NKR 05 Skulder Subacromial decompression surgery for rotator cuff disease [Data only. When citing this record quote "Cochrane Database of Systematic Reviews 2019, Issue 1".]

Review information

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Characteristics of studies

Characteristics of included studies

Brox 1993

Methods	Design: single-centre, 3-arm, randomised trial Setting: public hospital surgery and physiotherapy departments in Norway, patients referred from general practitioners in the hospital catchment area Timing: not reported, trial reported in 1993 Interventions: ASD + exercise vs exercise therapy vs sham laser Sample size: the study was planned to detect a difference of 10 points between groups, which equals a reduction from moderate to mild pain. After a pilot study the SD was estimated at 13 points. With α set at 0 05 and, ß 0.10 36 participants were required for each treatment group to complete the trial. Analysis: ITT analysis.
Participants	Number of participants 444 considered for inclusion 195 fulfilled eligibility criteria 125 consented and randomised (45 ASD; 30 placebo laser; 50 exercises) Data for 31 (69%) for ASD, 27 (90%) for placebo and 42 (84%) for exercises at 3 months; and 41 (91%) for ASD, 30 (100%) for placebo and 49 (98%) for exercises at 6 months Inclusion criteria ● Age 18-66 years ● Pain in shoulder > 3 months ● Resistant to physiotherapy, NSAIDs, steroids ● Dysfunction or pain on abduction ● Normal passive glenohumeral ROM ● Pain during 2 of 3 isometric-eccentric tests (abduction at 0° and 30° and external rotation) ● Positive results in tests for impingement; positive response to subacromial injection of local anaesthetic into the subacromial space Exclusion criteria ● Arthritis of AC joint ● Cervical syndrome ● Rupture of the rotator cuff ● Glenohumeral instability ● Bilateral muscular pain with

	tenderness ● Severely decreased ability to relax shoulder, neck, and temporomandibular joints on examination ● Reluctant to accept ≥ 1 study treatments Baseline characteristics Surgery (ASD) group Mean age: 48 years Number (%) female: 16 (36%) Duration of symptoms: 3 years 20 (44%) Number (%) participants with bilateral pain: 11 (24%) Number (%) participants with dominant affected: 28 (62%) Number (%) participants on sick leave: 27 (60%) Number (%) participants on analgesics: 30 (67%) Mean Neer score: 63.6 (pain 13.8; function 22.3; ROM 17.5) Mean Hopkins symptoms checklist score: 1.6 Exercise therapy group Mean age: 47 years Number (%) female: 28 (56%) Duration of symptoms: 3 years 25 (50%) Number (%) participants with bilateral pain: 12 (24%) Number (%) participants with dominant affected: 31 (62%) Number (%) participants on sick leave: 27 (54%) Number (%) participants with on analgesics: 39 (77%) Mean Neer score: 66.2 (pain 14.7; function 23.0; ROM 18.5) Mean Hopkins symptoms checklist score: 1.6
Interventions	2 experienced surgeons performed the operations and several physiotherapists supervised the postoperative exercises For the exercise group, 1 experienced physiotherapist supervised the exercises ASD ASD by removing subacromial bursa and anterior and lateral part of acromion as well as cutting AC ligament. Postoperative rehabilitation was started at first postoperative day. Physiotherapy started 1 week after the procedure and was supervised by a physiotherapist where the participant lived. The postoperative regimen did not follow exactly the same protocol as in the exercise group. Exercise therapy The purpose of the exercises were to “normalise the dysfunctional neuromuscular patterns” and “increase the nutrition of the collagen in the rotator cuff ”. The participants performed exercises 1 h/day; twice weekly with a physiotherapist and other days at home. Resistance was increased gradually. Exercise regimen continued over 3-6 months Placebo-laser 12 sessions of detuned soft laser treatment twice a week for 6 weeks (this intervention were not included for this review)
Outcomes	The outcomes were assessed at baseline, 3, 6 months and 2.5 years Primary outcome measure ● Change in Neer score from baseline to 6 months, (0-100, higher score indicates better function. Domains: VAS for pain 35 points; clinical testing of function 30 points; active ROM 25 points; anatomical/radiological examination 10 points) Secondary outcomes: ● Pain with activity (1-9, higher score indicates worse pain) ● Pain at rest (1-9, higher score indicates worse pain) ● Pain at night (1-9, higher score indicates worse pain) ● Neer score (0-100 higher score indicates better function; due to normal X-rays at baseline and no X-rays in follow-up, the score could range between 10 and 100 in the participants) ● Change in the main symptom (Likert scale −9 worst to +9 best) reported at 2.5 years only ● Treatment success defined as those who had > 80 Neer score. Reported at 6 months and 2.5 years ● Emotional distress on the Hopkins symptom checklist reported at baseline only (0-4, higher score indicating higher anxiety and depression) ● Length of sick leave ● Cost of surgery and cost of exercise ● Isometric abduction endurance at 2.5 years only ● Disability to carry 5 kg at the side (1-7, higher score indicating higher disability) at 2.5 years only ● Disability to take down something from a wall cupboard (1-7, higher score indicating higher disability) at 2.5 years only ● Shoulder-related absence from work (reported at 6 months and 2.5 years in 1999 paper for those participants not lost to follow-up by 2.5 years) Outcomes used in this review ● Mean pain; pain on activity (NRS) ● Mean function; Neer score ● Participation (number at work)
Notes	Source of funding: Norwegian Research Council. Trial registration: not available Data analysis:we included only the comparison ASD versus exercise in the surgery versus exercises analysis. Placebo laser was not relevant to our review question. Trial authors reported median values in the original publications, but provided full data regarding pain and Neer score upon request. Pain was measured on a 1-9 scale and we transformed pain values and SD to a 0-10 scale before analyses using the formula from Thorlund 2011. 2.5 year results were used in sensitivity analysis 1-3 years’ time point (Analysis 5.4). Participation to work per protocol data used Withdrawals: 4/45 in arthroscopic surgery group did not attend follow-up, reasons unclear Cross-overs: 1/50 participant in exercise group had surgery. 3/45 participants in the surgery group had only exercises AEs: none reported SAEs: none reported Trial authors performed an interim analysis of 68 participants who completed 6 months’ follow-up and found that surgery or exercises were superior to placebo laser, and thus stopped allocating participants to placebo laser (hence the smaller number of participants) . The trial authors did not appear to statistically adjust for the interim analysis in the final analysis

Risk of bias table

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Sequence generation not described. random permutted blocks to ensure allocation concealment. Probably done.
Allocation concealment (selection bias)	Unclear risk	Not reported
Blinding of participants and personnel (performance bias)	High risk	Participants in the surgery and exercise group were not blinded
Blinding of outcome assessment (detection bias)	High risk	Self-reported outcome: Participants were aware of whether or not they received surgery or exercise. Assessor reported outcome: outcome assessors were blinded to treatment intervention
Incomplete outcome data (attrition bias)	Low risk	4/45 in the surgery group and 1/50 in the exercise group were lost to follow-up
Selective reporting (reporting bias)	Unclear risk	No portocol available. Lenght of sick leave was measured but incompletely reported. Global succes was not reported in the first paper but included as an outcome at 6 month and 2,5 years. This measure was based on the Neer score and unclear if post hoc definition of cut-off caused bias
other bias	High risk	Unplanned interim analysis performed after 68 particiopants have been followed up for 6 months. 9/45 allocated to surgery did not undergo surgery, and 7/50 allocated to to exercise did not complete the planned exercises and one of these had surgery. However the analysis was performed as intention to treat

Ketola 2009

Methods	Design: 2-centre, parallel, 2-arm, RCT Setting: 2 public hospitals in Finland Timing: June 2001-July 2004 Interventions: ASD + exercise versus exercise therapy alone Sample size: power calculations were performed using self-reported pain (0-10 scale VAS) at 24 months as the outcome measure. Using 1.5 (SD 2.5) as a clinically important between-group difference, the sample size was estimated to be 45 participants per group, if 5% type I (α) and 20% type II (β) errors were allowed. As the SD of the outcome measure was only a rough estimate, 70 participants were included in both groups Analysis: ITT analysis
Participants	Number of participants Number screened not reported 140 eligible 140 randomised (70 to decompression + exercise and 70 to exercise alone) Data available for 99 (43/70 (61%) for surgery and 56/70 (80%) for exercises) at 6 months; 113 (51/70 (73%) for surgery and 62/70 (89%) for exercises) at 12 months; 134 (68/70 (97%) for surgery and 66/70 (94%) for exercise group) at 2 years; 109 (52/ 70 (74%) for surgery and 57/70 (81%) for exercise group) at 5 years; and 90 (44 (63%) for surgery and 46 (66%) for exercise group) at 10 years Inclusion criteria ● Participants aged 18-60 years and willing to comply with the randomised treatment protocol and follow-up visits ● Positive Neer's test (after 5 mL 1% lidocaine had been injected into the subacromial space) ● Pain in the shoulder that was resistant to rest, anti-inflammatory drugs, subacromial glucocorticosteroid injections and physiotherapy ● Symptoms that had persisted for ≥ 3 months Exclusion criteria ● Glenohumeral or AC osteoarthritis ● Signs of glenohumeral instability ● Previous surgery to the affected shoulder ● Full-thickness tear of the rotator cuff ● Cervical radicular syndrome ● Adhesive capsulitis or neuropathy of the shoulder region Baseline data Surgery group (ASD) Mean (range) age: 46.4 (23.3-60.0) years Number (%) of female: 47 (67%) Mean (range) BMI: 27.4 (19.5 - 46.3) Dominant hand affected n (%): 45 (64%) Duration of symptoms, years (range): 2.6 (0.25-20) Mean (range) pain VAS: 6.5 (1-10) Mean (range) night pain: 6.2 (0-10) Mean (range) disability: 6.2 (1-10) Mean (range) working ability (range): 5.7 (0-9) Mean (range)

	SDQ score (range): 78.0 Exercise group Age, mean (range): 47.8 (26.8-59.2) years Number (%) female: 41 (59%) Mean (range) BMI: 27 (15.2-41.2) Dominant hand affected: 46 (66%) Duration of symptoms, years (range): 2.5 (0.25-17) Mean (range) pain VAS: 6.5 (1.0-10) Mean (range) night pain: 6.4 (0-10) Mean (range) disability (range): 6.5 (2-10) Mean (range) working ability (range): 5.9 (0-9) Mean (range) SDQ score: 82.5.
Interventions	1 surgeon performed all operations Surgery (ASD) Acromioplasty + ASD and debridement +/- coracoacromial ligament release (participants with thick or tight ligament). Supervised exercise treatment, overnight in hospital, ibuprofen, collar+cuff, mobilisation permitted and free active movement. After 7-10 days participants commenced on similar programme as exercise group with 6 physiotherapy visits Exercise therapy group Supervised exercise treatment (physiotherapist), individual home programme, sessions 4 times/week, 9 different exercises with 30-40 repetitions 3 times. 7 control visits by physiotherapist. As self-assessed ability and strength increased, repetitions diminished. NSAIDs were permitted Subacromial corticosteroid injections were permitted in both groups if pain interfered with the exercise programme.
Outcomes	Outcomes were assessed at baseline, 3, 6, 12, 24 months, 5 years and > 10 years. Primary outcome ● Pain measured on a 0-10 VAS (0-10, higher score indicates worse pain), time point not specified Secondary ● Disability (0-10 VAS, higher score indicates more disability) ● Pain at night (0-10 VAS, higher score indicates worse pain) ● Working ability (0-10 VAS, higher score indicates worse pain) ● SDQ score (0-100, higher score indicates more disability) ● Participants retired and participants retired due to shoulder condition (at 5 and 10 years) ● Mean number of days absence from work during last 3 months; reported at 10 years in categories 0; 1-7; 8-14; > 14 ● Number of painful days during the previous 3 months (reported at 24 months, 5 years, and 10 years) ● ● Proportion of pain-free participants (defined as VAS < 3) at 24 months, 5 years and 10 years ● Overall state of health compared with before treatment (at 10 years only) ● Mean 15D score (0-1; higher score indicates better QoL); likely this was added after the study was ongoing and only assessed at 5 and 10 years. ● Resource use: unit costs (EUR) and mean costs (EUR) of direct healthcare and non-healthcare costs (travel, massage, manipulation) at 2004 prices ● MRI (cuff tendons and muscle volume) at 5 years Outcomes used in this review: ● Mean pain; VAS for pain (0-10) ● Mean function; SDQ score ● HRQoL; 15D score (only at 5-year follow-up) ● Participation (work); participants not retired (total - number of retired)
Notes	Source of funding not staded. Trial registration: not available Data analysis: original reports do not include 3-12 months' results but the trial authors provided pain and SDQ score upon request. We inverted SDQ before entering the data (so that higher indicated better). 15D data at 5 years also received from the trial authors. Imbalance in available data between groups at 6 months, probably due to delay in surgery (data not reported for participants not operated before follow-up point) Withdrawals: in surgery group, 2/70 (3%); In exercise group, 3/70 (4%) Cross-overs: in surgery group, 13 (19%) cancelled operation: 6 because lack of symptoms; 2 due to work; 1 fear of operation, 2 other reasons, 1 withdrew, 1 underwent manipulation only. 9 (13% also received labral repair during the operation). 14 (20%) participants in the exercise group received surgery. Over the 2-year follow-up a mean of 0.3 (range 0-3) and 1.0 (range 0-10) glucocorticoid injections were given to the surgical and exercise groups AEs: no major surgical complications reported, AEs in exercise group not specifically reported SAEs: no major surgical complications.

Risk of bias table

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Computer-generated randomisation (using 14 as the block size)
Allocation concealment (selection bias)	Low risk	Computer-generated numbers sealed in opaque envelopes prepared by an independent statistician not otherwise involved in the study
Blinding of participants and personnel (performance bias)	High risk	Neither participants nor study personnel were blinded
Blinding of outcome assessment (detection bias)	High risk	Self-reported outcomes: Participants were not blinded. assessor reported outcomes: A single independent physiotherapist was blinded to treatment allocation as participants wore T-shirts to cover scars and were asked not to reveal any information regarding their allocation
Incomplete outcome data (attrition bias)	High risk	There were missing data at 3, 6 and 12 months and the proportions differed between groups at 3 and 6 months (3 months: 27/70 (39%) in surgery group and 13/70 (19%) in the exercise group; 6 months: 26/70 (37%) in surgery group and 14/70 (20%) in exercise group; 12 months: 19/70 (27%) in surgery group and 18/70 (26%) in exercise group; 24 months: 2/70 (3%) in the surgery group and 4/70 (6%) in the exercise group. No reasons for missing data were reported
Selective reporting (reporting bias)	Unclear risk	No protocol available. Trial authors reported only 24-month, 5-year and 10-year results in the paper but we received pain in VAS and SDQ-score at 3, 6 and 12 months from the trial authors. Trial authors stated that there were no major surgical complications but AEs in the exercise arm were not reported. Passive movement and strength were measured but not reported
other bias	Unclear risk	9 (13%) participants in the surgery group also received labral repair during the operation, which was an unplanned co-intervention and may have biased the estimate of the effect of surgery (in either direction). Both treatment groups received glucocorticoid injections over the 2-year follow-up (mean 0.3 (range 0-3) and 1.0 (range 0-10) glucocorticoid injections in the surgical and exercise groups). This may also have biased the estimate of the effect of surgery. The exercise group 14/70 (20%) had decompression by 24 months. In the surgery group, 13 (18%) did not receive planned surgery. However the analysis was performed on an ITT basis irrespective of whether or not the allocated treatment was received

Paavola 2018 (decompression vs. diag. arthroscopy)

Methods	Design: multicentre, 3-group, randomised, assessor- and patient-blinded, placebo-controlled trial Setting: 3 hospitals in Finland Timing: 1 February 1 2005-25 June 2015 Interventions: ASD vs placebo (arthroscopy only) vs exercise therapy Sample size: trial authors powered the study to detect a difference of at least the MCID (15 points) in the 2 primary outcomes between the decompression and placebo groups. For the study to have 90% power to show a minimal clinically important advantage of decompression over placebo, under the assumption of a 2-sided type 1 error rate of 5%, study planned to recruit 70 participants per group. Analysis: ITT analysis.
Participants	Number of participants 281 participants screened for eligibility 71 excluded before randomisation: rotator cuff tear 47; AC-joint osteoarthritis 2; calcifications 2; became asymptomatic while waiting MRA 7; MRA could not be performed 4; declined 3; other intra-articular pathology 6 210 randomised (71 exercise therapy; 139 to surgery) 5 excluded before surgery (AC-joint osteoarthritis 2; declined 2; not suitable for outpatient operation 1) 12 excluded during arthroscopy (full-thickness rotator cuff tear 6; slap or long head of biceps 5; Instability 1) 122 randomised after arthroscopy (63 to placebo and 59 to ASD) Data for 186 (68 (96%) for exercise therapy and 59 (94%) for placebo and 59 (100%) for ASD groups available) at 24-month follow-up Inclusion criteria ● Men or women ages 35 to 65 years ● Subacromial pain for greater than 3 months with no relief from non-operative means

	(physiotherapy, non-steroidal anti-inflammatory medication, corticosteroid injections, and rest) ● Pain provoked by abduction and positive painful arc sign ● Positive impingement test (temporary relief of pain by subacromial injection of lidocaine) ● Pain in at least 2 out of 3 isometric tests (abduction 0 degrees and 30 degrees or external rotation) ● Ability to speak, understand and read in the language of the clinical site Exclusion criteria ● Full-thickness tear of the rotator cuff tendons diagnosed on clinical examination (marked weakness in any of the examined muscles) or magnetic resonance imaging with intra-articular contrast ● Osteoarthritis of the glenohumeral and/or AC joint diagnosed on clinical examination and on x-rays ● Substantial calcific deposits in the rotator cuff tendons found in the preoperative imaging ● Previous surgical procedure on the affected shoulder ● Evidence of shoulder instability (positive apprehension/positive sulcus sign) ● Symptomatic cervical spine pathology ● History of alcoholism, drug abuse, psychological or psychiatric problems that are likely to invalidate informed consent Baseline characteristics ASDgroup Mean (SD) age: 50.5 (7.3) Sex female N(%): 42 (71%) Mean (SD) duration of symptoms, months: 18 (14) Mean (SD) VAS at rest: 41.3 (25.8) Mean (SD) VAS activity: 71.2 (23.6) Mean (SD) Constant score: 32.2 (15.8) Mean (SD) Simple shoulder test score: 4.9 (2.9) Mean (SD) 15D score: 0.89 (0.06) Placebo group (Arthroscopy and exercises) Age, mean (SD): 50.8 (7.6) Sex female N(%): 46 (73%) Mean duration of symptoms, months (SD): 18 (19) Mean (SD) VAS at rest: 41.6 (25.5) mean (SD) VAS at activity: 72.3 (21.7) Mean (SD) Constant-Murley Score: 31.7 (14) Mean (SD) Simple shoulder test score: 4.9 (2.9) Mean (SD) 15D score: 0.89 (0.07) Exercise therapy Mean (SD) Age: 50.4 (6.6) Sex female N(%): 47 (66%) Mean (SD) duration of symptoms, months: 22 (23) Mean (SD) VAS at rest: 41.7 (27.5) Mean (SD) VAS activity: 72.4 (20.8) Mean (SD) Constant-Murley Score: 35.2 (16.2) Mean (SD) Simple shoulder test score: 4.8 (2.7) Mean (SD) 15D score: 0.88 (0.08).
Interventions	Placebo surgery group Arthroscopic examination of the GHJ and subacromial space was performed with the use of standard posterior and lateral portals and a 4-mm arthroscope with the participant under general anaesthesia, usually supplemented with an interscalene brachial plexus block. The surgeon performed an intra-articular and subacromial assessment of the rotator cuff integrity. If the rotator cuff insertion could not be otherwise visualised, subacromial bursal tissue was bluntly stretched with a trochar or resected, keeping the resection to a minimum. If arthroscopic examination revealed any pathology requiring intervention other than decompression, the participant was excluded from the trial. For those allocated to the placebo group, the operation was terminated. The placebo participants were kept in the operating theatre for the time required to perform ASD In both the ASD and the placebo groups, the postoperative rehabilitation was identical. All surgically treated participants had 1 visit to an independent physiotherapist for guidance and instructions for home exercises. Subsequent rehabilitation was carried out according to the standardised rehabilitation protocols of the participant centres. Since the initial rehabilitation after a surgery needed to be ‘tempered’ due to joint irritation, the rehabilitation protocol of the placebo and arthroscopic decompression groups was not identical to the exercise alone group ASD group After arthroscopic examination of the shoulder (i.e. diagnostic arthroscopy as described above), the surgeon debrided the entire subacromial bursa (bursectomy) and resected the bony spurs and the projecting anterolateral undersurface of the acromion. The removal of tissue was carried out with a shaver, burr and/or electrocoagulation Exercise therapy group Supervised, progressive, individually-designed physiotherapy was started within 2 weeks of randomisation using a standardised protocol that relied primarily on daily home exercises as well as 15 visits to an independent physiotherapist. Programme was divided into 4 phases each consisting of active and passive exercises.
Outcomes	Outcomes were collected at 3, 6, 12 and 24 months. Study primary endpoint was at 24 months Primary outcomes ● Pain at rest (0-100, higher scores indicate more pain) ● Pain at arm activity (0-100, higher scores indicate more pain) Secondary outcomes ● Constant-Murley score at 6 and 24 months (0-100; higher score indicates better function) ● Simple Shoulder Test (0 to 12; higher score indicates better function) at 6 and 24 months ● Participants’ global satisfaction in VAS scale (0-100, higher score indicates better satisfaction) ● Participant global assessment of satisfaction (responder analysis) with treatment: 5-point scale (participants reporting very satisfied or satisfied) in Likert scale from 1 (dissatisfied) to 5 (very satisfied) ● Participants exceeding the threshold for minimal clinically important improvement (MCII) ● Participants exceeding the threshold for reaching the patient-acceptable symptom state (PASS) ● Participants able to return to previous leisure activities ● Participants’ guess of whether they received active treatment (proportion of correct guesses) ● Participation (number of participants able to work and do recreational activities) ● AEs Outcomes used in this review ● Mean pain; pain VAS at rest ● Mean function; Constant score ● Mean QoL; 15D ● Global assessment of success; proportion of participants reporting very satisfied or satisfied ● Number of AEs ● Participation (number absent from work and number able to do recreational activities)

Notes	Source of funding: The trial was supported by the Sigrid Juselius Foundation, the State funding for university-level health research (Tampere and Helsinki University Hospitals), the Academy of Finland, and the Jane and Aatos Erkko Foundation. The funders of the study had no role in study design, data collection, data analysis, data interpretation, or writing of the report. Sponsors had no access to the data and did not perform any of the study analysis. The corresponding authors had full access to all the data in the study and had final responsibility for the decision to submit for publication. Trial registration: ClinicalTrials.gov NCT00428870 Withdrawals: of 139 originally allocated to surgery arm, 17 were excluded before the 2nd randomisation (to either decompression or placebo) due to findings at arthroscopy. In the exercise group, 3/71 (4%) participants withdrew; in placebo surgery group 2/63 (3%) participants withdrew; and in ASD group 1 died Cross-overs: 9 (14%) participants in placebo group were unblinded before 24 months' follow-up; 8 of them received surgery (7 ASDs and 1 ASD and rotator cuff repair. 6 (10%) participants in the ASD group were unblinded before 24-month follow-up, of whom 2 were re-operated (1 resection of distal head of clavicle and 1 manipulation under anaesthesia) 15 (21%) participants in the exercise group had surgery before 24 months' follow-up (13 ASD; 1 ASD and manipulation; 1 ASD + resection of distal head of the clavicle; 1 ASD and arthroscopic capsular release) AEs: in placebo surgery group, 1 participant had temporary swelling in the brachial area related to a brachial plexus block. 3 participants who received decompression and 1 participant who received placebo developed symptoms consistent with a frozen shoulder SAEs: none Risk of bias: we separately note the risk of bias for the 2 surgery groups and the exercise group in the 'Risk of bias' table and review authors' judgements are for the comparison of the 2 surgical groups (decompression and placebo) Trial authors provided SF-36 data that were not reported in the results paper upon request. There were no between-group differences at any time point

Risk of bias table

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	An independent statistician with no involvement in the execution of the trial prepared separate randomisation lists for each study centre using a computer-generated algorithm. Block randomisation of varying sizes were used
Allocation concealment (selection bias)	Low risk	The envelopes were sealed and opaque and were kept in a secure, agreed location at each centre. The first allocation occurred after inclusion (surgery or exercise) and the second allocation (placebo or ASD) occurred in the operating theatre once the arthroscopy was performed
Blinding of participants and personnel (performance bias)	Low risk	Quote: "To ensure concealment of the participants and the staff other than those in the operating theatre, the participants were kept in the operating theatre for the required time to perform ASD. Personnel other than the surgical team were blinded to treatment intervention. All postoperative care was identical in both groups." Participants in the exercise group alone were aware of their treatment allocation (high risk). At 3 months, 42% in the placebo surgery group and 39% in the decompression group believed they had received placebo treatment
Blinding of outcome assessment (detection bias)	Low risk	Self-reported outcomes: Participants in both surgery groups were blinded to treatment allocation. 9/63 participants in the placebo surgery group and 6/59 in the decompression group requested unblinding by 24 months. Participants in the exercise group were not blinded so assessment of treatment in this group was at high risk of bias. Assessor reported outcomes: Assessors were blinded to treatment allocation for all 3 treatment groups. Outcome assessors were instructed not to ask about treatment received. Participants wore a tshirt on all follow-up examinations
Incomplete outcome data (attrition bias)	Low risk	Missing data were low and comparable between the groups: for pain and function 0- 4 participants in the decompression group (0%-7%); 2-7 participants (3%-11%) in placebo surgery; and 3-7 participants (4%- 10%) in exercise therapy group in followup points up to 24 months

Selective reporting (reporting bias)	Low risk	The results for the SF-36 were not reported in the publication but were pre-specified in the protocol. Trial authors provided these data upon request
other bias	High risk	Only 281 participants were screened for eligibility over a ten years period. Since the trial was a multicenter trial with three participating high volume orthopedics clinics it seems highly unlikely that the 281 participants accounted for in the participant flow represent the whole population of participants with shoulder impignement syndrome at hospitals. It might account for as little as 5% of the total population (https://bmj.com/content/362/bmj.k2860/rr-8). We therefore judge that the trial might have a high risk of selection bias in the screening process before randomization. 2/63 participants in the placebo group had decompression by 6 months, 8/63 by 12 months and 8/63 by 24 months. This may have underestimated any potential benefit of decompression. The trial authors excluded 17 participants in the operative arm due to findings at arthroscopy, which caused imbalance between the decompression and exercise treatment groups

Paavola 2018 (decompression vs. exercise)

Methods	Design: multicentre, 3-group, randomised, assessor- and patient-blinded, placebo-controlled trial Setting: 3 hospitals in Finland Timing: 1 February 1 2005-25 June 2015 Interventions: ASD vs placebo (arthroscopy only) vs exercise therapy Sample size: trial authors powered the study to detect a difference of at least the MCID (15 points) in the 2 primary outcomes between the decompression and placebo groups. For the study to have 90% power to show a minimal clinically important advantage of decompression over placebo, under the assumption of a 2-sided type 1 error rate of 5%, study planned to recruit 70 participants per group. Analysis: ITT analysis.
Participants	Number of participants 281 participants screened for eligibility 71 excluded before randomisation: rotator cuff tear 47; AC-joint osteoarthritis 2; calcifications 2; became asymptomatic while waiting MRA 7; MRA could not be performed 4; declined 3; other intra-articular pathology 6 210 randomised (71 exercise therapy; 139 to surgery) 5 excluded before surgery (AC-joint osteoarthritis 2; declined 2; not suitable for outpatient operation 1) 12 excluded during arthroscopy (full-thickness rotator cuff tear 6; slap or long head of biceps 5; Instability 1) 122 randomised after arthroscopy (63 to placebo and 59 to ASD) Data for 186 (68 (96%) for exercise therapy and 59 (94%) for placebo and 59 (100%) for ASD groups available) at 24-month follow-up Inclusion criteria ● Men or women ages 35 to 65 years ● Subacromial pain for greater than 3 months with no relief from non-operative means (physiotherapy, non-steroidal anti-inflammatory medication, corticosteroid injections, and rest) ● Pain provoked by abduction and positive painful arc sign ● Positive impingement test (temporary relief of pain by subacromial injection of lidocaine) ● Pain in at least 2 out of 3 isometric tests (abduction 0 degrees and 30 degrees or external rotation) ● Ability to speak, understand and read in the language of the clinical site Exclusion criteria ● Full-thickness tear of the rotator cuff tendons diagnosed on clinical examination (marked weakness in any of the examined muscles) or magnetic resonance imaging with intra-articular contrast ● Osteoarthritis of the glenohumeral and/or AC joint diagnosed on clinical examination and on x-rays ● Substantial calcific deposits in the rotator cuff tendons found in the preoperative imaging ● Previous surgical procedure on the affected shoulder ● Evidence of shoulder instability (positive apprehension/positive sulcus sign) ● Symptomatic cervical spine pathology ● History of alcoholism, drug abuse, psychological or psychiatric problems that are likely to invalidate informed consent Baseline characteristics ASDgroup Mean (SD) age: 50.5 (7.3) Sex female N(%): 42 (71%) Mean (SD) duration of symptoms, months: 18 (14) Mean (SD) VAS at rest: 41.3 (25.8) Mean (SD) VAS activity: 71.2 (23.6) Mean (SD) Constant score: 32.2 (15.8) Mean (SD) Simple shoulder test score: 4.9 (2.9) Mean (SD) 15D score: 0.89 (0.06) Placebo group (Arthroscopy and exercises) Age, mean (SD): 50.8 (7.6) Sex female N(%): 46 (73%) Mean duration of symptoms, months (SD): 18 (19) Mean (SD) VAS at rest: 41.6 (25.5) mean (SD) VAS at activity: 72.3 (21.7) Mean (SD) Constant-Murley Score: 31.7 (14) Mean (SD) Simple shoulder test score: 4.9 (2.9) Mean (SD) 15D score: 0.89 (0.07) Exercise therapy Mean (SD) Age: 50.4 (6.6) Sex female N(%): 47 (66%) Mean (SD) duration of symptoms, months: 22 (23) Mean (SD) VAS at rest: 41.7 (27.5) Mean (SD) VAS activity: 72.4 (20.8) Mean (SD) Constant-Murley Score: 35.2 (16.2) Mean (SD) Simple shoulder test score: 4.8 (2.7) Mean (SD) 15D score: 0.88 (0.08).

Interventions	Placebo surgery group Arthroscopic examination of the GHJ and subacromial space was performed with the use of standard posterior and lateral portals and a 4-mm arthroscope with the participant under general anaesthesia, usually supplemented with an interscalene brachial plexus block. The surgeon performed an intra-articular and subacromial assessment of the rotator cuff integrity. If the rotator cuff insertion could not be otherwise visualised, subacromial bursal tissue was bluntly stretched with a trochar or resected, keeping the resection to a minimum. If arthroscopic examination revealed any pathology requiring intervention other than decompression, the participant was excluded from the trial. For those allocated to the placebo group, the operation was terminated. The placebo participants were kept in the operating theatre for the time required to perform ASD In both the ASD and the placebo groups, the postoperative rehabilitation was identical. All surgically treated participants had 1 visit to an independent physiotherapist for guidance and instructions for home exercises. Subsequent rehabilitation was carried out according to the standardised rehabilitation protocols of the participant centres. Since the initial rehabilitation after a surgery needed to be 'tempered' due to joint irritation, the rehabilitation protocol of the placebo and arthroscopic decompression groups was not identical to the exercise alone group ASD group After arthroscopic examination of the shoulder (i.e. diagnostic arthroscopy as described above), the surgeon debrided the entire subacromial bursa (bursectomy) and resected the bony spurs and the projecting anterolateral undersurface of the acromion. The removal of tissue was carried out with a shaver, burr and/or electrocoagulation Exercise therapy group Supervised, progressive, individually-designed physiotherapy was started within 2 weeks of randomisation using a standardised protocol that relied primarily on daily home exercises as well as 15 visits to an independent physiotherapist. Programme was divided into 4 phases each consisting of active and passive exercises.
Outcomes	Outcomes were collected at 3, 6, 12 and 24 months. Study primary endpoint was at 24 months Primary outcomes ● Pain at rest (0-100, higher scores indicate more pain) ● Pain at arm activity (0-100, higher scores indicate more pain) Secondary outcomes ● Constant-Murley score at 6 and 24 months (0-100; higher score indicates better function) ● Simple Shoulder Test (0 to 12; higher score indicates better function) at 6 and 24 months ● Participants' global satisfaction in VAS scale (0-100, higher score indicates better satisfaction) ● Participant global assessment of satisfaction (responder analysis) with treatment: 5-point scale (participants reporting very satisfied or satisfied) in Likert scale from 1 (dissatisfied) to 5 (very satisfied) ● Participants exceeding the threshold for minimal clinically important improvement (MCII) ● Participants exceeding the threshold for reaching the patient-acceptable symptom state (PASS) ● Participants able to return to previous leisure activities ● Participants' guess of whether they received active treatment (proportion of correct guesses) ● Participation (number of participants able to work and do recreational activities) ● AEs Outcomes used in this review ● Mean pain; pain VAS at rest ● Mean function; Constant score ● Mean QoL; 15D ● Global assessment of success; proportion of participants reporting very satisfied or satisfied ● Number of AEs ● Participation (number absent from work and number able to do recreational activities)
Notes	Source of funding: The trial was supported by the Sigrid Juselius Foundation, the State funding for university-level health research (Tampere and Helsinki University Hospitals), the Academy of Finland, and the Jane and Aatos Erkko Foundation. The funders of the study had no role in study design, data collection, data analysis, data interpretation, or writing of the report. Sponsors had no access to the data and did not perform any of the study analysis. The corresponding authors had full access to all the data in the study and had final responsibility for the decision to submit for publication. Trial registration: ClinicalTrials.gov NCT00428870 Withdrawals: of 139 originally allocated to surgery arm, 17 were excluded before the 2nd randomisation (to either decompression or placebo) due to findings at arthroscopy. In the exercise group, 3/71 (4%) participants withdrew; in placebo surgery group 2/63 (3%) participants withdrew; and in ASD group 1 died Cross-overs: 9 (14%) participants in placebo group were unblinded before 24 months' follow-up; 8 of them received surgery (7 ASDs and 1 ASD and rotator cuff repair. 6 (10%) participants in the ASD group were unblinded before 24-month follow-up, of whom 2 were re-operated (1 resection of distal head of clavicle and 1 manipulation under anaesthesia) 15 (21%) participants in the exercise group had surgery before 24 months' follow-up (13 ASD; 1 ASD and manipulation; 1 ASD + resection of distal head of the clavicle; 1 ASD and arthroscopic capsular release) AEs: in placebo surgery group, 1 participant had temporary swelling in the brachial area related to a brachial plexus block. 3 participants who received decompression and 1 participant who received placebo developed symptoms consistent with a frozen shoulder SAEs: none Risk of bias: we separately

	note the risk of bias for the 2 surgery groups and the exercise group in the 'Risk of bias' table and review authors' judgements are for the comparison of the 2 surgical groups (decompression and placebo) Trial authors provided SF-36 data that were not reported in the results paper upon request. There were no between-group differences at any time point

Risk of bias table

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	An independent statistician with no involvement in the execution of the trial prepared separate randomisation lists for each study centre using a computer-generated algorithm. Block randomisation of varying sizes were used
Allocation concealment (selection bias)	Low risk	The envelopes were sealed and opaque and were kept in a secure, agreed location at each centre. The first allocation occurred after inclusion (surgery or exercise) and the second allocation (placebo or ASD) occurred in the operating theatre once the arthroscopy was performed
Blinding of participants and personnel (performance bias)	High risk	Quote: "To ensure concealment of the participants and the staff other than those in the operating theatre, the participants were kept in the operating theatre for the required time to perform ASD. Personnel other than the surgical team were blinded to treatment intervention. All postoperative care was identical in both groups." Participants in the exercise group alone were aware of their treatment allocation (high risk). At 3 months, 42% in the placebo surgery group and 39% in the decompression group believed they had received placebo treatment
Blinding of outcome assessment (detection bias)	High risk	Self-reported outcomes: Participants in both surgery groups were blinded to treatment allocation. 9/63 participants in the placebo surgery group and 6/59 in the decompression group requested unblinding by 24 months. Participants in the exercise group were not blinded so assessment of treatment in this group was at high risk of bias. Assessor reported outcomes: Assessors were blinded to treatment allocation for all 3 treatment groups. Outcome assessors were instructed not to ask about treatment received. Participants wore a tshirt on all follow-up examinations
Incomplete outcome data (attrition bias)	Low risk	Missing data were low and comparable between the groups: for pain and function 0- 4 participants in the decompression group (0%-7%); 2-7 participants (3%-11%) in placebo surgery; and 3-7 participants (4%- 10%) in exercise therapy group in followup points up to 24 months
Selective reporting (reporting bias)	Low risk	The results for the SF-36 were not reported in the publication but were pre-specified in the protocol. Trial authors provided these data upon request
other bias	High risk	Only 281 participants were screened for eligibility over a ten years period. Since the trial was a multicenter trial with three participating high volume orthopedics clinics it seems highly unlikely that the 281 participants accounted for in the participant flow represent the whole population of participants with shoulder impignement syndrome at hospitals. It might account for as little as 5% of the total population (https://bmj.com/content/362/bmj.k2860/rr-8). We therefore judge that the trial might have a high risk of selection bias in the screening process before randomization. 2/63 participants in the placebo group had decompression by 6 months, 8/63 by 12 months and 8/63 by 24 months. This may have underestimated any potential benefit of decompression. The trial authors excluded 17 participants in the operative arm due to findings at arthroscopy, which caused imbalance between the decompression and exercise treatment groups.

Rahme 1998

Methods	Design: RCT Setting: orthopedic department in a public hospital in Sweden Timing: 1986-1988 Interventions: open subacromial decompression versus physiotherapy Sample size: 42 participants, power analysis not reported Analysis: as-treated analysis
Participants	Number of participants Participants screened for eligibility: not reported 42 randomised (21 to exercise therapy; 21 to surgery) Data for 39 (18 (86%) for exercise therapy and 21 (100%) for ASD) at 6-month and 12-month follow-up points Inclusion criteria ● Isolated shoulder disease ● Working age ● Pain at rest for ≥ 12 months and accentuated by elevation ● Positive impingement sign (pain elicited by forced elevation and internal rotation) ● Positive impingement test (pain on elevation markedly reduced by local anaesthetic injection into subacromial space) Exclusion criteria ● Patients with glenohumeral osteoarthrosis ● Patients requiring resection of the acromio-clavicular joint Baseline characteristics Group data not reported separately Mean age (range): 42 (28-63) years female n (%): 23 (55%)
Interventions	ASD Open anterior acromioplasty (Neer technique) with any portion of the acromion which extended beyond the anterior border of the clavicle being osteotomised vertically before removing the area of the anteroinferior surface of the acromion; followed by a physiotherapy regime including exercise and education, starting about 3 months after surgery Exercise therapy The physiotherapy regime was based mainly on the principles of Bohmer: information to the participant on functional anatomy and biomechanics of the shoulder; advice on how to avoid positions for 'wear and tear' of the subacromial structures; unloaded movements of the shoulder; measures to normalise the scapulohumeral rhythm and to increase postural awareness; strengthening of the shoulder muscles and endurance training. Submaximal training of the rotator cuff was started about 3 months after the operation in group 1 and when pain had subsided in group 2. Initially all participants were seen 2-3 times per week and the intervals between treatments were successively increased as they became more familiar with the object of the exercises
Outcomes	The outcomes were measured at 8 weeks, 16 weeks, 6 months and 12 months Outcomes ● Pain at rest (measurement scale 0-10; reported as proportion of participants reaching > 50% reduction) ● Pain while performing 'pour out of a pot' manoeuvre (0-10, higher indicates worse pain) ● Motor performance 'pour out of a pot' manoeuvre (0-4, 4 indicating normal performance) ● 'Hand in neck' manoeuvre (0-5, higher score indicating better function/reach) ● Active and passive ROM (scale and method not described) ● Grip strength (dynamometer, not reported) ● Force of wrist extensors (manual assessment, not reported) Outcomes used in this review ● Global assessment of treatment success; number of participants with > 50% improvement in pain
Notes	Source of funding: Not reported. Trial registration: not registered Data analysis: pain values or variance not reported. We requested absolute values from the trial author, but did not receive additional data. We included data for the participants in the exercise group who received surgery in the exercise group for the purpose of metaanalysis (only data for participant global success available from the published report) Withdrawals: 3 participants in exercise group dropped out Cross-overs: participants were allowed cross-over from exercise to surgery after 6 months. In exercise group, 12 (57%) participants were operated before 1-year follow-up. 6 participants in surgery group had full-thickness tears, which were repaired in conjunction with ASD AEs: none reported, unclear if they were measured SAEs: none reported, unclear if they were measured

Risk of bias table

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	The participants were randomised to 2 treatment groups using blocked randomisation. Sequence generation not reported.
Allocation concealment (selection bias)	Unclear risk	Allocation concealment not reported.

Blinding of participants and personnel (performance bias)	High risk	The participants and personnel were likely not blinded to treatment allocation (not explicitly reported).
Blinding of outcome assessment (detection bias)	High risk	The participants were not blinded, selfreported outcomes
Incomplete outcome data (attrition bias)	Unclear risk	3/21 (14%) participants dropped out from the exercise group and reasons were not provided.
Selective reporting (reporting bias)	High risk	The outcomes specified in the methods were not reported consistently and at all time points. Only 6-month and 12-month results for pain were reported
other bias	High risk	3/21 (14%) participants had full-thickness tears identified at arthroscopy in the operative group while the number of participants with similar tears in the exercise group is unknown. 12/21 (57%) of participants originally allocated to exercises crossed over to surgery after 6 months. The trial authors analysed them as a separate group (not an ITT analysis)

Footnotes

Characteristics of excluded studies

Footnotes

Characteristics of studies awaiting classification

Footnotes

Characteristics of ongoing studies

Footnotes

References to studies

Included studies

Brox 1993

Ketola 2009

Paavola 2018 (decompression vs. diag. arthroscopy)

Published and unpublished data

Paavola 2018 (decompression vs. exercise)

Published and unpublished data

[Empty]

Rahme 1998

Excluded studies

Data and analyses

1 Subacromial decompression vs no treatment

Outcome or Subgroup	Studies	Participants	Statistical Method	Effect Estimate
1.1 Smerte (Pain)	1		Mean Difference (IV, Fixed, 95% CI)	Subtotals only
1.1.2 6 months	1	120	Mean Difference (IV, Fixed, 95% CI)	0.02 [-0.85, 0.89]
1.1.3 1 year	1	111	Mean Difference (IV, Fixed, 95% CI)	-0.48 [-1.39, 0.43]
1.2 Funktion (Function)	1		Mean Difference (IV, Fixed, 95% CI)	Subtotals only
1.2.1 6 months	1	120	Mean Difference (IV, Fixed, 95% CI)	-6.20 [-12.02, -0.38]
1.2.2 1 year	1	117	Mean Difference (IV, Fixed, 95% CI)	4.20 [-1.61, 10.01]
1.3 Patientoplevet effekt, global (Global perceived effect)	1		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
1.3.1 6 months	1	113	Risk Ratio (M-H, Fixed, 95% CI)	1.02 [0.75, 1.39]
1.3.2 1 year	1	111	Risk Ratio (M-H, Fixed, 95% CI)	1.02 [0.80, 1.30]
1.4 Helbredsrelateret livskvalitet (Health-related quality of life)	1		Mean Difference (IV, Fixed, 95% CI)	Subtotals only
1.4.2 6 months	1	110	Mean Difference (IV, Fixed, 95% CI)	0.00 [-0.02, 0.02]
1.4.3 1 year	1	107	Mean Difference (IV, Fixed, 95% CI)	-0.01 [-0.02, 0.00]
1.5 Tilbagevenden til arbejde (number at work)	1		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
1.5.2 6 months	1	114	Risk Ratio (M-H, Fixed, 95% CI)	1.08 [0.91, 1.28]
1.5.3 1 year	1	111	Risk Ratio (M-H, Fixed, 95% CI)	1.05 [0.89, 1.23]
1.6 Frossen skulder, antal personer med (frozen shoulder)	1	122	Risk Ratio (M-H, Fixed, 95% CI)	3.20 [0.34, 29.94]

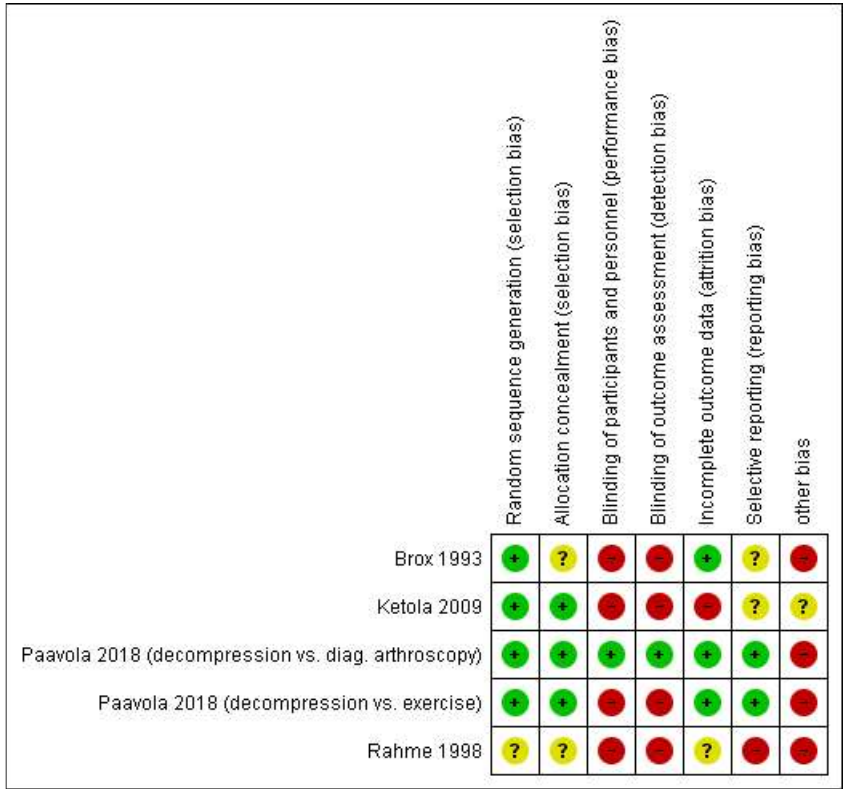
1.7 Alvorlige birvirkninger (serious adverse events)	1	122	Risk Difference (M-H, Fixed, 95% CI)	0.00 [-0.03, 0.03]

2 Subacromial decompression vs non-operative treatment (exercise)

Outcome or Subgroup	Studies	Participants	Statistical Method	Effect Estimate
2.1 Smerte (Pain)	3		Mean Difference (IV, Random, 95% CI)	Subtotals only
2.1.2 6 months	3	315	Mean Difference (IV, Random, 95% CI)	-0.69 [-1.30, -0.08]
2.1.3 1 year	2	232	Mean Difference (IV, Random, 95% CI)	-1.16 [-1.80, -0.52]
2.2 Funktion (Function)	3		Mean Difference (IV, Random, 95% CI)	Subtotals only
2.2.2 6 months	3	314	Mean Difference (IV, Random, 95% CI)	5.35 [-2.09, 12.79]
2.2.3 1 year	1	113	Mean Difference (IV, Random, 95% CI)	16.80 [5.09, 28.51]
2.3 Patientoplevet effekt, global (Global perceived effect)	2		Risk Ratio (M-H, Random, 95% CI)	Subtotals only
2.3.1 6 months	2	161	Risk Ratio (M-H, Random, 95% CI)	1.47 [0.74, 2.91]
2.3.2 1 year	2	158	Risk Ratio (M-H, Random, 95% CI)	1.21 [0.96, 1.51]
2.4 Helbredsrelateret livskvalitet (Health-related quality of life)	1		Mean Difference (IV, Fixed, 95% CI)	Subtotals only
2.4.2 6 months	1	119	Mean Difference (IV, Fixed, 95% CI)	0.02 [0.01, 0.03]
2.4.3 1 year	1	116	Mean Difference (IV, Fixed, 95% CI)	0.01 [-0.01, 0.03]
2.5 Tilbagevenden til arbejde (number at work)	2		Risk Ratio (M-H, Random, 95% CI)	Subtotals only
2.5.2 6 months	2	187	Risk Ratio (M-H, Random, 95% CI)	1.05 [0.81, 1.36]
2.5.3 1 year	1	119	Risk Ratio (M-H, Random, 95% CI)	0.98 [0.85, 1.13]
2.6 Frossen skulder (frozen shoulder)	1	130	Risk Ratio (M-H, Fixed, 95% CI)	1.81 [0.31, 10.45]
2.7 Alvorlige bivrikninger (seroius adverse events)	3	365	Risk Difference (M-H, Fixed, 95% CI)	0.00 [-0.02, 0.02]

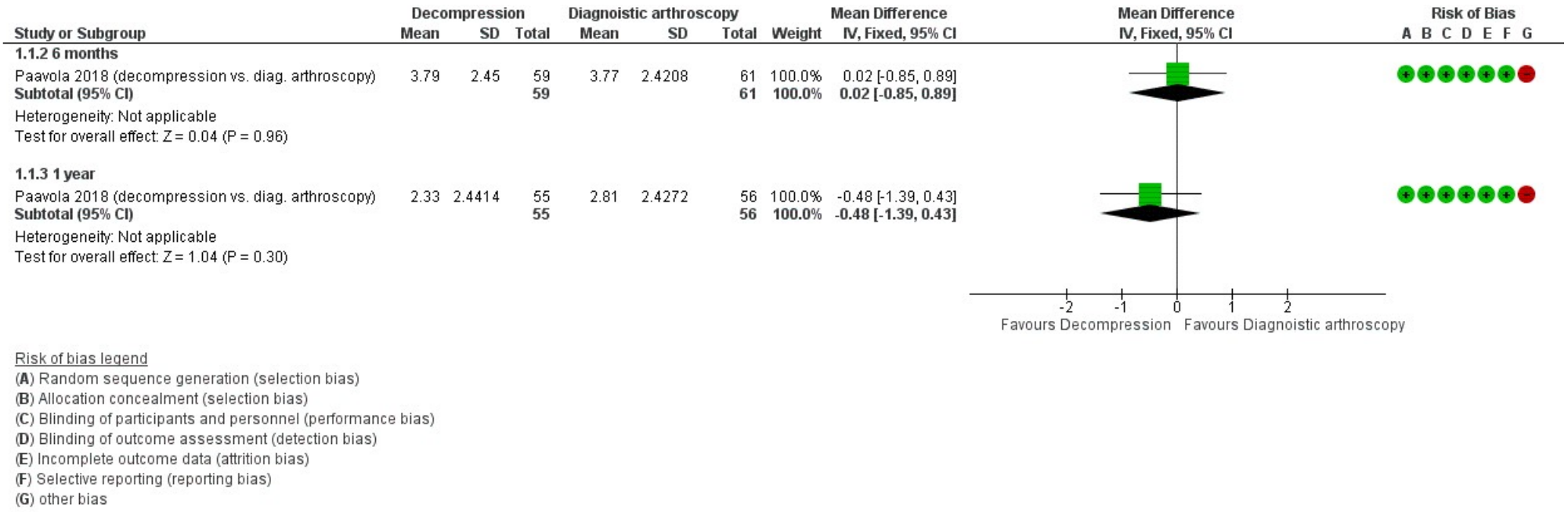
Figures

Figure 1



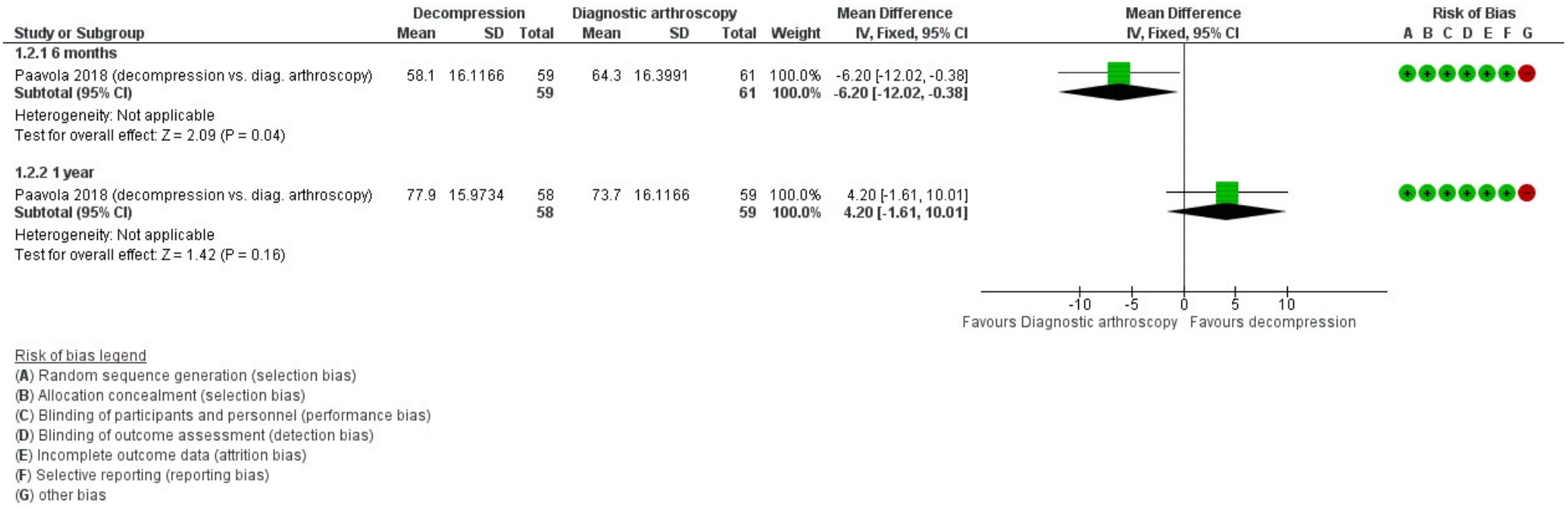
Risk of bias summary: review authors' judgements about each risk of bias item for each included study.

Figure 2 (Analysis 1.1)



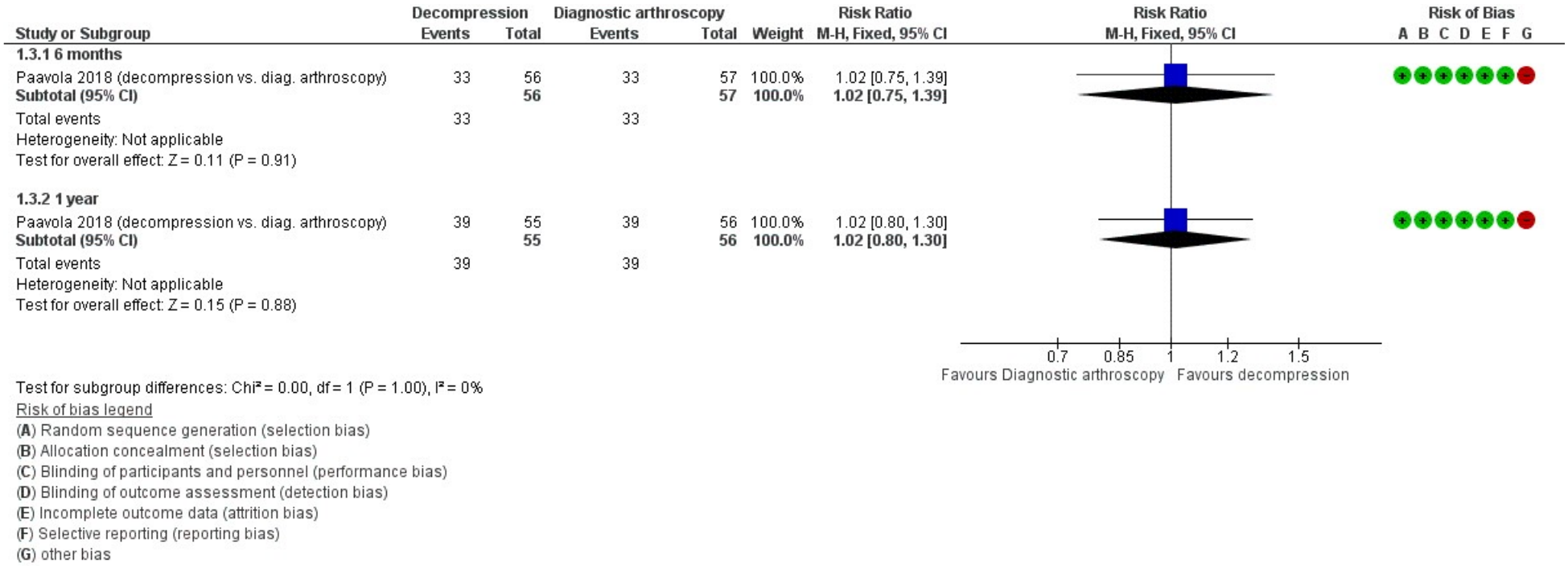
Forest plot of comparison: 1 Subacromial decompression vs no treatment, outcome: 1.1 Smerte (Pain).

Figure 3 (Analysis 1.2)



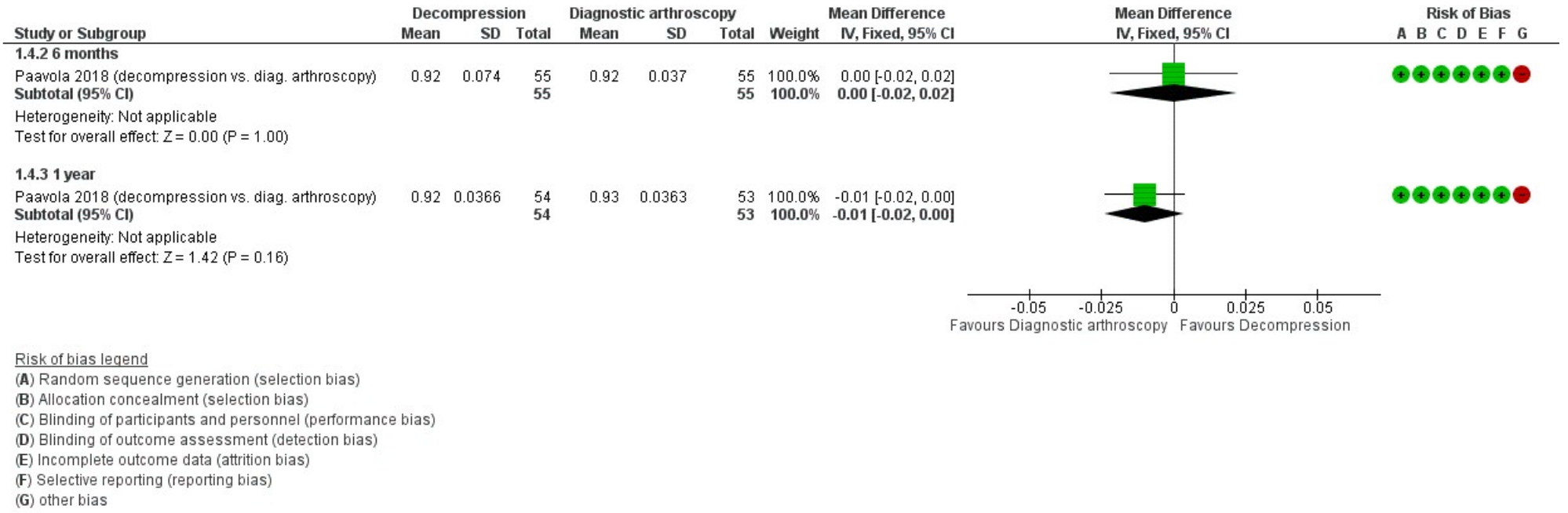
Forest plot of comparison: 1 Subacromial decompression vs no treatment, outcome: 1.2 Funktion (Function).

Figure 4 (Analysis 1.3)



Forest plot of comparison: 1 Subacromial decompression vs no treatment, outcome: 1.3 Patientoplevet effekt, global (Global perceived effect).

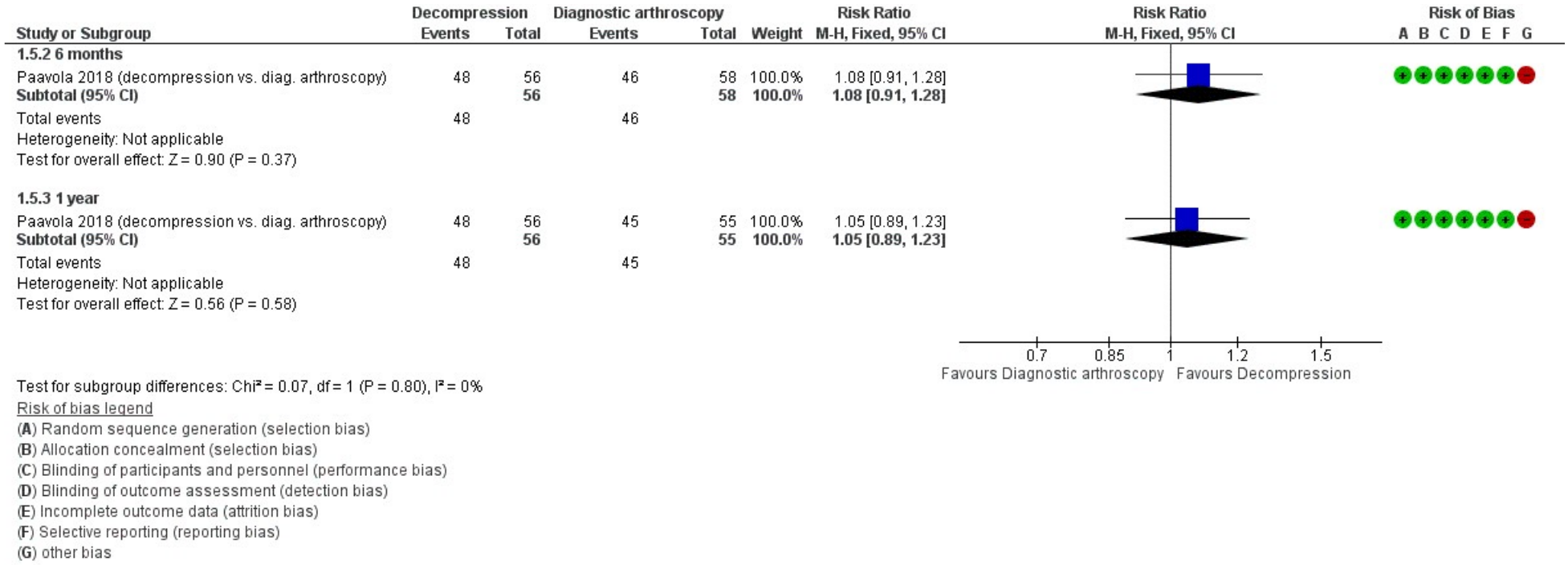
Figure 5 (Analysis 1.4)



Risk of bias legend
(**A**) Random sequence generation (selection bias)
(**B**) Allocation concealment (selection bias)
(**C**) Blinding of participants and personnel (performance bias)
(**D**) Blinding of outcome assessment (detection bias)
(**E**) Incomplete outcome data (attrition bias)
(**F**) Selective reporting (reporting bias)
(**G**) other bias

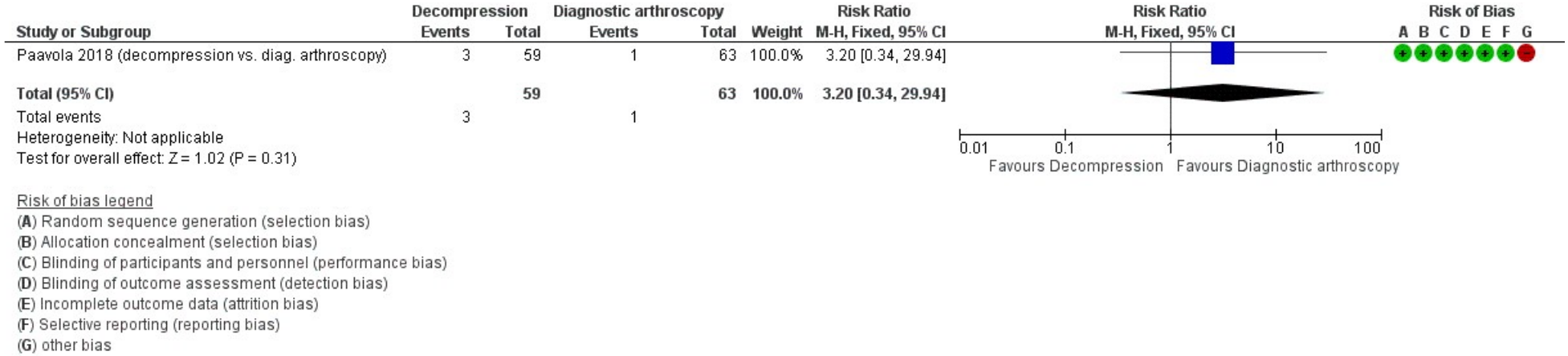
Forest plot of comparison: 1 Subacromial decompression vs no treatment, outcome: 1.4 Helbredsrelateret livskvalitet (Health-related quality of life).

Figure 6 (Analysis 1.5)



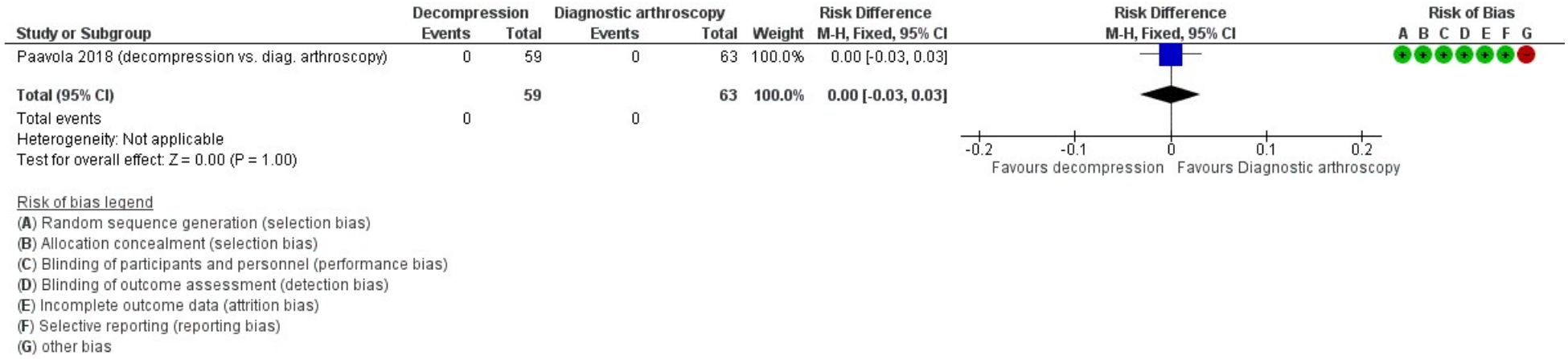
Forest plot of comparison: 1 Subacromial decompression vs no treatment, outcome: 1.5 Tilbagevenden til arbejde (number at work).

Figure 7 (Analysis 1.6)



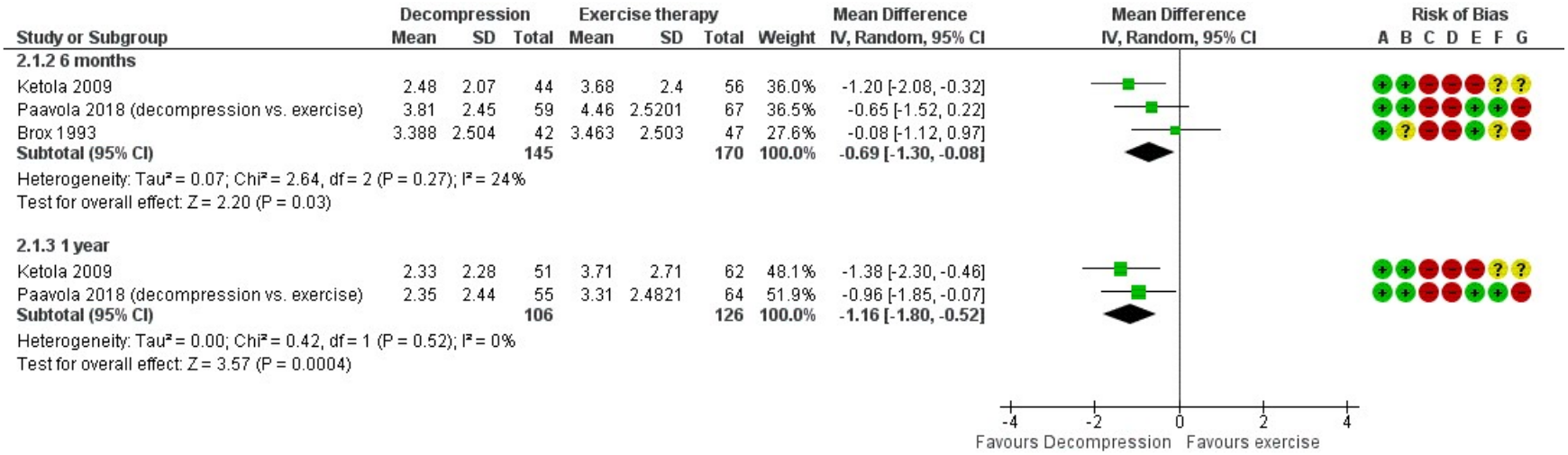
Forest plot of comparison: 1 Subacromial decompression vs no treatment, outcome: 1.6 Frossen skulder, antal personer med (frozen shoulder).

Figure 8 (Analysis 1.7)



Forest plot of comparison: 1 Subacromial decompression vs no treatment, outcome: 1.7 Alvorlige birvirkninger (serious adverse events).

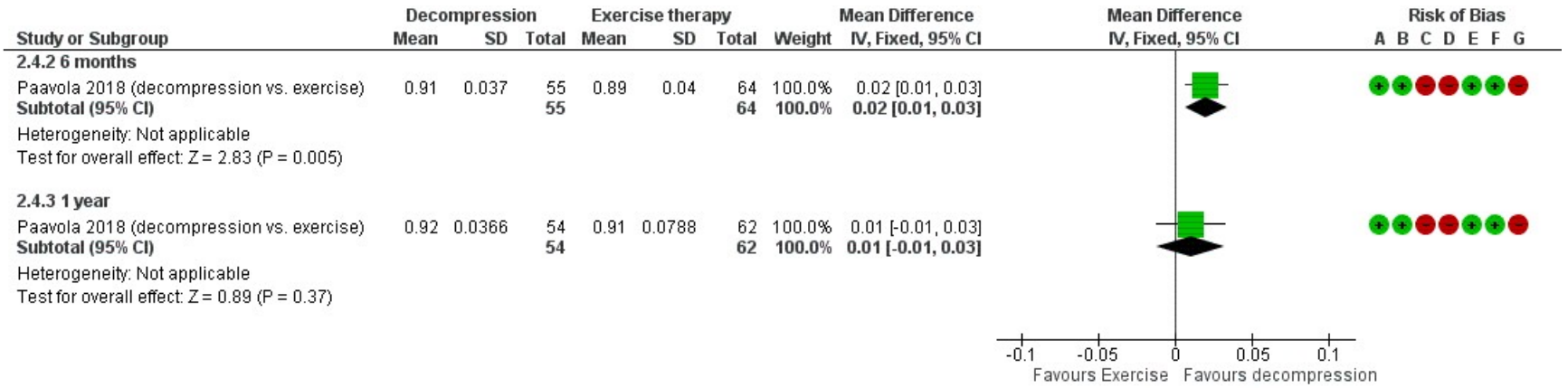
Figure 9 (Analysis 2.1)



Risk of bias legend
(**A**) Random sequence generation (selection bias)
(**B**) Allocation concealment (selection bias)
(**C**) Blinding of participants and personnel (performance bias)
(**D**) Blinding of outcome assessment (detection bias)
(**E**) Incomplete outcome data (attrition bias)
(**F**) Selective reporting (reporting bias)
(**G**) other bias

Forest plot of comparison: 2 Subacromial decompression vs non-operative treatment (exercise), outcome: 2.1 Smerte (Pain).

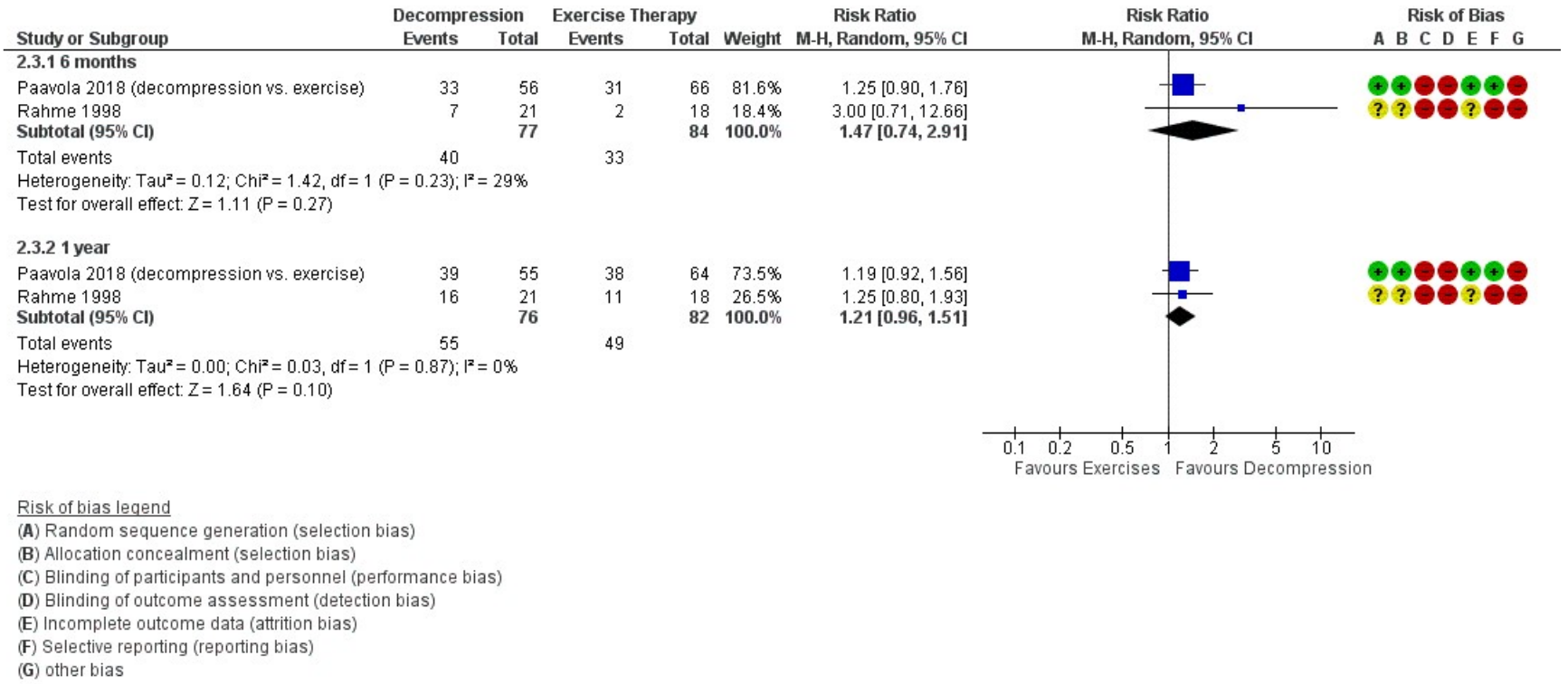
Figure 10 (Analysis 2.4)



Risk of bias legend
(**A**) Random sequence generation (selection bias)
(**B**) Allocation concealment (selection bias)
(**C**) Blinding of participants and personnel (performance bias)
(**D**) Blinding of outcome assessment (detection bias)
(**E**) Incomplete outcome data (attrition bias)
(**F**) Selective reporting (reporting bias)
(**G**) other bias

Forest plot of comparison: 2 Subacromial decompression vs non-operative treatment (exercise), outcome: 2.4 Helbredsrelateret livskvalitet (Health-related quality of life).

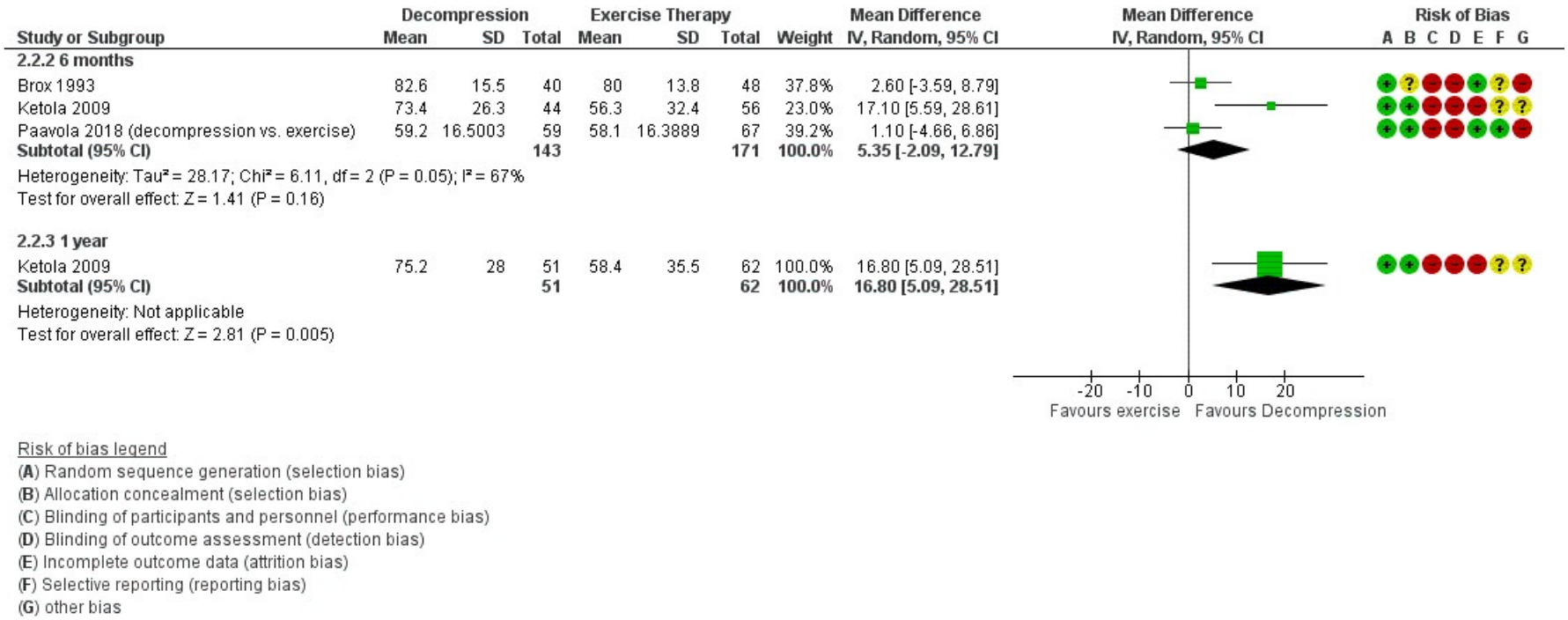
Figure 11 (Analysis 2.3)



Risk of bias legend
(**A**) Random sequence generation (selection bias)
(**B**) Allocation concealment (selection bias)
(**C**) Blinding of participants and personnel (performance bias)
(**D**) Blinding of outcome assessment (detection bias)
(**E**) Incomplete outcome data (attrition bias)
(**F**) Selective reporting (reporting bias)
(**G**) other bias

Forest plot of comparison: 2 Subacromial decompression vs non-operative treatment (exercise), outcome: 2.3 Patientoplevet effekt, global (Global perceived effect).

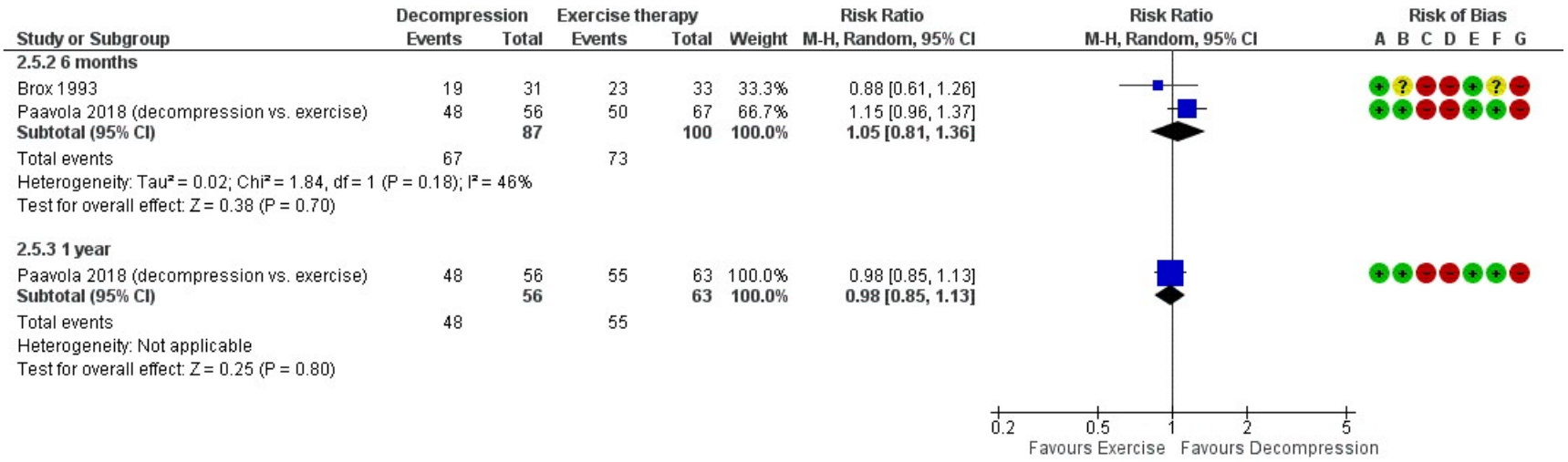
Figure 12 (Analysis 2.2)



Risk of bias legend
(**A**) Random sequence generation (selection bias)
(**B**) Allocation concealment (selection bias)
(**C**) Blinding of participants and personnel (performance bias)
(**D**) Blinding of outcome assessment (detection bias)
(**E**) Incomplete outcome data (attrition bias)
(**F**) Selective reporting (reporting bias)
(**G**) other bias

Forest plot of comparison: 2 Subacromial decompression vs non-operative treatment (exercise), outcome: 2.2 Funktion (Function).

Figure 13 (Analysis 2.5)



Risk of bias legend
(**A**) Random sequence generation (selection bias)
(**B**) Allocation concealment (selection bias)
(**C**) Blinding of participants and personnel (performance bias)
(**D**) Blinding of outcome assessment (detection bias)
(**E**) Incomplete outcome data (attrition bias)
(**F**) Selective reporting (reporting bias)
(**G**) other bias

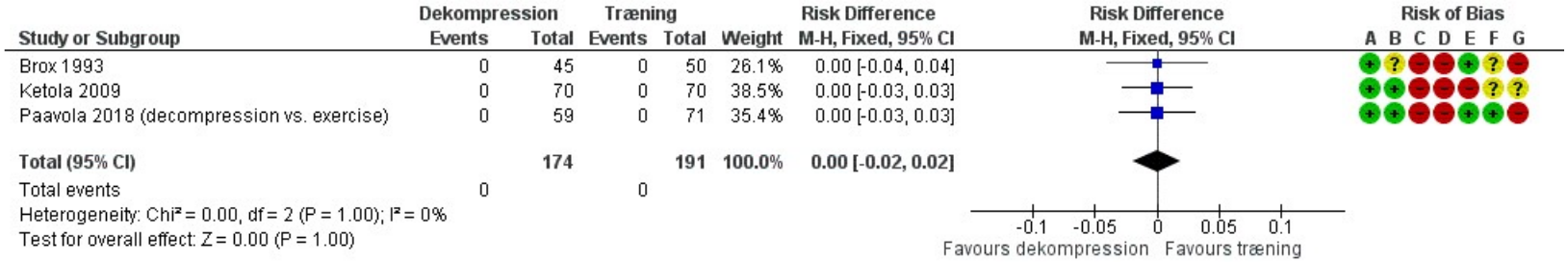
Forest plot of comparison: 2 Subacromial decompression vs non-operative treatment (exercise), outcome: 2.5 Tilbagevenden til arbejde (number at work).

Figure 14 (Analysis 2.6)

Risk of bias legend
(A) Random sequence generation (selection bias)
(B) Allocation concealment (selection bias)
(C) Blinding of participants and personnel (performance bias)
(D) Blinding of outcome assessment (detection bias)
(E) Incomplete outcome data (attrition bias)
(F) Selective reporting (reporting bias)
(G) other bias

Forest plot of comparison: 2 Subacromial decompression vs non-operative treatment (exercise), outcome: 2.6 Frossen skulder (frozen shoulder).

Figure 15 (Analysis 2.7)



Risk of bias legend
(A) Random sequence generation (selection bias)
(B) Allocation concealment (selection bias)
(C) Blinding of participants and personnel (performance bias)
(D) Blinding of outcome assessment (detection bias)
(E) Incomplete outcome data (attrition bias)
(F) Selective reporting (reporting bias)
(G) other bias

Forest plot of comparison: 2 Subacromial decompression vs non-operative treatment (exercise), outcome: 2.7 Alvorlige bivrikninger (seroius adverse events).