**S1 Table.** Heterogeneity Tests, Meta-Analyses and Sensitivity Analyses.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Outcomes** | **No. of study** | **Eligible patients** | **Heterogeneity test** | **SMD (95%CI); *P* value** |
| **Pain** | | | | |
| all include | 16 | 840 | *P* = 0.000 (*I*2 = 86.6%) | -0.520 (-0.926, -0.114); *P* = 0.012 |
| with omission | 9 | 545 | *P* = 0.100 (*I*2 = 40.2%) | -0.481 (-0.653, -0.309); *P* = 0.000 |
| study excluded | 7 | 295 | *P* = 0.000 (*I*2 = 93.9%) | -0.743 (-1.837, 0.352); *P* = 0.183 |
| **Follow up-Pain** | | | | |
| all included | 4 | 325 | *P* = 0.000 (*I*2 = 97.0%) | -0.248 (-1.923, 1.427); *P* = 0.772 |
| **CROM** | | | | |
| **flexion** | 8 | 389 | *P* = 0.000 (*I*2 = 87.3%) | 0.921( 0.287, 1.555), *P* = 0.000 |
| **extension** |  |  |  |  |
| all include | 8 | 389 | *P* =0.000 (*I*2=81.1%) | 0.667( 0.161, 1.174), *P* = 0.01 |
| with omission | 5 | 257 | *P* = 0.551(*I*2=0%) | 0.572(0.321, 0.822), *P* = 0.000 |
| study excluded | 3 | 132 | *P* =0.000 (*I*2=93.7%) | 1.620(-0.033, 3.273), *P* = 0.055 |
| **left lateral flexion** | 7 | 358 | *P* =0.000 (*I*2=80.4%) | 0.593(0.075, 1.112), *P* = 0.025 |
| **right lateral flexion** |  |  |  |  |
| all include | 7 | 358 | *P* =0.000(*I*2=80.5%) | 0.612(0.090,1.133), *P* =0.022 |
| with omission | 5 | 295 | *P* =0.047(*I*2=0%) | 0.195(-0.034,0.425), *P* =0.095 |
| study excluded | 2 | 63 | *P* =0.30(*I*2=6.8%) | 1.893(1.251, 2.535), *P* =0.000 |
| **Left rotation** |  |  |  |  |
| all include | 8 | 390 | *P* =0.002(*I*2=77.4%) | 0.440(0.031,0.849), *P* =0.035 |
| with omission | 6 | 327 | *P* =0.472(*I*2=0%) | 0.230(0.010, 0.450), *P* =0.040 |
| study excluded | 2 | 63 | *P* =0.300(*I*2=6.8%) | 1.879(1.276, 2.482), *P* = 0.000 |
| **Right rotation** |  |  |  |  |
| all include | 8 | 390 | *P* =0.002(*I*2=69.6%) | 0.468(0.072, 0.864), *P* =0.077 |
| with omission | 6 | 327 | *P* =0.246(*I*2=25.1%) | 0.212 (-0.053, 0.477), *P* =0.117 |
| study excluded | 2 | 63 | *P* = 0.479(*I*2=0%) | 1.458(0.896, 2.020), *P* = 0.000 |
| **Disability** | | | | |
| all included | 8 | 489 | *P* = 0.000 (*I2* = 95.3%) | -1.435 (-2.480, -0.390); *P* = 0.007 |
| **Follow up-Disability** | | | | |
| all included | 3 | 284 | *P* = 0.000 (*I2* = 98.7%) | -1.512 (-4.859, 1.835); *P* = 0.376 |
| **QOL-MCS** | | | | |
| all included | 1 | 120 | - | -0.107 (-0.465, 0.251); *P* = 0.558 |
| **QOL-PCS** | | | | |
| all included | 1 | 120 | - | 0.658 (0.290, 1.025); *P* = 0.000 |

**S2 Table.** Sub-Groups Analyses and Meta-Regression Analyses.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Outcomes &**  **Sub-groups** | | **No. of**  **study** | **patients** | | **Heterogeneity**  **test** | **SMD/RR (95%CI)**  ***P* value** | **Heterogeneity in sub-groups** | | **Meta-regression** | |
| **Pain (included studies)** | | | | | | | | | | |
| **Duration** | **A+S** | 6 | 344 | *P* =0.000(*I*2 =89.7 %) | | --0.676(-1.451,0.099); *p* = 0.087 | *P* = 0.000 | | | *P* = 0.893 |
| **C** | 8 | 437 | *P* =0.000(*I*2 =84.8 %) | | -0.539(-1.069,-0.010), *p* = 0.046 |  | | |  |
| **Course of treatment** | **Immediately** | 7 | 322 | *P* =0.015(*I*2 =61.9 %) | | -0.058(-0.435, 0.319),*p* = 0.762 | *P* = 0.000 | | | *P* = 0.766 |
| **Continued** | 9 | 519 | *P* =0.000(*I*2 =87.6 %) | | -0.850(-1.417,-0.283); *p* = 0.003 |  |  | | |
| **Direction** | **Distraction** | 2 | 90 | *P* =0.000(*I*2 =93.0 %) | | - -0.369(-1.530,0.791), *p* = 0.533 | *P* = 0.000 | *P* = 0.113 | | |
| **Posterior-anterior** | 6 | 632 | *P* =0.000(*I*2 =85.4 %) | | -0.449(-0.944,0.047),*p* = 0.076 |  |  | | |
| **Screw thrust** | 1 | 26 | *P*=0.000(*I*2=82.2%) | | -0.003(-0.771,0.776), *p* = 0.995 |  |  | | |
| **Comparison** | **Placebo** | 5 | 223 | *P* =0.011(*I*2 =69.5 %) | | -0.222(-0.752, 0.309), *p* = 0.412 | *P* = 0.000 | *P* = 0.349 | | |
| **Exercise** | 5 | 267 | *P* =0.000(*I*2 =93.3%) | | -0.492(-1.656,0.671), *p =* 0.407 |  |  | | |
| **Pain (excluded studies)** | | | | | | | | | | |
| **Duration** | **A+S** | 3 | 93 | *P*=0.000(*I*2= 95.5%) | | -0.955(-1.456, -0.454), *p* = 0.000 | *P*=0.000 |  | | |
| **C** | 4 | 203 | *P*=0.000(*I*2=95.0%) | | -0.380(-0.715, -0.045), *p* = 0.026 |  |  | | |
| **Course of treatment** | **Immediately** | 4 | 130 | *P*=0.001(*I*2= 86.5%) | | 0.136(-0.176, 0.448), *p* = 0.394 | *P*=0.000 |  | | |
| **Continued** | 3 | 166 | *P*=0.000(*I*2= 94.3%) | | -1.369(-1.804, -0.934), *p* = 0.000 |  |  | | |
| **Direction** | **Distraction** | 2 |  | *P*=0.000(*I*2= 97.7%) | | -0.7069-1.303,-0.109), *p* = 0.020 |  |  | | |
| **Posterior-anterior** | 3 |  | *P*=0.000(*I*2= 93.4%) | | -0.284(-0.620, 0.052), *p* = 0.097 |  |  | | |
| **Comparison** | **Placebo** | 2 | 124 | *P*=0.000(*I*2= 92.2%) | | 0.005(-0.357, 0.367), *p* = 0.978 | P=0.000 |  | | |
| **Exercise** | 4 | 172 | *P*=0.000(*I*2= 94.8%) | | -0.315(-0.719, 0.0880, *p* = 0.126 |  |  | | |
| **ROM-** **flexion (included studies)** | | | | | | | | | | |
| **Duration** | **A+S** | 3 | 108 | *P*=0.000(*I*2 =87.1%) | | 1.848(1.376, 2.321), *p* = 0.000 | *P*=0.000 |  | | |
| **C** | 4 | 239 | *P* =0.005(*I*2=76.8%) | | 0.596(0.333, 0.859), *p* = 0.000 |  |  | | |
| **Course of treatment** | **Immediately** | 3 | 130 | *P* =0.839(*I*2= 0.0%) | | 0.038( -0.306, 0.382), *p* = 0.828 | *P*=0.000 |  | | |
| **Continued** | 5 | 259 | *P* =0.000((*I*2=83.9%) | | 1.269(0.994, 1.544), *p* = 0.000 |  |  | | |
| **Direction** | **Distraction** | 2 | 90 | *P* =0.215(*I*2 =35.1 %) | | 2.389(1.707, 3.071),*p* = 0.000 | *P*=0.000 |  | | |
| **Posterior- anterior** | 2 | 182 | *P*=0.002(*I*2=89.1%) | | 0.438(-0.509, 1.385), *p* = 0.365 |  |  | | |
| **Screw thrust** | 1 | 26 | *-* | | 0.208(-0.563,0.979), *p* =0.597 |  |  | | |
| **Comparison** | **Placebo** | 1 | 26 | *-* | | 0.208(-0.563, 0.979), *p* = 0.597 | *P* = 0.000 |  | | |
| **Exercise** | 2 | 73 | *P*=0.000(*I*2=81.6%) | | 0.521( 0.044, 0.998), *p* = 0.032 |  |  | | |
| **ROM-extension** | | | | | | | | | | |
| **Duration** | **A+S** | 3 | 90 | *P*=0.066(*I*2 =63.2%) | | 1.457(1.025, 1.890), *p* = 0.000 | *P* = 0.000 |  | | |
| **C** | 4 | 239 | *P*=0.386(*I*2 =1.2%) | | 0.573(0.313, 0.832), *p* = 0.000 |  |  | | |
| **Course of treatment** | **Immediately** | 3 | 120 | *P*=0.074(*I*2= 61.7%) | | 0.024(-0.323, 0.372), *p* = 0.890 | *P* =0.000 |  | | |
| **Continued** | 5 | 258 | *P*=0.014(*I*2= 68.0%) | | 1.004(0.742, 1.267), *p* = 0.000 |  |  | | |
| **Direction** | **Distraction** | 2 | 90 | *P*=0.298(*I*2=7.5%) | | 1.695(1.189, 2.200), *p* = 0.000 | *P* =0.000 |  | | |
| **Posterior-anterior** | 2 | 182 | *P*=0.100(*I*2= 63.0%) | | 0.562(0.052, 1.071), *p* = 0.031 |  |  | | |
| **Screw thrust** | 1 | 26 | *-* | | 0.367(-0.409, 1.143), *p* = 0.354 |  |  | | |
| **Comparison** | **Placebo** | 1 | 26 | *\_* | | 0.36( -0.409, 1.143), *p* = 0.354 | *P* =0.000 |  | | |
| **Exercise** | 2 | 73 | *P*=0.022(*I*2= 80.9%) | | -0.098(-0.566, 0.370), *p* = 0.682 |  |  | | |
| **ROM****-left lateral flexion** | | | | | | | | | | |
| **Duration** | **A+S** | 3 | 90 | *P* =0.000(*I*2*=*88.7%) | | 1.162(-0.165,2.488), *p* = 0.086 | *P* =0.000 |  | | |
| **C** | 3 | 208 | *P* =0.017(*I*2*=*75.6%) | | 0.406(-0.212,.023), *p* = 0.198 |  |  | | |
| **Course of treatment** | **Immediately** | 3 | 120 | *P*=0.357(*I*2= 2.8%) | | 0.045(-0.306, 0.397), *p* = 0.800 | *P* =0.000 |  | | |
| **Continued** | 4 | 227 | *P*=0.000(*I*2= 83.1%) | | 0.994(0.228, 1.759), *p* = 0.011 |  |  | | |
| **Direction** | **Distraction** | 2 | 90 | *P*=0.001(*I*2= 90.4%) | | 0.654( -0.759, 2.066), *p* = 0.364 | *P* =0.000 |  | | |
| **Posterior-anterior** | 2 | 182 | *P*=0.004(*I*2= 87.7%) | | 0.347(-0.541, 1.235), *p* = 0.444 |  |  | | |
| **Screw thrust** | 1 | 26 | *-* | | 0.549(-0.235, 1.334), *p* = 0.170 |  |  | | |
| **Comparison** | **Placebo** | 1 | 26 | *-* | | 0.549( -0.235, 1.334) , *p* = 0.170 | *P* =0.000 |  | | |
| **Exercise** | 1 | 42 | *-* | | 2.417(1.166, 3.668), *p* = 0.000 |  |  | | |
| **ROM-****right lateral flexion** | | | | | | | | | | |
| **Duration** | **A+S** | 3 | 90 | *P*=0.000(*I*2= 88.8%) | | 1.355( -0.008, 2.718), *p* = 0.051 | *P* =0.000 |  | | |
| **C** | 3 | 208 | *P*=0.482(*I*2= 0.0%) | | 0.290(0.016, 0.564), *p* = 0.038 |  |  | | |
| **Course of treatment** | **Immediately** | 3 | 120 | *P*=0.240(*I*2= 29.8%) | | 0.133( -0.291, 0.557), *p* = 0.538 | *P* =0.000 |  | | |
| **Continued** | 4 | 227 | *P*=0.000(*I*2= 87.2%) | | 1.020(0.137, 1.904), *p* = 0.024 |  |  | | |
| **Direction** | **Distraction** | 2 | 90 | *P*=0.001(*I*2= 91.6%) | | 0.902( -0.653, 2.457), *p* = 0.256 | *P* =0.000 |  | | |
| **Posterior-anterior** | 2 | 182 | *P*=0.504(*I*2= 0.0%) | | 0.238( -0.054, 0.530), *p* = 0.110 |  |  | | |
| **Screw thrust** | 1 | 26 | *-* | | 0.672(-0.120, 1.464), *p* = 0.096 |  |  | | |
| **Comparison** | **Placebo** | 1 | 26 | *-* | | 0.672( -0.120, 1.464), *p* = 0.096 | *P* =0.000 |  | | |
| **Exercise** | 1 | 42 | *-* | | 2.465(1.203, 3.728), *p* = 0.000 |  |  | | |
| **ROM-left rotation** | | | | | | | | | | |
| **Duration** | **A+S** | 3 | 108 | *P=0.000*(I2*= 88.8%)* | | 1.355( -0.008, 2.718), *p* = 0.051 | *P* =0.000 |  | | |
| **C** | 3 | 208 | *P=0.482*(I2*= 0.0%)* | | 0.290(0.016, 0.564), *p* = 0.038 |  |  | | |
| **Course of treatment** | **Immediately** | 4 | 162 | *P=0.241*(I2*= 28.5%)* | | 0.226( -0.155, 0.608), *p* = 0.245 | *P* =0.000 |  | | |
| **Continued** | 4 | 228 | *P=0.000*(I2*= 87.2%)* | | 1.020( 0.137, 1.904), *p* = 0.024 |  |  | | |
| **Direction** | **Distraction** | 2 | 90 | *P=0.001*(I2*= 91.6%)* | | 0.902( -0.653, 2.457), *p* = 0.256 | *P* = 0.000 |  | | |
| **Posterior-anterior** | 3 | 214 | *P=0.535*(I2*= 0.0%)* | | 0.286( 0.013, 0.559), *p* = 0.040 |  |  | | |
| **Screw thrust** | 1 | 26 | *-* | | 0.672( -0.120, 1.464), *p* = 0.096 |  |  | | |
| **Comparison** | **Placebo** | 2 | 58 | *P=0.916*(I2*= 0.0%)* | | 0.641(0.091, 1.190), *p* = 0.022 | *P* = 0.000 |  | | |
| **Exercise** | 1 | 42 | *-* | | -0.186(-0.793, 0.420), *p* = 0.547 |  |  | | |
| **ROM-right rotation** | | | | | | | | | | |
| **Duration** | **A+S** | 3 | 108 | *P=0.005*(I2*= 87.4%)* | | 0.833( -0.946, 2.612), *p* = 0.359 | *P* =0.030 |  | | |
| **C** | 3 | 208 | *P=0.264*(I2*= 24.9%)* | | 0.290( -0.044, 0.624), *p* = 0.089 |  |  | | |
| **Course of treatment** | **Immediately** | 4 | 162 | *P=0.312*(I2*=15.9%)* | | 0.124( -0.223, 0.472), *p* = 0.484 | *P* =0.030 |  | | |
| **Continued** | 4 | 228 | *P=0.018*(I2*= 75.2%)* | | 0.600( -0.126, 1.325), *p* = 0.105 |  |  | | |
| **Direction** | **Distraction** | 2 | 90 | *P=0.002*(I2*= 89.1%)* | | 0.594(0.159, 1.028), *p* = 0.007 | *P* =0.030 |  | | |
| **Posterior-anterior** | 3 | 214 | *P=0.178*(I2*=42.1%)* | | 0.355(0.081, 0.629), *p* = 0.011 |  |  | | |
| **Screw thrust** | 1 | 26 | *-* | | P=0.328(-0.446,1.103), *p* = 0.406 |  |  | | |
| **Comparison** | **Placebo** | 2 | 58 | *P=0.033*(I2*= 77.9%)* | | 1.011( -0.436, 2.457), *p* = 0.171 | *P* =0.030 |  | | |
| **Exercise** | 1 | 42 | *-* | | 0.680( -0.087, 1.447), *p* = 0.082 |  |  | | |
| **Disability (included studies)** | | | | | | | | | | |
| **Duration** | **A+S** | 5 | 320 | *P* =0.000(I*2* =96.4 %) | | -1.877(-2.168, -1.585); *P* = 0.000 | *P* = 0.000 | *P* = 0.792 | | |
| **C** | 2 | 151 | *P* =0.002(I*2* =89.5 %) | | -0.800(-1.138, -0.463); *P* = 0.000 |  |  | | |
| **Direction** | **Distraction** | 2 | 90 | *P* =0.926(I*2* =0.0 %) | | -2.185(-2.711, -1.658); *P* = 0.000 | *P* = 0.000 | *P* = 0.040 | | |
| **Posterior-anterior** | 2 | 186 | *P* =0.320(I*2* =0.0 %) | | -0.689(-0.986, -0.393); *P* = 0.000 |  |  | | |
| **Follow-up Pain (included studies)** | | | | | | | | | | |
| **Duration** | **A+S** | 2 | 164 | *P* =0.000(I*2* =98.7 %) | | -1.923(-2.404, -1.442); *P* =0.000 | *P* =0.000 | *P* =0.907 | | |
| **C** | 1 | 120 | *-* | | -0.647(-1.014, -0.279); *P* =0.001 |  |  | | |
| **Following-Disability (included studies)** | | | | | | | | | | |
| **Duration** | **A+S** | 2 | 164 | *P* =0.000(I*2* =99.2 %) | | -2.445(-3.038, -1.852); *p* =0.000 | *P* =0.000 | *P* =0.816 | | |
| **C** | 1 | 120 | - | | -0.384(-0.746, -0.023); *p* =0.037 |  |  | | |

Notes: A+S, duration<3 months; C, duration>3 months;

**S3 Table.** Publication Bias Analyses.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Outcomes** | **No. of study** | | | | **patients** | **Begg’s Test** | | **Egger’s Test** |
|
| **Pain** | | | 1  6 | 840 | | | *P* = 0.685 | *P* =0.610 |
| **ROM** | | |  |  | | |  |  |
| flexion | | 8 | | 379 | | | *P* =0.764 | *P* =0.901 |
| extension | | 8 | | 379 | | | *P* =1.00 | *P* =0.400 |
| left lateral flexion | | 7 | | 358 | | | *P* = 0.133 | *P* = 0.502 |
| right lateral flexion | | 7 | | 358 | | | *P=0.452* | *P= 0.197* |
| left rotation | | 8 | | 390 | | | *P* = 0.368 | *P* = 0.149 |
| right rotation | | 8 | | 390 | | | *P* = 0.386 | *P* =0.367 |
| **Disability** | | 8 | | 489 | | | *P* =0.902 | *P* =0.700 |
| **QOL-MCS** | | 1 | | 120 | | | - | - |
| **QOL-PCS** | | 1 | | 120 | | | - | - |