

Supplementary Table 1. Risk of bias by QUIPS tools.

|                                                                         | Verla<br>2016 | Storheim<br>2017 | Zotti<br>2017 | Betz<br>2017 | Hong<br>2018 | Liu<br>2019 | Wang<br>2020    | Tiago<br>2022   | Han<br>2022 | Chen<br>2022    |
|-------------------------------------------------------------------------|---------------|------------------|---------------|--------------|--------------|-------------|-----------------|-----------------|-------------|-----------------|
| <b>Study Participation</b>                                              |               |                  |               |              |              |             |                 |                 |             |                 |
| Source of target population                                             | yes           | yes              | yes           | yes          | yes          | yes         | yes             | yes             | yes         | yes             |
| Method used to identify population                                      | yes           | yes              | yes           | yes          | yes          | yes         | yes             | yes             | yes         | yes             |
| Recruitment period                                                      | yes           | yes              | yes           | yes          | yes          | yes         | yes             | yes             | yes         | yes             |
| Place of recruitment                                                    | yes           | yes              | yes           | yes          | yes          | yes         | yes             | yes             | yes         | yes             |
| Inclusion and exclusion criteria                                        | yes           | yes              | yes           | yes          | yes          | yes         | yes             | yes             | yes         | yes             |
| Adequate study participation                                            | yes           | yes              | yes           | yes          | yes          | yes         | no              | no              | yes         | no              |
| Baseline characteristics                                                | yes           | yes              | yes           | partial      | yes          | yes         | yes             | yes             | yes         | yes             |
| <b>Summary Study participation (risk of bias)</b>                       | <b>low</b>    | <b>low</b>       | <b>low</b>    | <b>low</b>   | <b>low</b>   | <b>low</b>  | <b>moderate</b> | <b>moderate</b> | <b>low</b>  | <b>moderate</b> |
| <b>Study Attrition</b>                                                  |               |                  |               |              |              |             |                 |                 |             |                 |
| Proportion of baseline sample available for analysis                    | yes           | yes              | unsure        | yes          | yes          | yes         | yes             | yes             | yes         | yes             |
| Attempts to collect information on participants who<br>dropped out      | yes           | yes              | unsure        | yes          | yes          | yes         | yes             | yes             | yes         | yes             |
| Reasons and potential impact of subjects lost to<br>follow-up           | yes           | yes              | unsure        | yes          | yes          | yes         | yes             | yes             | yes         | yes             |
| Outcome and prognostic factor information on those<br>lost to follow-up | unsure        | unsure           | unsure        | unsure       | unsure       | unsure      | unsure          | unsure          | unsure      | unsure          |
| <b>Study Attrition Summary (risk of bias)</b>                           | <b>low</b>    | <b>low</b>       | <b>high</b>   | <b>low</b>   | <b>low</b>   | <b>low</b>  | <b>low</b>      | <b>low</b>      | <b>low</b>  | <b>low</b>      |
| <b>Prognostic Factor Measurement</b>                                    |               |                  |               |              |              |             |                 |                 |             |                 |
| Definition of the PF                                                    | yes           | yes              | yes           | yes          | yes          | yes         | yes             | yes             | yes         | yes             |
| Valid and Reliable Measurement of PF                                    | yes           | yes              | yes           | yes          | yes          | yes         | yes             | yes             | yes         | yes             |
| Proportion of data on PF available for analysis                         | yes           | yes              | yes           | yes          | yes          | yes         | yes             | yes             | yes         | yes             |
| Method used for missing data                                            | yes           | yes              | yes           | yes          | yes          | yes         | yes             | yes             | yes         | yes             |

|                                                      |                 |            |                 |             |            |            |                 |            |            |             |
|------------------------------------------------------|-----------------|------------|-----------------|-------------|------------|------------|-----------------|------------|------------|-------------|
| <b>PF Measurement Summary (risk of bias)</b>         | <b>low</b>      | <b>low</b> | <b>low</b>      | <b>low</b>  | <b>low</b> | <b>low</b> | <b>low</b>      | <b>low</b> | <b>low</b> | <b>low</b>  |
| <b>Outcome Measurement</b>                           |                 |            |                 |             |            |            |                 |            |            |             |
| Definition of the Outcome                            | yes             | yes        | yes             | yes         | yes        | yes        | yes             | yes        | yes        | yes         |
| Valid and Reliable Measurement of Outcome            | no              | yes        | yes             | yes         | yes        | yes        | no              | yes        | yes        | yes         |
| Method and Setting of Outcome Measurement            | yes             | yes        | yes             | yes         | yes        | yes        | yes             | yes        | yes        | yes         |
| <b>Outcome Measurement Summary (risk of bias)</b>    | <b>moderate</b> | <b>low</b> | <b>low</b>      | <b>low</b>  | <b>low</b> | <b>low</b> | <b>moderate</b> | <b>low</b> | <b>low</b> | <b>low</b>  |
| <b>Study Confounding</b>                             |                 |            |                 |             |            |            |                 |            |            |             |
| Important Confounders Measured                       | yes             | yes        | yes             | unsure      | yes        | yes        | yes             | yes        | yes        | yes         |
| Definition of the confounding factor                 | unsure          | yes        | yes             | unsure      | yes        | yes        | unsure          | unsure     | yes        | unsure      |
| Valid and Reliable Measurement of Confounders        | yes             | yes        | yes             | unsure      | yes        | yes        | yes             | yes        | yes        | yes         |
| Method and Setting of Confounding Measurement        | yes             | yes        | yes             | unsure      | yes        | yes        | yes             | yes        | yes        | yes         |
| Method used for missing data                         | yes             | yes        | yes             | yes         | yes        | yes        | yes             | yes        | yes        | yes         |
| Appropriate Accounting for Confounding               | unsure          | yes        | yes             | unsure      | yes        | yes        | yes             | yes        | yes        | yes         |
| <b>Study Confounding Summary (risk of bias)</b>      | <b>moderate</b> | <b>low</b> | <b>low</b>      | <b>high</b> | <b>low</b> | <b>low</b> | <b>low</b>      | <b>low</b> | <b>low</b> | <b>low</b>  |
| <b>Statistical Analysis and Reporting</b>            |                 |            |                 |             |            |            |                 |            |            |             |
| Presentation of analytical strategy                  | unsure          | yes        | yes             | yes         | yes        | yes        | yes             | yes        | yes        | no          |
| Model development strategy                           | yes             | yes        | unsure          | yes         | yes        | yes        | yes             | yes        | yes        | yes         |
| Reporting of results                                 | yes             | yes        | yes             | yes         | yes        | yes        | yes             | yes        | yes        | yes         |
| <b>Statistical Analysis and Presentation Summary</b> | <b>moderate</b> | <b>low</b> | <b>moderate</b> | <b>low</b>  | <b>low</b> | <b>low</b> | <b>low</b>      | <b>low</b> | <b>low</b> | <b>high</b> |
| <b>Overall bias in 6 domains</b>                     | <b>moderate</b> | <b>low</b> | <b>high</b>     | <b>high</b> | <b>low</b> | <b>low</b> | <b>low</b>      | <b>low</b> | <b>low</b> | <b>high</b> |

Supplementary table 2. Data for studies in meta-analysis of postoperative ODI between patients with high and low MF FI for lumbar surgery.

| Study         | High FI of MF                                                                            |               |             | Low FI of MF                                                                      |               |             |
|---------------|------------------------------------------------------------------------------------------|---------------|-------------|-----------------------------------------------------------------------------------|---------------|-------------|
|               | Characteristics                                                                          | Mean ODI (SD) | Sample size | Characteristics                                                                   | Mean ODI (SD) | Sample size |
| Storheim 2017 | FI > 20%                                                                                 | 22.4 (14.6)   | 47          | FI < 20%                                                                          | 15.0 (17.1)   | 36          |
| Liu 2019      | FI ≥ 25%                                                                                 | 29.5 (4.4)    | 42          | FI < 25%                                                                          | 26.7 (4.1)    | 42          |
| Han 2022      | FI > 25%                                                                                 | 21.7 (15.1)   | 160         | FI < 25%                                                                          | 17.1 (14.1)   | 160         |
| Tiago 2022    | Grade 0 = no intramuscular fat, I = some fatty streaks, II = fat less than muscle tissue | 29.6 (18.9*)  | 43          | Grade III = fat equal to amount of muscle, grade IV = more fat than muscle tissue | 31.3 (18.9*)  | 32          |

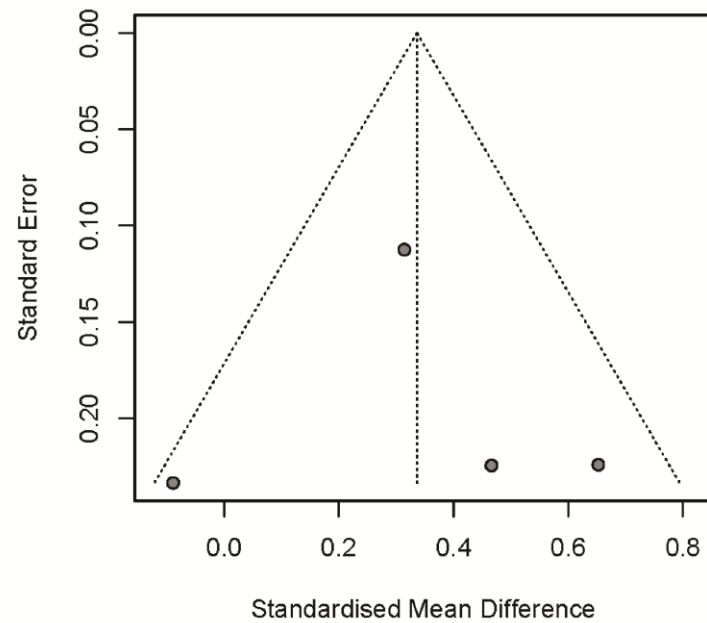
\* Estimated from means, precise P value and degree of freedom.

Supplementary table 3. Data for studies in meta-analysis of postoperative back pain between patients with high and low MF FI for lumbar surgery.

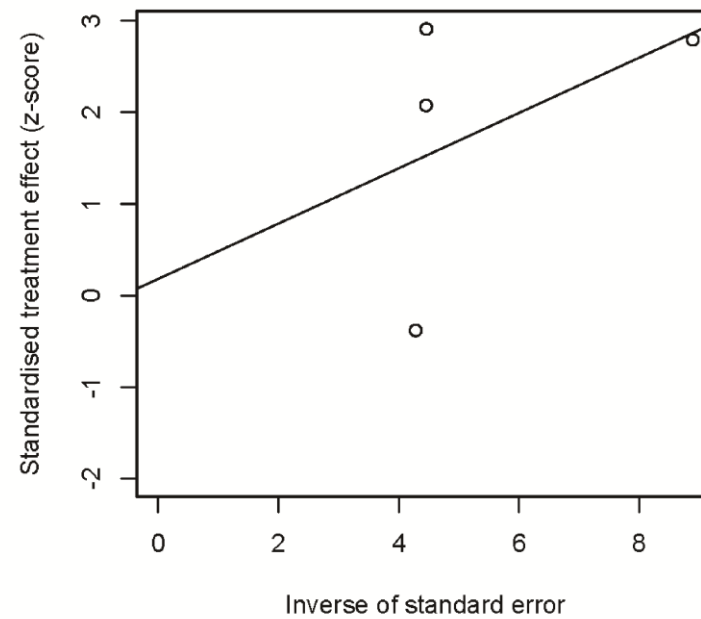
| Study         | High FI of MF                                                                            |                   |             | Low FI of MF                                                                      |                   |             |
|---------------|------------------------------------------------------------------------------------------|-------------------|-------------|-----------------------------------------------------------------------------------|-------------------|-------------|
|               | Characteristics                                                                          | Mean score (SD)   | Sample size | Characteristics                                                                   | Mean score (SD)   | Sample size |
| Betz 2017     | Goutallier FI grade $\geq 2$                                                             | NRS = 3.5 (2.5)   | 53          | Goutallier FI grade $< 2$                                                         | NRS = 2.9 (2.5)   | 112         |
| Storheim 2017 | FI $> 20\%$                                                                              | VAS = 33.3 (27.1) | 47          | FI $> 20\%$                                                                       | VAS = 25.9 (28.2) | 36          |
| Liu 2019      | FI $\geq 25\%$                                                                           | VAS = 3.4 (0.8)   | 42          | FI $< 25\%$                                                                       | VAS = 3.2 (0.7)   | 42          |
| Han 2022      | FI $> 25\%$                                                                              | VAS = 3.2 (2.3)   | 160         | FI $< 25\%$                                                                       | VAS = 2.8 (2.2)   | 160         |
| Tiago 2022    | Grade 0 = no intramuscular fat, I = some fatty streaks, II = fat less than muscle tissue | VAS = 5 (3.5*)    | 43          | Grade III = fat equal to amount of muscle, grade IV = more fat than muscle tissue | VAS = 5.9 (3.5*)  | 32          |

\*Estimated from means, precise P value and degree of freedom.

(1)

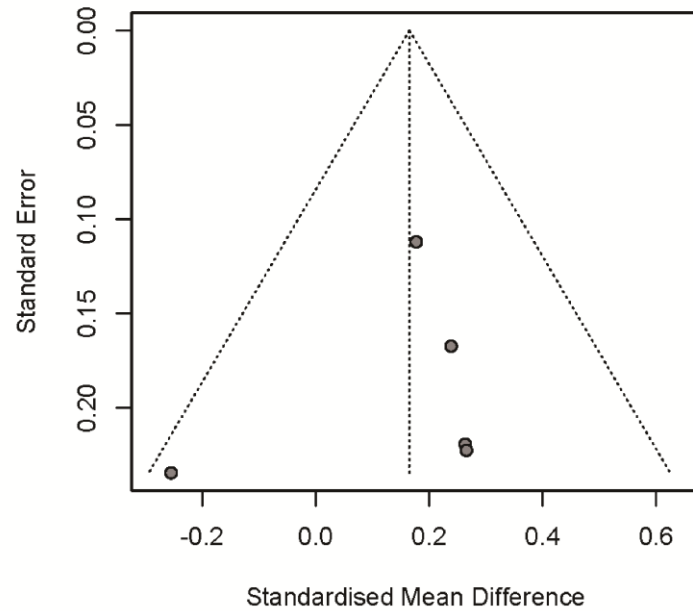


(2)

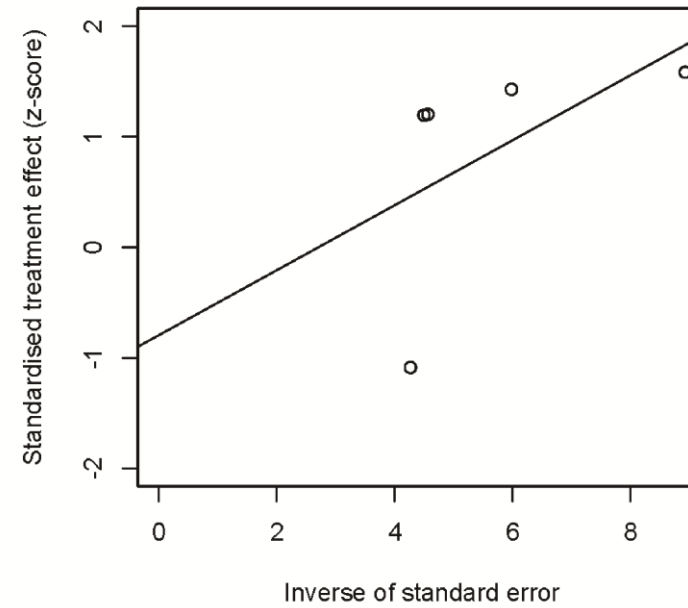


Supplementary figure 1. Funnel plot and Egger's test for meta-analysis of postoperative ODI between patients with high and low MF FI for lumbar surgery. The funnel plot and Egger's test were conducted by Rstudio. P value in Egger's test = 0.95.

(1)



(2)



Supplementary figure 2. Funnel plot and Egger's test for meta-analysis of postoperative back pain between patients with high and low MF FI for lumbar surgery. The funnel plot and Egger's test were conducted by Rstudio. P value in Egger's test = 0.66.