11$) = modalities (hot pack, transcutaneous electrical nerve stimulation (TENs), Ultrasound). IMSID, IM, and SID groups also received modalities for 20 min. Treatments 2× week for 4 weeks. All given home exercise programme.	Shoulder Pain and Disability Index (SPADI), Constant-Murley Shoulder Function Assessment Score (CS), Hand behind body (HBB), Active range of motion (AROM), and Verbal Numeric Score (VNS). Assessments: pre and post-treatment (4 weeks).	Post hoc Mann-Whitney U test revealed no significant differences between the IMSID and IM groups or between the SID and GroupT Groups. There were significant differences in all values between the IMSID and SID Groups; significant differences in VNS, HBB, SPADI, and CS between the IMSID and GroupT Groups ($p < 0.01$), significant differences in all values between the MI and SID Groups, except SPADI and significant differences in VNS, HBB, and CS between the MI and GroupT Groups ($p < 0.01$).
Schydlowsky et al. 2012 (80) Denmark $n = 18$	To compare the effect of subcutaneous adalimumab injections with intraarticular glucocorticoid injections on pain and ROM.	Two groups. Group 1: ($n = 10$) = 1 ml adalimumab by subcutaneous injection. Group 2: ($n = 8$) = 4 ml of lidocaine 1 % and 40 mg methylprednisolone acetate in the affected glenohumeral joint under ultrasonographic guidance. Treatment repeated once every second week for a maximum of 3 treatments.	Constant score, Shoulder Rating Questionnaire, Shoulder Pain and Disability Index (SPADI) Active and passive range of motion. Assessments: Baseline, 1, 3, 6 months.	Trial halted early: $n = 4/10$ from Group 1 withdrew or were excluded from the study, either because of lack of effect, or because of side effects. No patients withdrew from Group 2. Apart from baseline differences (Group 1 lower values for flexion) there were no other between-group differences. There were within-group improvements for all outcomes in Group 2.

Table I. *Cont.*

Study Country Number of participants	Aim	Intervention	Main outcome measures	Summarized main results
Shin et al. 2013 (81) South Korea $n=191$	To compare the clinical outcomes after treatment by a single corticosteroid injection in different locations of the shoulder.	Four groups. Group 1–3 received a corticosteroid injection composed of 4 ml of 2% lidocaine and 40 mg of triamcinolone (1 ml). All injections ultrasound guided and delivered by posterior approach. All participants received a weekly rehabilitation programme delivered by a physiotherapist for 1 month followed by a HEP. Passive pendulum and self-assisted movements with a bar from 7 days after treatment. Active-assisted ROM exercises began at 6 weeks and resisted shoulder exercises were started at 3 months. Exercises guided by level of pain. Group 1: ($n=49$) = subacromial space injection. Group 2: ($n=48$) = intra-articular Injection. Group 3: ($n=47$) = intra-articular combined with subacromial space. In Group 3, the injection dose was equally divided between the glenohumeral joint and subacromial bursa. Group 4: ($n=49$) = oral aceclofenac NSAID (100 mg) twice daily for 6 weeks.	American Shoulder and Elbow Surgeons Score. Visual analogue scale (pain integrity) integrity-and patient satisfaction). Active shoulder range of motion (ROM), pain (flexion, internal and external rotation). Assessments: Baseline, 2, 4, 8, 16, and 24 weeks after treatment.	Those treated with corticosteroids achieved faster pain relief and had greater satisfaction levels than those in Group 4 during the 16 weeks after treatment. No significant between-group differences in pain scores ($p=0.670$), ROM and functional outcomes (flexion $p=0.117$, function $p=0.651$) was observed among the 4 groups at 24-week follow-up visits ($p=0.670$).
Tanaka et al. 2010 (82) Japan $n=120$	To assess outcomes based on the frequency of treatment for frozen shoulder.	Three groups. Group 1: ($n=40$) = high-frequency (HF) group (treatment > 2 times a week). Group 2: ($n=40$) = moderate-frequency (MF) group (treatment = once a week). Group 3: ($n=40$) = low-frequency (LF) group (treatment < once a week). All groups received the same standardized intervention (40 min) including joint mobilization (as per Vermeulen et al. (ref)) plus home exercise programme (pendulum exercises, passive stretching such as "climbing the wall exercise") 2–3× per day. Mean duration: 4.6+1.2 months.	The point in time at which range of motion (ROM) improvement plateaued for more than 1 month was defined as "the ROM plateau point." The functional outcome was investigated in terms of improved angle (IA) of the shoulder joint. The time required to reach the ROM plateau point (T). IA and T were compared in terms of: (1) age, (2) gender, (3) handedness, (4) duration before rehabilitative intervention, (5) frequency of sessions (6) self-exercise compliance (Questionnaire). Assessments: Mean follow up time+ 5.9+1.3 months.	No significant differences in IA between male and female. IA of the dominant-handed group was significantly higher than that of the non-dominant handed group (95%CI 7.3–25.6, $p=0.010$). No significant differences in T between groups. IA of the group that had experienced more than 7 months of the condition was significantly low (95% CI 17.2–54.3, $p=0.018$) however linear regression did not indicate a relationship of duration with IA or T. Frequency of mobilisations showed no relationship with IA or T. IA was significantly higher and T was significantly shorter in the group that performed self-exercise every day than in those who performed less.
Vahdatpour et al. 2014 (83) Iran $n=40$	To compare the effect of extracorporeal shockwave therapy (ESWT) in the treatment vs sham shockwave therapy.	Two groups. Prior to ESWT or sham shockwave, all received intra-articular injection of 40 mg triamcinolone. All received activity modification, meloxicam 15 mg daily, and home exercise programme (pendulum, stretching, wall walking 2× daily). Group 1: ($n=19$) = ESWT 1× week for 4 weeks from anterior and posterior directions (mean 1,200 shocks between 0.1 and 0.3 mJ/mm^2) up to the maximum threshold of pain tolerance. Group 2: ($n=17$) = sham shockwave therapy 1× week for 4 weeks: device was turned off and placed on the patient's shoulder for the same period of time.	Shoulder Pain and Disability Index (SPADI), range of motion. Assessments: Baseline, post-intervention, 2, 5 months after intervention.	Variance analysis at 5 months after intervention showed greater improvement in Group 1: SPADI pain Group 1: 16.2±6.7, Group 2: 39.5±10.4 $p<0.001$), SPADI disability Group 1: 19.2±15.8, Group 2: 40.9±8.7 $p=0.002$), ROM flexion (Group 1: 111.1±19.4, Group 2: 77.4+8.7 $p=0.001$), abduction (Group 1: 96.1±20.3, Group 2: 59.5±12.8 $p<0.001$). Control group had greater extension (Group 1: 37.6±13.1, Group 2: 46.8±9.5 $p=0.006$) and external rotation (Group 1: 32.6±11.8, Group 2: 36.5±10.4 $p=0.004$) at 5 months after intervention. No significant difference in internal rotation between groups.

Table I. *Cont.*

Study Country Number of participants	Aim	Intervention	Main outcome measures	Summarized main results
Wu et al. 2014 (84) Taiwan *n* = 60	To compare the effect of physical therapy alone with physical therapy and pulsed radiofrequency (PRF) lesioning of the suprascapular nerve (SSN) using an ultrasound guided (UG) technique.	Two groups. Both groups received multimodal treatment that included: hot pack applications and TENS (transcutaneous electrical nerve stimulation), and stretching exercise, mobilisations and therapeutic exercises (30 min, 3× week for 12 weeks). Group 1: (*n* = 30) = multimodal treatment. Group 2: (*n* = 30) = multimodal and 1 dose of PRF lesioning of the SSN. PRF lesioning was performed for 180 s (2 Hz, 30-ms pulse width, 42°C).	Pain (visual analogue scale), Shoulder Pain and Disability (SPADI), Passive range of motion. Assessments: Baseline, 1, 4, 8 and 12 weeks.	Group 2 had a shorter time to onset of significant pain relief (6.1 ± 3.4 vs 28.1 ± 9.2 days; $p < 0.001$) and reduction of VAS score at week 1 (40% vs 4.7%) than the Group 1 ($p < 0.001$). Comparison of the 2 groups indicated significant improvement in the Group 2 throughout with respect to the VAS and SPADI scores, and for the most gain in PROM (passive flexion: weeks 8 and 12; passive extension in week 12, medial rotation in weeks 4, 8, and 12; all $p < 0.05$). No serious adverse effects or complications in either group.
Yang et al. 2012 (85) Taiwan *n* = 34	To compare the effectiveness of end-range mobilisation/scapular mobilisation treatment approach (EMSMTA) vs control.	3 groups: Group 1: (*n* = 11) assigned to control. N = 23 who met the criteria were randomly assigned to: Group 2: (*n* = 12) criteria-control (*n* = 12) who received a standardized physical therapy program, or to Group 3: (*n* = 11) criteria intervention, the EMSMTA group. Control and criteria control groups had standardized treatment (2× week for 3 months) of passive mid-range mobilization, flexion and abduction stretching techniques, physical modalities (ultrasound, shortwave diathermy, and/or electrotherapy), and active exercises. Participants advised to use the affected shoulder in daily activities whenever possible. No home exercise programme. The EMSMTA Group received mobilisations (Maitland 1991, Vermeulen 2000) 2× week for 8 weeks) end-range mobilization (10–15 reps Grade IV anterior-posterior) and scapular mobilizations (10 sets of 10 reps with 30 s rest between sets).	Range of motion: Passive internal and external rotation and abduction. Hand behind back reach (HBBR). Disability: (FLEX-SF questionnaire). Shoulder complex kinematics (FASTRAK motion analysis). Assessments: Baseline, 4, 8 weeks (not 12 weeks).	Baseline differences (scapular posterior tipping, humeral external rotation and hand behind back reach). 8 weeks: humeral external rotation and HBBR improved in control Group compared with the criteria-control Group (26.4°, 95% CI 10.2, 42.9 and 0.36, 95% CI 0.19, 0.51, $p = 0.002$, $p < 0.0005$). 8 weeks: humeral external rotation and the HBBR improved in the criteria-intervention Group compared with the criteria-control Group (23.4°, 95% CI 8.2, 37.3 and 0.33, 95% CI 0.17, 0.44, $p = 0.002$, < 0.0005). Humeral external rotation and HBBR means not different between the criteria-intervention and control Groups ($p > 0.05$). 8 weeks: FLEX-SF improved in the control Group compared with criteria-control Group (4.9 scores, 95% CI 1.2, 11.2, $p = 0.03$). 8 weeks: FLEX-SF improved in the criteria-intervention Group compared with criteria-control Group (7.4 scores, 95% CI = 2.6, 12.5, $p = 0.005$). No differences between criteria-intervention Group and control. At 4 and 8 weeks, scapular upward rotation/tipping and the scapulohumeral rhythm improved in the control compared with the criteria-control group. 8 weeks: scapular tipping and the scapulohumeral rhythm improved in the criteria-intervention Group compared with criteria-control (5° tipping, 95% CI 0.1, 10.2 and rhythm ratio = 0.32, 95% CI 0.13, 0.52, $p = 0.004$ and 0.002). No difference between the criteria-intervention and control group.
Yoon et al. 2013 (32) South Korea *n* = 53	To compare intra-articular high dose, low dose and placebo corticosteroid injections.	Single injection. 3 groups: Group 1: (*n* = 20) = 4 ml of 10 mg/ml triamcinolone acetonide and 1 ml of 1% lidocaine (high-dose group). Group 2: (*n* = 20) = 2 ml of 10 mg/ml triamcinolone acetonide and 3 ml of 1% lidocaine (low-dose group). Group 3: (*n* = 13) = 5 ml of 1% lidocaine (placebo group). All instructed to carry out HEP (ROM, stretches) for 10 min 3× day.	Shoulder Pain and Disability Index (SPADI), visual analogue scale (VAS) for mean shoulder pain level, and, passive range of motion for flexion, abduction, extension, external and internal rotation. Assessments: B/L 1, 3, 6, 12 weeks after treatment.a	No significant difference between the 2 different corticosteroid dose groups (*post-hoc* tests showed improvement in SPADI and VAS scores and in flexion, abduction, and internal rotation for the low- and high-dose groups compared with the placebo).

Ca2+: calcium; ml: millilitres; mg: milligram; HF: high-frequency; MF: moderate-frequency; LF: low-frequency; IA: improved angle; ROM: range of movement; T: plateau point; SPADI: Shoulder Pain and Disability Index; ESWT: Extracorporeal Shock Wave Therapy; PRF: pulsed radiofrequency; SSN: suprascapular nerve; UG: ultrasound guided; s: seconds; ms: milliseconds; EMSMTA: effectiveness of end-range mobilisation/scapular mobilisation treatment approach; HBBR hand behind back reach;.