

表 1 纳入研究的一般情况及文献特征〔范围（ $\bar{x} \pm s$ ）/例〕

| 纳入研究                               | 研究类型 | 分组      | 例数  | 平均年龄<br>(岁) | 手术时间<br>(min) | 术后住院<br>时间 (d) | 术后引流<br>时间 (d) | 术中出血量<br>(mL) | 并发症<br>数 | 术后<br>复发<br>数 | 疼痛 VAS 评分<br>24 h | 48 h | 72 h      |
|------------------------------------|------|---------|-----|-------------|---------------|----------------|----------------|---------------|----------|---------------|-------------------|------|-----------|
| Liang Zhu2013 <sup>[30]</sup>      | 病例对照 | SITS    | 23  | 16 ~ 29     | 51.63±19.57   | 5.77±1.26      | 3.93±1.69      | 27.78±15.36   | NA       | NA            | NA                | NA   | 1.91±0.52 |
|                                    |      | 3P-VATS | 27  | 17 ~ 32     | 52.42±21.07   | 6.09±1.45      | 4.52±1.98      | 33.59±18.11   | NA       | NA            | NA                | NA   | 2.29±0.52 |
| Huang Lizhi2014 <sup>[28]</sup>    | 病例对照 | SITS    | 99  | 27.11±10.23 | 54.6±19.4     | 9.6±3.1        | 4.7±1.8        | 27.2±39.5     | 3        | 3             | 3.1±1.2           | NA   | 2.54±0.52 |
|                                    |      | 3P-VATS | 101 | 29.32±12.53 | 64.9±24.3     | 10.4±4.6       | 5.5±2.9        | 44.3±36.8     | 4        | 4             | 4.2±1.0           | NA   | 2.93±0.52 |
| Zheng Bo2016 <sup>[46]</sup>       | RCT  | SITS    | 30  | 22.6±4.2    | 30.1±5.5      | 3.1±0.5        | 2.5±0.9        | 9.7±3.5       | 0        | NA            | NA                | NA   | N/A       |
|                                    |      | 3P-VATS | 30  | 22.6±4.2    | 29.5±4.2      | 3.5±0.7        | 2.7±1.5        | 9.9±5.5       | 4        | NA            | NA                | NA   | N/A       |
| Zhang Tao2017 <sup>[22]</sup>      | 病例对照 | SITS    | 28  | 41.16±16.21 | 116.82±21.77  | 8.17±1.62      | 5.27±1.96      | 95.27±10.96   | 3        | NA            | 1.37±1.40         | NA   | N/A       |
|                                    |      | 3P-VATS | 30  | 38.15±12.34 | 153.50±22.05  | 10.64±2.80     | 7.32±2.57      | 93.43±8.86    | 19       | NA            | 2.64±1.52         | NA   | N/A       |
| Li Peng2017 <sup>[47]</sup>        | 病例对照 | SITS    | 45  | 59.13±16.34 | 45.3±17.6     | 6.0±2.5        | 3.0±2.0        | 25.6±10.2     | NA       | NA            | NA                | NA   | N/A       |
|                                    |      | 3P-VATS | 35  | 56.46±18.12 | 52.0±15.5     | 7.5±2.0        | 4.0±1.0        | 35.2±6.2      | NA       | NA            | NA                | NA   | N/A       |
| Meng Qingjiang2017 <sup>[48]</sup> | 病例对照 | SITS    | 22  | 24.68 ±3.66 | 55.45±6.11    | 7.91±1.41      | 3.91±1.10      | 39.23±5.93    | NA       | NA            | 2.05±0.58         | NA   | 1.45±0.52 |
|                                    |      | 3P-VATS | 22  | 23.27 ±4.13 | 57.64±8.77    | 8.41±1.29      | 4.27±1.20      | 41.27±7.96    | NA       | NA            | 2.73±0.46         | NA   | 2.00±0.52 |
| Zhang Ming2018 <sup>[49]</sup>     | RCT  | SITS    | 42  | 68.3±5.2    | 71.2±10.7     | 2.8±0.4        | NA             | 26.1±6.4      | 1        | NA            | 4.6±0.4           | NA   | 2.34±0.52 |
|                                    |      | 3P-VATS | 42  | 68.3±5.2    | 65.3±11.3     | 4.1±0.6        | NA             | 47.2±9.3      | 6        | NA            | 5.3±0.5           | NA   | 3.03±0.52 |
| Zhang Shaoyu2018 <sup>[50]</sup>   | RCT  | SITS    | 50  | 22.4±8.9    | 55.8±22.6     | 10.5±1.8       | NA             | 26.4±19.5     | 4        | 3             | 2.9±1.3           | NA   | 2.54±0.52 |
|                                    |      | 3P-VATS | 50  | 27.6±11.7   | 68.6±19.2     | 11.3±3.1       | NA             | 39.8±15.6     | 4        | 5             | 4.1±1.7           | NA   | 3.03±0.52 |
| Zhou Jing2018 <sup>[35]</sup>      | 病例对照 | SITS    | 64  | 24.87±7.70  | 50.39±9.58    | 4.73±1.38      | 3.31±0.90      | 42.70±9.54    | NA       | NA            | 1.48±0.50         | NA   | N/A       |
|                                    |      | 3P-VATS | 42  | 24.16±7.81  | 49.30±6.45    | 4.80±1.32      | 3.33±0.95      | 43.54±8.67    | NA       | NA            | 2.71±0.45         | NA   | N/A       |

|                                    |      |         |    |              |             |           |           |            |    |    |           |           |          |
|------------------------------------|------|---------|----|--------------|-------------|-----------|-----------|------------|----|----|-----------|-----------|----------|
| Ren Zhanliang2018 <sup>[36]</sup>  | 病例对照 | SITS    | 22 | 25±7.3       | 82.4±5.8    | 7.5±2.4   | 4.2±1.3   | 146.0±18.9 | 2  | NA | 3±1.8     | 4±0.6     | 3±0.6    |
|                                    |      | 3P-VATS | 19 | 26±6.5       | 81.2±4.2    | 8.7±1.9   | 4.6±1.0   | 150.3±15.8 | 8  | NA | 4±1.3     | 7±0.9     | 6±0.9    |
| Lin Liyao2019 <sup>[51]</sup>      | RCT  | SITS    | 45 | NA           | 60.2±10.1   | 4.3±1.1   | 3.2±1.3   | 5.5±1.4    | NA | NA | 3.6±0.7   | NA        | NA       |
|                                    |      | 3P-VATS | 45 | NA           | 56.2±11.45  | 6.5±1.3   | 3.6±1.5   | 15.4±2.7   | NA | NA | 5.3±0.2   | NA        | NA       |
| Li Xiong2019 <sup>[34]</sup>       | 病例对照 | SITS    | 21 | 17-47        | 114±36      | 7.4±3.3   | 5.8±1.0   | 74.5±16.4  | NA | NA | 4.0±0.7   | NA        | NA       |
|                                    |      | 3P-VATS | 28 | 17-47        | 120±48      | 9.5±4.6   | 7.1±1.8   | 162.2±20.8 | NA | NA | 5.4±0.8   | NA        | NA       |
| Liu Bao2019 <sup>[52]</sup>        | RCT  | SITS    | 40 | 32.5±1.4     | 52.2±6.5    | 5.3±1.3   | 3.2±1.5   | NA         | NA | NA | NA        | NA        | 2.21±0.4 |
|                                    |      | 3P-VATS | 40 | 32.3±1.2     | 53.6±8.3    | 5.5±1.4   | 3.1±1.6   | NA         | NA | NA | NA        | NA        | 3.64±0.7 |
| Yin Yan2019 <sup>[53]</sup>        | RCT  | SITS    | 35 | 42.5±4.4     | 49.17±9.91  | 6.62±1.22 | 2.2±0.8   | 22.97±3.13 | 1  | NA | NA        | NA        | NA       |
|                                    |      | 3P-VATS | 35 | 44.0±4.1     | 51.98±11.05 | 7.23±1.43 | 4.5±0.5   | 24.22±5.66 | 6  | NA | NA        | NA        | NA       |
| Li Yuanyuan2020 <sup>[54]</sup>    | 病例对照 | SITS    | 52 | 28.56±11.49  | 78.79±14.87 | 7.72±1.95 | 3.83±1.62 | 29.87±4.69 | NA | NA | 4.12±0.65 | 3.75±0.74 | 2.03±0.4 |
|                                    |      | 3P-VATS | 52 | 30.41±12.05  | 83.49±16.88 | 8.38±1.81 | 4.32±2.05 | 31.23±4.34 | NA | NA | 6.31±0.62 | 5.08±0.71 | 3.75±0.7 |
| Xu Ziming2020 <sup>[32]</sup>      | 病例对照 | SITS    | 29 | 26.94±2.56   | 48.25±4.62  | NA        | 2.12±0.58 | 22.62±3.25 | NA | NA | NA        | NA        | NA       |
|                                    |      | 3P-VATS | 25 | 26.66±3.84   | 48.15±4.22  | NA        | 4.68±0.87 | 22.67±2.84 | NA | NA | NA        | NA        | NA       |
| Zhang Shaoqin2020 <sup>[20]</sup>  | 病例对照 | SITS    | 55 | 23.15±3.84   | 41.05±5.83  | 5.28±1.02 | 2.01±0.58 | 21.03±3.04 | NA | NA | 5.08±1.65 | 2.81±0.62 | NA       |
|                                    |      | 3P-VATS | 55 | 22.84±3.75   | 39.28±5.72  | 6.53±1.26 | 2.49±0.64 | 24.18±3.17 | NA | NA | 6.37±2.14 | 3.69±1.01 | NA       |
| Miao Shoushi2021 <sup>[55]</sup>   | RCT  | SITS    | 50 | 25.92±5.17   | 22.86±5.66  | NA        | NA        | 20.33±5.30 | NA | NA | NA        | NA        | 1.78±0.4 |
|                                    |      | 3P-VATS | 50 | 26.19±4.77   | 30.35±6.86  | NA        | NA        | 28.55±6.75 | NA | NA | NA        | NA        | 3.06±0.7 |
| Sun Jian2021 <sup>[18]</sup>       | 病例对照 | SITS    | 24 | 48.56±5.38   | 59.73±4.69  | 4.36±0.38 | NA        | 5.79±0.56  | 2  | NA | 5.61±0.57 | 2.68±0.73 | 1.93±0.4 |
|                                    |      | 3P-VATS | 23 | 48.73±4.26   | 58.75±3.39  | 6.24±0.49 | NA        | 14.41±1.37 | 3  | NA | 6.46±0.62 | 3.71±0.92 | 2.66±0.7 |
| Zhang Dingqian2021 <sup>[56]</sup> | RCT  | SITS    | 50 | 62.11 ± 5.82 | 69.41±5.62  | 5.41±1.59 | 3.42±2.14 | 22.31±5.78 | 2  | 1  | NA        | NA        | NA       |
|                                    |      | 3P-VATS | 50 | 61.49 ± 5.77 | 65.40±5.61  | 7.52±2.13 | 5.43±2.15 | 42.30±5.77 | 8  | 1  | NA        | NA        | NA       |
| Xu Xianchuang2021 <sup>[57]</sup>  | 病例对照 | SITS    | 30 | 19.58±2.79   | NA          | 5.75±1.13 | 3.22±1.04 | 15.35±2.77 | 4  | NA | NA        | NA        | NA       |
|                                    |      | 3P-VATS | 30 | 21.32±3.61   | NA          | 7.42±1.56 | 5.38±1.19 | 24.52±3.66 | 9  | NA | NA        | NA        | NA       |
| Ma Zhikun2022 <sup>[58]</sup>      | RCT  | SITS    | 52 | 28.84±4.67   | 54.45±6.12  | 6.37±0.72 | 2.31±0.87 | 50.79±4.98 | 8  | NA | NA        | NA        | NA       |
|                                    |      | 3P-VATS | 52 | 28.94±4.45   | 54.78±6.34  | 8.91±0.45 | 4.36±0.95 | 51.34±4.68 | 2  | NA | NA        | NA        | NA       |
| Jutley 2005 <sup>[9]</sup>         | 病例对照 | SITS    | 16 | 28.9±15.4    | NA          | 4.6±2.1   | 4.6±2.0   | NA         | NA | 0  | NA        | NA        | NA       |
|                                    |      | 3P-VATS | 19 | 32.1±10      | NA          | 4.1±1.0   | 3.9±2.1   | NA         | NA | 1  | NA        | NA        | NA       |
| Salati 2008 <sup>[8]</sup>         | 病例对照 | SITS    | 28 | 24±6.3       | 72.3±31.8   | 3.8±1.8   | NA        | NA         | NA | 3  | NA        | NA        | NA       |

|                                  |      |         |     |             |              |           |           |             |    |    |           |           |           |
|----------------------------------|------|---------|-----|-------------|--------------|-----------|-----------|-------------|----|----|-----------|-----------|-----------|
|                                  |      | 3P-VATS | 23  | 26.4±6.4    | 68.7±25.5    | 4.9±2.4   | NA        | NA          | NA | 3  | NA        | NA        | NA        |
| Chen 2011 <sup>[45]</sup>        | 病例对照 | SITS    | 10  | 22.97±8.13  | 80.50±20.74  | 4.40±0.96 | 3.00±0.94 | NA          | NA | NA | 4.50±0.70 | 4.20±0.78 | 3.30±0.70 |
|                                  |      | 3P-VATS | 20  | 22.97±8.13  | 85.50±21.87  | 4.85±1.46 | 3.55±1.50 | NA          | NA | NA | 4.95±0.39 | 4.25±0.58 | 3.55±0.58 |
| Chen 2012 <sup>[44]</sup>        | 病例对照 | SITS    | 36  | 29.1        | 53.9         | 4.1       | NA        | NA          | 0  | 1  | 4.0       | 3.2       | 2.9       |
|                                  |      | 3P-VATS | 26  | 24.5        | 63.5         | 6.2       | NA        | NA          | 1  | 2  | 4.4       | 3.6       | 2.9       |
| Tamura 2013 <sup>[29]</sup>      | 病例对照 | SITS    | 19  | 44.6±5.4    | 60.5±3.1     | 3.85±0.27 | 1.11±0.09 | NA          | 0  | 0  | 2.74±0.34 | NA        | 1.32±0.27 |
|                                  |      | 3P-VATS | 18  | 43.4±5.5    | 58.8±3.2     | 4.33±0.28 | 1.22±0.09 | NA          | 1  | 1  | 3.78±0.35 | NA        | 1.94±0.35 |
| Yang 2013 <sup>[43]</sup>        | 病例对照 | SITS    | 27  | 22.0±9.1    | 74.6±22.8    | 2.3±0.7   | NA        | NA          | 1  | 1  | 4.1±1.7   | 3.2±1.4   | 2.7±1.4   |
|                                  |      | 3P-VATS | 13  | 27.1±12.3   | 72.4±20.2    | 2.5±0.8   | NA        | NA          | 0  | 1  | 4.8±2.2   | 2.8±1.4   | 2.6±1.4   |
| Kang 2014 <sup>[42]</sup>        | 病例对照 | SITS    | 33  | 14-49       | 41.21±9.10   | 3.64±1.03 | 2.82±0.92 | NA          | NA | NA | 4.06±1.20 | NA        | NA        |
|                                  |      | 3P-VATS | 19  | 16-30       | 41.58±9.14   | 4.47±1.35 | 3.79±1.44 | NA          | NA | NA | 5.00±1.83 | NA        | NA        |
| Igai 2014 <sup>[41]</sup>        | 病例对照 | SITS    | 31  | 23.8±6.1    | 55.2±15.5    | 2.4±0.1   | 1.2±0.5   | NA          | NA | NA | NA        | NA        | NA        |
|                                  |      | 3P-VATS | 72  | 23.4±6.2    | 35.9±14.0    | 2.6±0.1   | 1.0±0.3   | NA          | NA | NA | NA        | NA        | NA        |
| Tsuboshima 2015 <sup>[27]</sup>  | 病例对照 | SITS    | 34  | 2.9±8.7     | 67.9±19.4    | 3.6±2.0   | 1.3±0.9   | NA          | NA | 4  | NA        | NA        | NA        |
|                                  |      | 3P-VATS | 35  | 25.9±8.8    | 62.5±15.4    | 3.9±1.6   | 1.2±0.5   | NA          | NA | 5  | NA        | NA        | NA        |
| Song 2015 <sup>[39]</sup>        | 病例对照 | SITS    | 37  | 22.0±6.3    | 57.1±18.6    | 5.0±1.8   | 3.6±2.3   | NA          | 4  | 2  | 3.9±1.2   | NA        | 2.5±1.2   |
|                                  |      | 3P-VATS | 23  | 23.4±6.4    | 60.7±18.4    | 4.9±1.3   | 4.0±1.1   | NA          | 1  | 0  | 5.2±1.3   | NA        | 3.9±1.3   |
| Jeon 2016 <sup>[26]</sup>        | 病例对照 | SITS    | 40  | 22.40±9.09  | 37.25±11.21  | 3.13±1.81 | 1.83±1.78 | NA          | 2  | 2  | NA        | NA        | NA        |
|                                  |      | 3P-VATS | 46  | 23.39±8.11  | 39.02±23.21  | 4.00±1.52 | 2.40±1.02 | NA          | 1  | 4  | NA        | NA        | NA        |
| Jung 2017 <sup>[59]</sup>        | 病例对照 | SITS    | 111 | 17.9±2.7    | 30.7±9.1     | 2.3±1.3   | 1.6±1.0   | NA          | 8  | 14 | NA        | NA        | NA        |
|                                  |      | 3P-VATS | 54  | 19.4±3.3    | 51.4±18.0    | 3.6±2.4   | 2.7±2.2   | NA          | 7  | 8  | NA        | NA        | NA        |
| Fiorelli 2021 <sup>[2]</sup>     | 病例对照 | SITS    | 21  | 34±2.6      | 47±4.8       | 4.2±1.2   | 3.2±0.8   | NA          | NA | NA | 2.0±0.5   | 1.4±0.7   | 1.1±0.5   |
|                                  |      | 3P-VATS | 22  | 35±1.8      | 43±7.9       | 4.3±0.9   | 3.4±1.8   | NA          | NA | NA | 2.4±0.5   | 1.8±0.3   | 1.5±0.5   |
| Wang Jianhua2020 <sup>[60]</sup> | 病例对照 | SITS    | 68  | 36±13       | 56±11        | 3.5±2.7   | NA        | 5.6±1.3     | NA | NA | NA        | NA        | NA        |
|                                  |      | 3P-VATS | 68  | 35±12       | 64±10        | 6.3±3.6   | NA        | 16.2±2.3    | NA | NA | NA        | NA        | NA        |
| Dou Jiwei2017 <sup>[61]</sup>    | 病例对照 | SITS    | 32  | 32.2±12.06  | 132.02±13.86 | 7.06±1.72 | NA        | NA          | NA | NA | NA        | NA        | NA        |
|                                  |      | 3P-VATS | 34  | 31.7±11.70  | 113.72±10.95 | 8.11±1.70 | NA        | NA          | NA | NA | NA        | NA        | NA        |
| Cheng Hui2015 <sup>[62]</sup>    | 病例对照 | SITS    | 30  | 31.77±14.97 | 131.37±14.15 | 7.11±1.77 | 3.83±1.93 | 84.67±14.80 | 4  | NA | 1.67±0.65 | NA        | NA        |
|                                  |      | 3P-VATS | 31  | 33.06±18.79 | 114.21±11.11 | 8.06±1.67 | 4.12±2.32 | 89.85±13.85 | 12 | NA | 1.81±0.70 | NA        | NA        |

| Author (Year)                     | Study Design | Group   | n  | Mean (SD)   | Mean (SD)   | Mean (SD)  | Mean (SD) | Mean (SD)   | Mean (SD) | Mean (SD) | Mean (SD) | Mean (SD) | Mean (SD) |
|-----------------------------------|--------------|---------|----|-------------|-------------|------------|-----------|-------------|-----------|-----------|-----------|-----------|-----------|
| Wang Jian2022 <sup>[63]</sup>     | 病例对照         | SITS    | 30 | 31.69±4.72  | 57.36±19.17 | 5.92±1.73  | 2.52±0.87 | 30.95±23.84 | NA        | NA        | NA        | NA        | 3.45±0.43 |
|                                   |              | 3P-VATS | 30 | 32.15±4.48  | 62.58±18.56 | 6.06±1.98  | 4.05±1.16 | 52.22±44.28 | NA        | NA        | NA        | NA        | 5.63±0.43 |
| Hong Songsong2023 <sup>[64]</sup> | RCT          | SITS    | 40 | 42.28±5.22  | 65.22±8.22  | 6.11±1.02  | 3.06±0.76 | 20.36±8.42  | 1         | NA        | 3.42±0.45 | 2.72±0.44 | 1.89±0.43 |
|                                   |              | 3P-VATS | 40 | 42.32±5.34  | 87.35±11.75 | 8.63±1.21  | 4.03±1.22 | 33.32±6.35  | 8         | NA        | 5.64±0.31 | 4.52±0.43 | 3.24±0.43 |
| Xia Bing2022 <sup>[65]</sup>      | 病例对照         | SITS    | 40 | 49.5±2.6    | 50.1±2.1    | 6.1±2.0    | NA        | 50.3±10.0   | 2         | 1         | NA        | NA        | NA        |
|                                   |              | 3P-VATS | 40 | 49.7±2.5    | 56.9±3.2    | 8.9±2.1    | NA        | 66.1±12.3   | 8         | 7         | NA        | NA        | NA        |
| Lu Xiaohc2016 <sup>[24]</sup>     | 病例对照         | SITS    | 49 | 36.3±4.8    | 52.3±11.3   | 5.2±0.3    | 2.4±0.4   | 24.4±5. 9   | 1         | NA        | NA        | NA        | NA        |
|                                   |              | 3P-VATS | 40 | 37.5±4.2    | 51.5±10.7   | 5.5±0.6    | 2.6±0.5   | 40.6 ±8.7   | 1         | NA        | NA        | NA        | NA        |
| Li Lijun2018 <sup>[66]</sup>      | RCT          | SITS    | 60 | NA          | 62.75±5.21  | 4.58±0.78  | 2.55±0.77 | 34.57±5.62  | 4         | NA        | NA        | NA        | NA        |
|                                   |              | 3P-VATS | 60 | NA          | 61.84±5.58  | 4.66±0.75  | 2.48±0.76 | 59.44±6.33  | 5         | NA        | NA        | NA        | NA        |
| Chen Fancai2022 <sup>[67]</sup>   | RCT          | SITS    | 44 | 72.26±3.64  | 48.23±5.32  | 3.55±1.65  | 2.53±0.98 | 38.22±5.63  | 3         | NA        | 2.11±0.23 | NA        | 1.62±0.23 |
|                                   |              | 3P-VATS | 44 | 72.36±3.54  | 55.23±8.32  | 5.26±3.59  | 3.53±1.03 | 43.69±8.26  | 11        | NA        | 2.32±0.62 | NA        | 2.01±0.23 |
| Cheng Liang2014 <sup>[68]</sup>   | 队列研究         | SITS    | 20 | 68.1±1.8    | 45.23±12.4  | 5.6±2.5    | NA        | 53.64±5.9   | NA        | 0         | NA        | NA        | NA        |
|                                   |              | 3P-VATS | 20 | 67.4±1.2    | 46.31±11.8  | 5.8±2.4    | NA        | 68.72±6.5   | NA        | 1         | NA        | NA        | NA        |
| Hu Wei2020 <sup>[69]</sup>        | RCT          | SITS    | 30 | 37.5±20.5   | NA          | 3.9±1.2    | NA        | NA          | 1         | 1         | NA        | NA        | NA        |
|                                   |              | 3P-VATS | 30 | 37.0±18.0   | NA          | 8.7±0.9    | NA        | NA          | 4         | 5         | NA        | NA        | NA        |
| Xiao Dayan2022 <sup>[70]</sup>    | RCT          | SITS    | 39 | 41.67±4.28  | 57.58±5.15  | 3.13±0.31  | 2.75±0.26 | 15.12±1.68  | NA        | NA        | 3.62±0.35 | 2.51±0.26 | 1.08±0.26 |
|                                   |              | 3P-VATS | 39 | 41.54±4.05  | 58.56±5.12  | 4.72±0.45  | 3.96±0.35 | 23.68±2.45  | NA        | NA        | 4.96±0.41 | 3.68±0.32 | 1.58±0.26 |
| Zhang Yin2022 <sup>[71]</sup>     | RCT          | SITS    | 40 | 33.24±4.24  | 34.35±6.35  | 5.85±1.47  | 2.65±1.19 | 25.35±4.61  | 2         | NA        | NA        | NA        | NA        |
|                                   |              | 3P-VATS | 40 | 33.67±4.55  | 30.36±6.74  | 7.01±1.52  | 3.45±1.21 | 30.35±8.65  | 5         | NA        | NA        | NA        | NA        |
| Du Donghai2021 <sup>[72]</sup>    | RCT          | SITS    | 42 | 39.44±6.27  | 42.25±2.84  | 4.21±1.05  | NA        | 20.39±2.98  | NA        | NA        | NA        | NA        | NA        |
|                                   |              | 3P-VATS | 41 | 39.26±6.35  | 59.29±3.07  | 5.87±1.13  | NA        | 23.41±3.01  | NA        | NA        | NA        | NA        | NA        |
| Lv Mingchuang2020 <sup>[73]</sup> | 病例对照         | SITS    | 52 | 42.03±3.19  | 48.38±5.38  | NA         | 2.37±0.79 | 41.26±5.03  | 2         | NA        | NA        | NA        | NA        |
|                                   |              | 3P-VATS | 52 | 41.87±3.11  | 37.37±4.41  | NA         | 2.28±0.85 | 44.52±8.37  | 8         | NA        | NA        | NA        | NA        |
| Tang Linqiang2021 <sup>[74]</sup> | 病例对照         | SITS    | 43 | 37.10±21    | 52.12±2.23  | 8.10±0.11  | 3.22±0.55 | 28.56±10.31 | 2         | NA        | 3.12±1.02 | NA        | 1.02±0.26 |
|                                   |              | 3P-VATS | 40 | 37.56±12.23 | 66.56±25.26 | 10.22±2.12 | 5.23±1.23 | 45.23±30.23 | 9         | NA        | 5.26±2.10 | NA        | 4.22±0.26 |
| Liu Yanjun2019 <sup>[75]</sup>    | RCT          | SITS    | 57 | 30.3±3.1    | 49.03±6.54  | 4.81±1.32  | 3.30±0.98 | 43.45±8.76  | 1         | 0         | NA        | NA        | NA        |
|                                   |              | 3P-VATS | 57 | 30.5±2.9    | 50.93±9.85  | 4.76±1.35  | 3.22±0.93 | 42.07±9.45  | 7         | 1         | NA        | NA        | NA        |
| Chen Yanzhi2019 <sup>[76]</sup>   | 病例对照         | SITS    | 50 | 67.51±4.98  | 54.09±8.73  | 2.76±0.35  | 3.01±0.32 | 25.81±6.29  | NA        | NA        | 3.22±0.48 | NA        | 2.17±0.26 |

|                                   |      |         |    |            |              |            |           |              |    |    |           |           |           |
|-----------------------------------|------|---------|----|------------|--------------|------------|-----------|--------------|----|----|-----------|-----------|-----------|
|                                   |      | 3P-VATS | 50 | 68.26±5.3  | 65.33±11.28  | 4.05±0.57  | 4.72±0.58 | 47.19±9.72   | NA | NA | 5.15±0.37 | NA        | 3.12±0.37 |
| Zhang Yi2020 <sup>[77]</sup>      | RCT  | SITS    | 48 | 32.5±1.6   | 43.64±3.12   | 4.47±1.15  | 2.29±0.24 | 21.83±2.37   | 1  | NA | 4.73±0.63 | NA        | 1.85±0.37 |
|                                   |      | 3P-VATS | 48 | 31.5±1.4   | 56.72±4.18   | 6.95±2.67  | 5.31±0.71 | 36.57±3.25   | 9  | NA | 5.39±0.87 | NA        | 3.92±0.37 |
| Sun Chuanwu2019 <sup>[78]</sup>   | RCT  | SITS    | 23 | 29.34±8.24 | 49.47±6.46   | 4.76±1.13  | 3.68±0.36 | 42.45±8.25   | NA | NA | NA        | NA        | NA        |
|                                   |      | 3P-VATS | 23 | 29.44±8.24 | 50.73±8.32   | 4.74±1.25  | 3.74±0.35 | 43.37±9.45   | NA | NA | NA        | NA        | NA        |
| Wang Jue2020 <sup>[79]</sup>      | RCT  | SITS    | 47 | 27.2±3.4   | 50.4±9.6     | 4.6±1.2    | 3.1±0.7   | 42.8±9.5     | NA | NA | NA        | NA        | NA        |
|                                   |      | 3P-VATS | 47 | 25.6±2.6   | 49.5±6.5     | 4.7±1.4    | 3.3±0.8   | 43.7±8.7     | NA | NA | NA        | NA        | NA        |
| Hu Yunfeng2020 <sup>[80]</sup>    | 病例对照 | SITS    | 54 | 28.43±4.60 | 55.93±7.04   | 4.79±1.13  | 4.20±2.24 | 29.56±8.12   | 1  | NA | NA        | NA        | NA        |
|                                   |      | 3P-VATS | 54 | 29.18±5.12 | 67.31±6.84   | 6.35±1.55  | 5.68±2.90 | 45.12±7.95   | 1  | NA | NA        | NA        | NA        |
| Xu Sushen2022 <sup>[81]</sup>     | RCT  | SITS    | 34 | 43.60±6.49 | 58.76±4.53   | 4.32±0.68  | 2.31±0.85 | 15.82±3.69   | 1  | NA | 5.63±0.58 | NA        | 3.07±0.37 |
|                                   |      | 3P-VATS | 34 | 43.52±6.57 | 57.82±4.62   | 5.27±0.75  | 2.96±0.93 | 22.75±5.28   | 6  | NA | 6.72±0.79 | NA        | 3.52±0.37 |
| Fan Chao2019 <sup>[82]</sup>      | RCT  | SITS    | 35 | 26.5±3.1   | NA           | 5.1±0.2    | NA        | NA           | NA | 0  | NA        | NA        | NA        |
|                                   |      | 3P-VATS | 35 | 25.3±2.4   | NA           | 9.5±0.3    | NA        | NA           | NA | 3  | NA        | NA        | NA        |
| Wu Xuanqin2019 <sup>[83]</sup>    | 病例对照 | SITS    | 40 | 31.25±1.25 | 51.25±9.45   | 9.13±1.63  | 5.53±1.25 | 39.93±8.19   | NA | 0  | 3.20±0.31 | NA        | 2.86±0.37 |
|                                   |      | 3P-VATS | 40 | 30.53±1.35 | 55.43±9.69   | 9.67±1.72  | 5.49±1.34 | 42.63±8.12   | NA | 1  | 4.12±0.34 | NA        | 3.25±0.37 |
| Liu Hanxing2020 <sup>[84]</sup>   | 病例对照 | SITS    | 20 | 26.32±1.85 | NA           | NA         | NA        | NA           | 2  | 0  | 1.83±0.32 | NA        | 2.57±0.37 |
|                                   |      | 3P-VATS | 20 | 26.28±2.01 | NA           | NA         | NA        | NA           | 7  | 1  | 1.09±0.21 | NA        | 1.78±0.37 |
| Yang Xiaolian2019 <sup>[85]</sup> | 病例对照 | SITS    | 34 | 21-53      | 71.42±8.37   | 6.0±1.5    | NA        | 70.48±9.22   | NA | NA | 3.25±0.58 | 2.98±0.61 | 2.41±0.37 |
|                                   |      | 3P-VATS | 39 | 17-47      | 45.29±6.30   | 10.76±2.43 | NA        | 228.49±24.76 | NA | NA | 5.82±1.31 | 3.87±1.05 | 2.96±0.37 |
| Huang Jianwen2021 <sup>[86]</sup> | 病例对照 | SITS    | 25 | 32.7±2.6   | 91.06±5.22   | 11.40±1.02 | NA        | 35.01±2.62   | NA | NA | 3.96±0.21 | 5.11±0.30 | 2.08±0.37 |
|                                   |      | 3P-VATS | 25 | 32.6±2.4   | 102.07±10.02 | 13.20±1.14 | NA        | 40.12±3.12   | NA | NA | 4.96±0.46 | 5.70±0.25 | 3.42±0.37 |
| Zhang Lei2019 <sup>[87]</sup>     | 病例对照 | SITS    | 39 | 29.13±4.08 | 57.94±14.68  | 3.62±1.07  | 2.72±0.76 | 17.08±8.13   | NA | NA | NA        | NA        | 2.58±0.37 |
|                                   |      | 2P-VATS | 39 | 28.92±3.94 | 61.46±18.12  | 5.09±1.46  | 3.38±1.29 | 24.89±9.81   | NA | NA | NA        | NA        | 4.79±0.37 |
| Guan Guoyin2020 <sup>[83]</sup>   | RCT  | SITS    | 40 | 25.78±2.91 | 64.62±4.11   | 3.62±1.02  | 2.34±0.35 | 10.22±1.14   | 1  | NA | NA        | NA        | NA        |
|                                   |      | 2P-VATS | 40 | 25.21±2.45 | 78.89±4.67   | 5.66±1.21  | 4.31±0.32 | 17.45±1.21   | 7  | NA | NA        | NA        | NA        |
| Li Gang2016 <sup>[88]</sup>       | 病例对照 | SITS    | 59 | 22.4±6.8   | 57.7±21.5    | 3.7±1.1    | 2.8±0.9   | NA           | 1  | NA | NA        | NA        | NA        |
|                                   |      | 2P-VATS | 50 | 23.9±9.3   | 60.3±26.8    | 4.7±3.0    | 4.2±2.8   | NA           | 1  | NA | NA        | NA        | NA        |
| Cao Jiwei2017 <sup>[21]</sup>     | RCT  | SITS    | 48 | 23.53±3.61 | 58.63±18.63  | NA         | 2.76±0.63 | NA           | NA | 1  | NA        | NA        | 2.63±0.37 |
|                                   |      | 2P-VATS | 48 | 24.15±3.86 | 63.53±16.54  | NA         | 4.62±1.24 | NA           | NA | 3  | NA        | NA        | 4.83±0.37 |

| Author (Year)                       | Study Design | Group   | n  | Mean (SD)  | Mean (SD)   | Mean (SD) | Mean (SD) | Mean (SD)  | Mean (SD) | Mean (SD) | Mean (SD) | Mean (SD) | Mean (SD) |
|-------------------------------------|--------------|---------|----|------------|-------------|-----------|-----------|------------|-----------|-----------|-----------|-----------|-----------|
| Xu Guang2017 <sup>[89]</sup>        | 病例对照         | SITS    | 48 | 24.2±4.8   | 56.3±19.4   | 3.9±1.1   | 2.8±0.8   | 15.2±10.8  | NA        | NA        | NA        | NA        | NA        |
|                                     |              | 2P-VATS | 40 | 23.6±5.1   | 57.1±20.7   | 4.6±1.6   | 3.9±1.2   | 23.6±14.8  | NA        | NA        | NA        | NA        | NA        |
| Miao Tianwen2018 <sup>[90]</sup>    | 病例对照         | SITS    | 38 | 22.89±4.13 | 56.31±19.42 | 3.68±1.13 | 2.84±0.82 | 15.21±9.87 | NA        | NA        | 3.84±0.63 | NA        | 2.56±0.8  |
|                                     |              | 2P-VATS | 38 | 22.74±4.25 | 59.63±20.15 | 4.65±1.69 | 3.94±1.25 | 23.4±14.98 | NA        | NA        | 4.98±0.92 | NA        | 3.42±0.8  |
| Zhou Xiaojiang2016 <sup>[38]</sup>  | 病例对照         | SITS    | 47 | 15-67      | 79.50±34.37 | 6.26±1.86 | 4.32±1.46 | 20.53±4.92 | 2         | NA        | NA        | NA        | NA        |
|                                     |              | 2P-VATS | 86 | 16-66      | 86.60±36.36 | 6.88±2.26 | 4.53±1.57 | 24.5±14.90 | 5         | NA        | NA        | NA        | NA        |
| Guo Jin2020 <sup>[91]</sup>         | 病例对照         | SITS    | 41 | 34.3±1.6   | NA          | 6.4±0.8   | 2.4±0.3   | NA         | NA        | NA        | NA        | NA        | NA        |
|                                     |              | 2P-VATS | 41 | 34.2±1.9   | NA          | 8.2±0.6   | 4.6±0.5   | NA         | NA        | NA        | NA        | NA        | NA        |
| Wang Zhiyong2021 <sup>[92]</sup>    | RCT          | SITS    | 40 | 27.74±2.28 | 58.21±14.67 | 3.79±1.01 | NA        | 16.88±7.65 | 1         | NA        | NA        | NA        | NA        |
|                                     |              | 2P-VATS | 40 | 27.65±2.31 | 61.23±17.96 | 4.92±1.37 | NA        | 23.95±8.74 | 3         | NA        | NA        | NA        | NA        |
| Hu Weicai2020 <sup>[93]</sup>       | 病例对照         | SITS    | 44 | 25.4±3.5   | 57.56±19.28 | NA        | 2.82±0.65 | 30.3±23.28 | NA        | NA        | NA        | NA        | NA        |
|                                     |              | 2P-VATS | 44 | 24.2±3.4   | 65.72±18.64 | NA        | 4.57±1.18 | 52.4±44.90 | NA        | NA        | NA        | NA        | NA        |
| Hong Liang2020 <sup>[94]</sup>      | 病例对照         | SITS    | 25 | 32.28±1.47 | 56.95±19.41 | NA        | 2.17±1.57 | 15.07±1.62 | 4         | 2         | NA        | NA        | NA        |
|                                     |              | 2P-VATS | 25 | 32.32±1.50 | 57.68±20.19 | NA        | 4.32±0.34 | 23.98±1.47 | 4         | 1         | NA        | NA        | NA        |
| Han Yifeng2022 <sup>[95]</sup>      | RCT          | SITS    | 28 | 33.78±2.56 | 22.98±2.19  | 3.58±0.23 | 2.79±0.17 | 21.67±2.21 | 1         | NA        | 3.61±0.18 | NA        | 2.48±0.1  |
|                                     |              | 2P-VATS | 28 | 33.84±2.63 | 32.65±3.85  | 4.65±0.38 | 4.13±0.26 | 27.89±2.43 | 4         | NA        | 4.29±0.23 | NA        | 3.63±0.1  |
| Wang Gefei2021 <sup>[96]</sup>      | 病例对照         | SITS    | 20 | 21.26±0.69 | 45.56±4.23  | NA        | NA        | 20.51±4.90 | 1         | 1         | NA        | NA        | NA        |
|                                     |              | 2P-VATS | 20 | 21.30±0.56 | 50.69±6.35  | NA        | NA        | 24.56±4.33 | 6         | 2         | NA        | NA        | NA        |
| Zhou Rubao2016 <sup>[97]</sup>      | 病例对照         | SITS    | 33 | 17-58      | 52.35±12.18 | 5.29±0.16 | 3.68±0.12 | 19.11±7.29 | NA        | NA        | NA        | NA        | NA        |
|                                     |              | 2P-VATS | 30 | 16-61      | 49.57±9.32  | 5.61±0.11 | 3.42±0.09 | 23.68±9.22 | NA        | NA        | NA        | NA        | NA        |
| Onur Akçay2019 <sup>[98]</sup>      | 病例对照         | SITS    | 29 | 25.4±7.2   | 78.6±16.0   | 7.0±2.4   | 7.1±4.4   | NA         | 8         | NA        | NA        | NA        | NA        |
|                                     |              | 2P-VATS | 15 | 29.9±12.7  | 86.0±24.1   | 6.5±1.1   | 8.3±4.4   | NA         | 5         | NA        | NA        | NA        | NA        |
| Wang 2022 <sup>[11]</sup>           | 病例对照         | SITS    | 56 | 23.91±0.68 | 62.05±1.18  | 4.14±0.17 | 1.64±0.15 | NA         | 5         | 2         | 3.70±0.22 | 2.68±0.17 | 1.88±0.1  |
|                                     |              | 2P-VATS | 48 | 25.52±0.64 | 64.71±1.63  | 4.29±0.21 | 1.77±0.20 | NA         | 3         | 1         | 4.38±0.22 | 3.40±0.17 | 2.23±0.1  |
| Li Zhongzheng2020 <sup>[99]</sup>   | 病例对照         | SITS    | 38 | 41.57±4.94 | 46.37±5.37  | 5.31±0.56 | NA        | 20.86±8.24 | NA        | NA        | 3.76±0.54 | NA        | 2.09±0.1  |
|                                     |              | 2P-VATS | 38 | 42.07±4.57 | 51.07±6.31  | 6.58±0.24 | NA        | 26.35±8.33 | NA        | NA        | 4.65±0.72 | NA        | 3.19±0.1  |
| Wang Qingliang2021 <sup>[100]</sup> | 病例对照         | SITS    | 31 | 38.49±5.92 | 52.34±7.64  | 5.76±1.17 | 3.13±0.51 | 20.11±4.37 | 1         | NA        | NA        | NA        | NA        |
|                                     |              | 2P-VATS | 30 | 38.66±5.34 | 85.61±10.32 | 8.27±2.16 | 5.31±1.46 | 25.41±5.13 | 8         | NA        | NA        | NA        | NA        |
| Chen Tao2018 <sup>[101]</sup>       | RCT          | SITS    | 35 | 49.8±5.4   | 59.2±4.7    | 5.2±0.8   | 5.3±0.7   | 26.5±2.6   | NA        | NA        | NA        | NA        | NA        |

|                                    |      |         |     |            |              |            |           |              |    |    |           |           |           |
|------------------------------------|------|---------|-----|------------|--------------|------------|-----------|--------------|----|----|-----------|-----------|-----------|
|                                    |      | 2P-VATS | 35  | 49.4±5.1   | 59.4±5.0     | 5.3±0.7    | 4.6±1.3   | 35.4±2.3     | NA | NA | NA        | NA        | NA        |
| Jin Luming2014 <sup>[40]</sup>     | 病例对照 | SITS    | 133 | 23.3±4.1   | 98.2±44.6    | 11.3±3.4   | 6.6±2.8   | 22.0±17.9    | NA | 3  | NA        | NA        | NA        |
|                                    |      | 2P-VATS | 194 | 22.8±4.3   | 103.4±42.5   | 10.8±3.8   | 6.3±2.4   | 24.9±19.4    | NA | 6  | NA        | NA        | NA        |
| Zhou Jinshan2022 <sup>[102]</sup>  | 病例对照 | SITS    | 80  | 44.7±11.7  | 60.12±8.17   | 9.23±1.18  | 3.88±1.06 | 94.31±20.67  | 6  | NA | NA        | 3.16±0.74 | 2.27±0.41 |
|                                    |      | 2P-VATS | 80  | 45.1±12.1  | 111.28±13.97 | 11.18±1.72 | 6.21±1.12 | 212.45±32.89 | 19 | NA | NA        | 4.26±0.84 | 3.42±0.51 |
| Fang yuanlin2019 <sup>[103]</sup>  | RCT  | SITS    | 36  | 31.86±2.92 | NA           | 3.87±0.34  | 2.79±0.26 | 15.19±1.33   | NA | 1  | NA        | NA        | NA        |
|                                    |      | 2P-VATS | 36  | 30.94±2.84 | NA           | 4.62±0.44  | 3.84±0.35 | 21.87±2.05   | NA | 2  | NA        | NA        | NA        |
| Zhang Maozeng2020 <sup>[104]</sup> | 病例对照 | SITS    | 31  | 25.66±4.23 | NA           | 3.81±0.63  | 2.81±0.29 | 16.21±2.69   | 2  | NA | 3.84±0.16 | NA        | 2.56±0.16 |
|                                    |      | 2P-VATS | 31  | 25.47±4.96 | NA           | 4.97±0.27  | 3.46±0.28 | 24.16±2.97   | 3  | NA | 4.98±0.41 | NA        | 3.42±0.16 |
| Wang Chenbin2017 <sup>[105]</sup>  | RCT  | SITS    | 48  | 41.8±3.6   | 131.5±26.7   | NA         | NA        | 203.5±31.9   | 2  | NA | 1.56±0.36 | NA        | NA        |
|                                    |      | 2P-VATS | 48  | 52.5±3.4   | 124.2±21.8   | NA         | NA        | 231.1±38.4   | 4  | NA | 1.89±0.54 | NA        | NA        |
| Zhu Guoqing2021 <sup>[106]</sup>   | RCT  | SITS    | 35  | 32.09±1.75 | NA           | NA         | NA        | NA           | 3  | NA | 3.74±0.59 | NA        | 2.41±0.16 |
|                                    |      | 2P-VATS | 35  | 32.16±1.78 | NA           | NA         | NA        | NA           | 4  | NA | 4.25±0.67 | NA        | 2.68±0.16 |
| Kang Poming2019 <sup>[107]</sup>   | RCT  | SITS    | 35  | 30.01±6.62 | 101.17±21.45 | 5.66±1.15  | 3.61±1.58 | 205.18±31.12 | 2  | NA | 2.18±0.96 | NA        | NA        |
|                                    |      | 2P-VATS | 35  | 30.01±6.62 | 99.72±20.26  | 7.47±1.31  | 4.49±1.87 | 232.63±30.67 | 3  | NA | 3.08±1.06 | NA        | NA        |
| Han Wenjian2018 <sup>[108]</sup>   | 病例对照 | SITS    | 60  | 28.4±11.0  | 58.2±14.7    | 3.8±1.1    | 2.8±0.8   | 16.9±8.2     | 2  | NA | NA        | NA        | NA        |
|                                    |      | 2P-VATS | 80  | 27.2±12.8  | 61.3±18.0    | 4.9±1.4    | 3.4±1.2   | 24.0±9.7     | 4  | NA | NA        | NA        | NA        |
| Zheng Xing2019 <sup>[109]</sup>    | RCT  | SITS    | 62  | 38.4±4.5   | 22.7±4.6     | NA         | NA        | 21.3±2.6     | NA | NA | NA        | NA        | NA        |
|                                    |      | 2P-VATS | 62  | 37.9±4.6   | 30.9±5.4     | NA         | NA        | 28.1±2.8     | NA | NA | NA        | NA        | NA        |
| Liu Dasheng2021 <sup>[110]</sup>   | 病例对照 | SITS    | 30  | 44.5±5.5   | 101.2±20.8   | 5.4±1.1    | 3.5±1.4   | 33.6±8.5     | 2  | NA | NA        | NA        | NA        |
|                                    |      | 2P-VATS | 30  | 43.4±5.2   | 99.8±20.4    | 7.3±1.2    | 4.6±1.9   | 42.1±9.4     | 3  | NA | NA        | NA        | NA        |
| Zhou Zhitao2022 <sup>[111]</sup>   | 病例对照 | SITS    | 49  | 18-65      | 36.59±9.12   | 6.3±0.7    | 3.5±0.6   | NA           | NA | NA | NA        | NA        | NA        |
|                                    |      | 2P-VATS | 49  | 20-63      | 40.98±10.67  | 7.3±0.5    | 5.7±0.4   | NA           | NA | NA | NA        | NA        | NA        |
| Song Huan2019 <sup>[112]</sup>     | 病例对照 | SITS    | 30  | 23.52±7.12 | NA           | 3.58±1.06  | 2.63±0.81 | NA           | 2  | NA | NA        | NA        | NA        |
|                                    |      | 2P-VATS | 30  | 24.21±7.03 | NA           | 4.82±2.87  | 4.35±2.54 | NA           | 1  | NA | NA        | NA        | NA        |
| Yang Lijie2014 <sup>[113]</sup>    | RCT  | 2P-VATS | 48  | 20.71±5.32 | 49.40±4.12   | 7.81±0.76  | 3.52±0.90 | 28.33±5.57   | NA | NA | NA        | NA        | NA        |
|                                    |      | 3P-VATS | 48  | 19.73±4.26 | 50.44±4.25   | 7.83±0.81  | 3.77±0.88 | 30.83±7.39   | NA | NA | NA        | NA        | NA        |
| Li Xu2012 <sup>[31]</sup>          | 病例对照 | 2P-VATS | 58  | 22.8±5.8   | 36.7±6.1     | 3.3±0.6    | 1.3±0.5   | 28.7±8.8     | NA | NA | 3.6±0.6   | NA        | 1.9±0.16  |
|                                    |      | 3P-VATS | 69  | 23.1±6.3   | 35.9±5.3     | 3.4±0.6    | 1.4±0.5   | 30.7±5.3     | NA | NA | 4.1±0.9   | NA        | 2.3±0.16  |

|                                   |      |         |    |            |             |           |           |             |    |    |           |           |           |
|-----------------------------------|------|---------|----|------------|-------------|-----------|-----------|-------------|----|----|-----------|-----------|-----------|
| Huang Daoyou2017 <sup>[114]</sup> | 病例对照 | 2P-VATS | 30 | 45.71±4.51 | 57.14±12.15 | 3.23±1.58 | 1.26±0.47 | 16.14±6.57  | NA | NA | NA        | NA        | 1.55±0.47 |
|                                   |      | 3P-VATS | 30 | 45.61±4.49 | 61.54±13.11 | 6.12±1.74 | 1.51±0.51 | 50.9±12.11  | NA | NA | NA        | NA        | 3.41±0.51 |
| Stephen2021 <sup>[115]</sup>      | 病例对照 | 2P-VATS | 28 | 18-40      | 60          | 7         | NA        | NA          | 11 | NA | NA        | NA        | NA        |
|                                   |      | 3P-VATS | 30 | 18 ~ 39    | 90          | 9         | NA        | NA          | 21 | NA | NA        | NA        | NA        |
| Stephen2022 <sup>[116]</sup>      | 病例对照 | 2P-VATS | 52 | 41-87      | 70.3        | 10.7      | NA        | NA          | 13 | NA | NA        | NA        | NA        |
|                                   |      | 3P-VATS | 63 | 44-87      | 91.4        | 14.3      | NA        | NA          | 25 | NA | NA        | NA        | NA        |
| Dai Shaoxing2017 <sup>[117]</sup> | 病例对照 | 2P-VATS | 23 | 46.8±3.6   | 36.5±6.3    | 3.4±0.7   | NA        | 34.3±6.3    | 2  | NA | NA        | NA        | NA        |
|                                   |      | 3P-VATS | 23 | 47.6±3.8   | 35.9±6.9    | 3.5±0.8   | NA        | 33.6±5.4    | 12 | NA | NA        | NA        | NA        |
| Gao Yanjun2018 <sup>[118]</sup>   | 病例对照 | 2P-VATS | 53 | 25.3±7.1   | 50.5±9.4    | 5.8±1.3   | 3.2±0.5   | 45.7±8.5    | 0  | NA | NA        | NA        | NA        |
|                                   |      | 3P-VATS | 40 | 24.8±6.6   | 61.7±10.4   | 7.1±1.2   | 4.6±1.1   | 84.3±14.5   | 3  | NA | NA        | NA        | NA        |
| Liu Li2021 <sup>[119]</sup>       | RCT  | 2P-VATS | 21 | 35.23±4.02 | 56.12±16.92 | NA        | 2.80±0.57 | 30.22±5.97  | NA | NA | NA        | NA        | 3.81±0.57 |
|                                   |      | 3P-VATS | 21 | 35.23±4.02 | 65.28±17.21 | NA        | 4.67±1.15 | 53.25±13.27 | NA | NA | NA        | NA        | 5.67±1.15 |
| Ocakcioglu 2016 <sup>[25]</sup>   | 队列研究 | SITS    | 37 | 26.2       | 61.7±13.1   | 2.85±1.48 | 3.00±0.88 | NA          | NA | 0  | 3.42±0.94 | 2.46±0.81 | 1.96±0.81 |
|                                   |      | 2P-VATS | 69 | 27.4       | 64.2±26.4   | 3.42±1.94 | 3.45±1.45 | NA          | NA | 5  | 4.16±0.77 | 3.28±0.78 | 2.30±0.78 |
|                                   |      | 3P-VATS | 40 | 27.9       | 63.8±22.8   | 3.30±1.20 | 3.50±1.55 | NA          | NA | 4  | 4.23±0.92 | 3.60±0.87 | 2.55±0.87 |
| Kutluk 2018 <sup>[120]</sup>      | RCT  | SITS    | 45 | 27.73±9.49 | 52.41±12.04 | 3.73±0.22 | 3.07±0.16 | NA          | 4  | 2  | 2.31±0.15 | NA        | 0.53±0.15 |
|                                   |      | 2P-VATS | 45 | 26.87±8.36 | 49.78±11.59 | 3.78±0.20 | 2.73±0.13 | NA          | 7  | 2  | 3.09±0.24 | NA        | 0.82±0.24 |
|                                   |      | 3P-VATS | 45 | 28.12±9.80 | 55.92±12.43 | 4.48±0.36 | 2.73±0.27 | NA          | 5  | 3  | 3.36±0.20 | NA        | 0.91±0.20 |
| Li Jinyou2017 <sup>[37]</sup>     | 病例对照 | SITS    | 31 | 25.93±5.48 | 47.58±4.36  | 5.45±0.92 | 2.38±0.80 | 45.35±4.31  | NA | NA | NA        | NA        | 3.58±0.92 |
|                                   |      | 2P-VATS | 35 | 25.40±4.40 | 37.88±4.75  | 5.34±0.96 | 2.31±0.90 | 48.02±4.65  | NA | NA | NA        | NA        | 3.82±0.96 |
|                                   |      | 3P-VATS | 42 | 25.64±4.75 | 36.38±4.39  | 5.26±0.85 | 2.19±0.86 | 47.54±5.88  | NA | NA | NA        | NA        | 4.69±0.85 |
| Zhang Jian2020 <sup>[19]</sup>    | 病例对照 | SITS    | 24 | 22.1±1.5   | 45.52±4.96  | NA        | 2.32±0.51 | 47.15±4.86  | NA | NA | NA        | NA        | NA        |
|                                   |      | 2P-VATS | 24 | 21.9±1.4   | 36.23±4.41  | NA        | 2.35±0.52 | 48.03±4.91  | NA | NA | NA        | NA        | NA        |
|                                   |      | 3P-VATS | 22 | 21.7±1.5   | 35.17±4.28  | NA        | 2.38±0.54 | 46.63±4.72  | NA | NA | NA        | NA        | NA        |
| Song Chao2017 <sup>[23]</sup>     | 病例对照 | SITS    | 22 | 38.10±2.15 | 49.64±11.35 | 6.79±1.68 | 3.99±1.05 | 21.06±3.16  | 0  | 0  | 2.97±0.86 | NA        | NA        |
|                                   |      | 2P-VATS | 23 | 40.69±3.05 | 48.26±9.86  | 6.85±1.25 | 4.04±1.12 | 23.08±3.08  | 1  | 1  | 3.76±0.96 | NA        | NA        |
|                                   |      | 3P-VATS | 28 | 39.15±2.75 | 53.05±10.58 | 7.03±1.38 | 4.49±1.51 | 24.16±5.71  | 2  | 2  | 4.45±1.05 | NA        | NA        |

NA：未获得相关数据；NOS：纽卡斯尔-渥太华量表

表 2 结局指标的 Meta 分析结果与亚组分析结果

| 亚组               | 纳入文献数                                                                           | 效应 |           |                           |               |                    |       |
|------------------|---------------------------------------------------------------------------------|----|-----------|---------------------------|---------------|--------------------|-------|
|                  |                                                                                 | 模型 |           | Meta 分析结果                 |               |                    |       |
|                  |                                                                                 |    |           | <i>SMD</i> /<br><i>OR</i> | 95% <i>CI</i> | <i>P</i> 值         |       |
| 手术时间             |                                                                                 |    |           |                           |               |                    |       |
| SITS vs. 3P-VATS | 62[2,8,18-20,22-30,32,34-37,39,41-43,45-56,58-68,70-81,83,85-86,120]            | 94 | <0.000 01 | 随机                        | - 0.16        | ( - 0.41, 0.09 )   | 0.21  |
|                  | 21[46,49-53,55-56,58,64,66,67,70-72,75]                                         |    |           |                           |               |                    |       |
|                  |                                                                                 |    |           |                           |               |                    |       |
| RCT 组            | 77-79,81,120]                                                                   | 95 | <0.000 01 | 随机                        | - 0.55        | ( - 0.97, - 0.13 ) | 0.010 |
|                  | 39[2,8,18-20,22-24,26-30,32,34-37,39,41-43,45,47,48,54,59-63,65,73,74,76,80,83] |    |           |                           |               |                    |       |
|                  |                                                                                 |    |           |                           |               |                    |       |
| 病例对照研究组          | 85-86]                                                                          | 95 | <0.000 01 | 随机                        | - 0.11        | ( - 0.46, 0.24 )   | 0.55  |
| 队列研究组            | 2[25,68]                                                                        | 0  | 0.95      | 随机                        | - 0.10        | ( - 0.47, 0.26 )   | 0.58  |
| SITS vs. 2P-VATS | 31[11,19,21,23,25,33,37-38,40,87-90,92]                                         |    |           |                           |               |                    |       |
|                  | -102,105,107-111,120]                                                           | 95 | <0.000 01 | 随机                        | - 0.53        | ( - 0.90, - 0.16 ) | 0.005 |
|                  |                                                                                 |    |           |                           |               |                    |       |
| RCT 组            | 9[21,33,92,95,101,105,107,109,120]                                              | 95 | <0.000 01 | 随机                        | - 0.82        | ( - 1.54, - 0.09 ) | 0.03  |
|                  | 21[11,19,23,37-38,40,87-90,93-94,97-10]                                         |    |           |                           |               |                    |       |
|                  |                                                                                 |    |           |                           |               |                    |       |
| 病例对照研究组          | 0,102,105,108,110-111]                                                          | 95 | <0.000 01 | 随机                        | - 0.43        | ( - 0.89, 0.03 )   | 0.07  |
| 队列研究组            | 1[25]                                                                           | -  | -         | 随机                        | - 0.11        | ( - 0.51, 0.29 )   | 0.59  |
| 2P-VATS vs.      |                                                                                 |    |           |                           |               |                    |       |
| 3P-VATS          | 11[19,23,25,31,37,113,114,117-120]                                              | 70 | 0.000 2   | 随机                        | - 0.23        | ( - 0.49, 0.03 )   | 0.08  |
|                  |                                                                                 |    |           |                           |               |                    |       |
|                  |                                                                                 |    |           |                           |               |                    |       |
| RCT 组            | 3[113,119-120]                                                                  | 0  | 0.62      | 随机                        | - 0.40        | ( - 0.66, - 0.14 ) | 0.003 |
|                  |                                                                                 |    |           |                           |               |                    |       |
|                  |                                                                                 |    |           |                           |               |                    |       |
| 病例对照研究组          | 7[19,23,31,37,114,117-118]                                                      | 80 | <0.0001   | 随机                        | - 0.16        | ( - 0.57, 0.24 )   | 0.43  |

|                     |                  |                                                      |    |           |    |        |                   |           |
|---------------------|------------------|------------------------------------------------------|----|-----------|----|--------|-------------------|-----------|
| 术中出血量               | 队列研究组            | 1 <sup>[25]</sup>                                    | -  | -         | 随机 | - 0.11 | ( - 0.56, 0.34)   | 0.63      |
|                     |                  | 48 <sup>[18-20,22-24,28,30,32,34-37,46-51,53]</sup>  |    |           |    |        |                   |           |
|                     | SITS vs. 3P-VATS | -58,60,62-68,70-81,83,85-86]                         | 96 | <0.000 01 | 随机 | - 1.58 | ( - 1.93, - 1.22) | <0.000 01 |
|                     |                  | 19 <sup>[46,49-51,53,55-56,58,64,66-67,70-72]</sup>  |    |           |    |        |                   |           |
|                     | RCT 组            | ,75,77-79,81]                                        | 97 | <0.000 01 | 随机 | - 1.66 | ( - 2.28, - 1.04) | <0.000 01 |
|                     |                  | 28 <sup>[18-20,22-24,28,30,32,34-37,47,48,54]</sup>  |    |           |    |        |                   |           |
|                     | 病例对照研究组          | ,57,60,62-63,65,73-74,76,80,83,85-86]                | 95 | <0.000 01 | 随机 | - 1.48 | ( - 1.92, - 1.03) | <0.000 01 |
|                     | 队列研究组            | 1 <sup>[68]</sup>                                    | -  | -         | 随机 | - 2.38 | ( - 3.21, - 1.55) | <0.000 01 |
|                     |                  | 26 <sup>[19,23,33,37-38,40,87,89-90,92-97,99]</sup>  |    |           |    |        |                   |           |
|                     | SITS vs. 2P-VATS | -105,107-110]                                        | 95 | <0.000 01 | 随机 | - 1.59 | ( - 2.03, - 1.14) | <0.000 01 |
| 2P-VATS vs. 3P-VATS | RCT 组            | 8 <sup>[33,92,101,103,105,107-109]</sup>             | 96 | <0.000 01 | 随机 | - 2.34 | ( - 3.30, - 1.37) | <0.000 01 |
|                     |                  | 18 <sup>[19,23,37-38,40,87,89-90,93-97,99-10]</sup>  |    |           |    |        |                   |           |
|                     | 病例对照研究组          | 0,102,104,110]                                       | 94 | <0.000 01 | 随机 | - 1.26 | ( - 1.74, - 0.78) | <0.000 01 |
|                     | 队列研究组            | 0                                                    | -  | -         | -  | -      | -                 | -         |
|                     |                  |                                                      |    |           |    |        |                   |           |
|                     |                  | 9 <sup>[19,23,31,37,113,114,117-119]</sup>           | 95 | <0.000 01 | 随机 | - 1.02 | ( - 1.81, - 0.22) | 0.01      |
|                     | RCT 组            | 2 <sup>[113,119]</sup>                               | 94 | <0.0001   | 随机 | - 1.26 | ( - 3.04, 0.52)   | 0.17      |
|                     | 病例对照研究组          | 7 <sup>[19,23,31,37,114,117-118]</sup>               | 96 | <0.000 01 | 随机 | - 0.95 | ( - 1.95, 0.04)   | 0.06      |
|                     | 队列研究组            | 0                                                    | -  | -         | -  | -      | -                 | -         |
|                     |                  |                                                      |    |           |    |        |                   |           |
| 术后住院时间              |                  | 62 <sup>[2,8,9,18,20,22-30,34-37,39,41-43,45-]</sup> |    |           |    |        |                   |           |
|                     | SITS vs. 3P-VATS | 54,56-72,74-83,85-86,120]                            | 93 | <0.000 01 | 随机 | - 1.05 | ( - 1.29, - 0.82) | <0.000 01 |
|                     |                  | 22 <sup>[46,49-53,56,58,64,66-67,69-72,75,77]</sup>  |    |           |    |        |                   |           |
|                     | RCT 组            | -79,81-82,120]                                       | 96 | <0.000 01 | 随机 | - 1.70 | ( - 2.23, - 1.17) | <0.000 01 |
|                     |                  | 38 <sup>[2,8,9,18,20,22-24,26-30,34-37,39,41-]</sup> |    |           |    |        |                   |           |
|                     |                  | 43,45,47,48,54,57,59-63,65,74,76,80,83,8]            |    |           |    |        |                   |           |
|                     | 病例对照研究组          | 5-86]                                                | 89 | <0.000 01 | 随机 | - 0.79 | ( - 1.03, - 0.56) | <0.000 01 |
|                     | 队列研究组            | 2 <sup>[25,68]</sup>                                 | 0  | 0.52      | 随机 | - 0.25 | ( - 0.61, 0.12)   | 0.19      |
|                     |                  |                                                      |    |           |    |        |                   |           |
|                     |                  |                                                      |    |           |    |        |                   |           |

|                     |    |                                                                                   |    |                                                           |    |        |                    |           |
|---------------------|----|-----------------------------------------------------------------------------------|----|-----------------------------------------------------------|----|--------|--------------------|-----------|
|                     | 28 | [11,23,25,33,37-38,40,87-92,95,97-104,107-108,110-112,120]                        | 92 | <0.000 01                                                 | 随机 | - 1.08 | ( - 1.39, - 0.77 ) | <0.000 01 |
| SITS vs. 2P-VATS    | 4  | [107-108,110-112,120]                                                             | 92 | <0.000 01                                                 | 随机 | - 1.36 | ( - 2.07, - 0.65 ) | <0.000 2  |
| RCT 组               | 7  | [33,92,95,101,103,107,120]                                                        | 20 | [11,23,37-38,40,87-91,97-100,102,104,107-108,110-112,120] |    |        |                    |           |
| 病例对照研究组             | 4  | [108,110-112]                                                                     | 93 | <0.000 01                                                 | 随机 | - 1.02 | ( - 1.39, - 0.65 ) | <0.000 01 |
| 队列研究组               | 1  | [25]                                                                              | -  | -                                                         | 随机 | - 0.32 | ( - 0.72, 0.09 )   | 0.12      |
| 2P-VATS vs. 3P-VATS | 9  | [23,25,31,37,113,114,117-118,120]                                                 | 91 | <0.000 01                                                 | 随机 | - 0.59 | ( - 1.11, - 0.06 ) | 0.03      |
| RCT 组               | 2  | [113,120]                                                                         | 94 | <0.000 1                                                  | 随机 | - 0.38 | ( - 1.04, 0.29 )   | 0.27      |
| 病例对照研究组             | 6  | [23,31,37,114,117-118]                                                            | 85 | <0.000 01                                                 | 随机 | - 0.50 | ( - 1.01, 0.01 )   | 0.06      |
| 队列研究组               | 1  | [25]                                                                              | -  | -                                                         | 随机 | 0.13   | ( - 0.47, 0.71 )   | 0.69      |
| 术后引流（置管）时间          | 51 | [2,9,19,22-30,32,34-37,39,41-42,45-48,50-54,56-59,62-64,66,67,70-71,73-81,83,120] | 93 | <0.000 01                                                 | 随机 | - 0.75 | ( - 1.00, - 0.50 ) | <0.000 01 |
| SITS vs. 3P-VATS    | 3  | [120]                                                                             | 17 | [46,51-53,56,58,64,66-67,70-71,75,77-79,81,120]           |    |        |                    |           |
| RCT 组               | -  | [79,81,120]                                                                       | 96 | <0.000 01                                                 | 随机 | - 1.05 | ( - 1.63, - 0.46 ) | <0.000 5  |
| 病例对照研究组             | 33 | [2,9,19,20,22-24,26-30,32,34-37,39,41,42,45,47-48,54,57,59,62-63,73-74,76,83]     | 89 | <0.000 01                                                 | 随机 | - 0.62 | ( - 0.87, - 0.36 ) | <0.000 01 |
| 队列研究组               | 1  | [25]                                                                              | -  | -                                                         | 随机 | - 0.39 | ( - 0.84, 0.06 )   | 0.09      |
| SITS vs. 2P-VATS    | 30 | [11,19,21,23,25,33,37-38,40,87-91,93-95,97-98,100-104,107-108,110-112,120]        | 97 | <0.000 01                                                 | 随机 | - 1.23 | ( - 1.72, - 0.75 ) | <0.000 01 |
| RCT 组               | 7  | [21,33,95,101,103,107,120]                                                        | 98 | <0.000 01                                                 | 随机 | - 2.04 | ( - 3.90, - 0.18 ) | 0.03      |
| 病例对照研究组             | 22 | [11,19,23,37-38,40,87-91,93-94,97-98,100,102,104,108,110-112]                     | 96 | <0.000 01                                                 | 随机 | - 1.05 | ( - 1.53, - 0.58 ) | 0.000 1   |
| 队列研究组               | 1  | [25]                                                                              | -  | -                                                         | 随机 | - 0.35 | ( - 0.75, 0.05 )   | 0.09      |
| 2P-VATS vs. 3P-VATS | 10 | [19,23,25,31,37,113-114,118-120]                                                  | 85 | <0.000 01                                                 | 随机 | - 0.46 | ( - 0.85, - 0.08 ) | 0.02      |

|                     |                                                                                                      |    |           |    |        |                  |           |
|---------------------|------------------------------------------------------------------------------------------------------|----|-----------|----|--------|------------------|-----------|
| 3P-VATS             |                                                                                                      |    |           |    |        |                  |           |
| RCT 组               | 3 <sup>[113,119-120]</sup>                                                                           | 91 | <0.000 1  | 随机 | - 0.71 | ( - 1.65, 0.23 ) | 0.14      |
| 病例对照研究组             | 6 <sup>[19,23,31,37,114,118]</sup>                                                                   | 86 | <0.000 01 | 随机 | - 0.44 | ( - 0.97, 0.08 ) | 0.10      |
| 队列研究组               | 1 <sup>[25]</sup>                                                                                    | -  | -         | 随机 | - 0.03 | ( - 0.42, 0.36 ) | 0.87      |
| 术后并发症               |                                                                                                      |    |           |    |        |                  |           |
|                     | 34 <sup>[18,22-24,26,28,29,36,39,43-44,46,49,50,53,56-59,62,64-67,69,71,73-75,77,80-81,84,120]</sup> |    |           |    |        |                  |           |
| SITS vs. 3P-VATS    | 15 <sup>[46,49-50,53,56,58,64,66-67,69,71,75]</sup>                                                  | 16 | 0.21      | 固定 | 0.34   | ( 0.26, 0.45 )   | <0.000 01 |
| RCT 组               | 19 <sup>[77,81,120]</sup>                                                                            | 31 | 0.12      | 固定 | 0.38   | ( 0.26, 0.56 )   | <0.000 01 |
| 病例对照研究组             | 19 <sup>[18,22-24,26,28-29,36,39,43-44,57,59]</sup>                                                  |    |           |    |        |                  |           |
| 病例对照研究组             | 2 <sup>[62,65,73-74,80,84]</sup>                                                                     | 2  | 0.43      | 固定 | 0.31   | ( 0.21, 0.45 )   | <0.000 01 |
| 队列研究组               | 0                                                                                                    | -  | -         | -  | -      | -                | -         |
|                     | 20 <sup>[11,23,33,38,88,92,94-96,98,100,102,104-108,110,112,120]</sup>                               |    |           |    |        |                  |           |
| SITS vs. 2P-VATS    | 7 <sup>[33,92,95,105-107,120]</sup>                                                                  | 0  | 0.84      | 固定 | 0.47   | ( 0.33, 0.68 )   | <0.000 1  |
| RCT 组               | 13 <sup>[11,23,38,88,94,96,98,100,102,104,10]</sup>                                                  | 0  | 0.80      | 固定 | 0.44   | ( 0.23, 0.85 )   | 0.01      |
| 病例对照研究组             | 8,110,112]                                                                                           | 0  | 0.62      | 固定 | 0.49   | ( 0.31, 0.76 )   | 0.001     |
| 队列研究组               | 0                                                                                                    | -  | -         | -  | -      | -                | -         |
| 2P-VATS vs. 3P-VATS |                                                                                                      |    |           |    |        |                  |           |
|                     | 6 <sup>[23,115-118,120]</sup>                                                                        | 10 | 0.35      | 固定 | 0.36   | ( 0.22, 0.59 )   | <0.000 1  |
| RCT 组               | 1 <sup>[120]</sup>                                                                                   | -  | -         | 固定 | 0.68   | ( 0.20, 2.32 )   | 0.54      |
| 病例对照研究组             | 5 <sup>[23,33,115-117]</sup>                                                                         | 11 | 0.34      | 固定 | 0.31   | ( 0.18, 0.55 )   | <0.000 1  |
| 队列研究组               | 0                                                                                                    | -  | -         | -  | -      | -                | -         |
| 术后复发                |                                                                                                      |    |           |    |        |                  |           |
|                     | 22 <sup>[8,9,23,25-29,39,43,44,50,56,59,65,68,69,75,82-84,120]</sup>                                 |    |           |    |        |                  |           |
| SITS vs. 3P-VATS    | 6 <sup>[50,56,69,75,82,120]</sup>                                                                    | 0  | 0.99      | 固定 | 0.50   | ( 0.33, 0.75 )   | 0.000 8   |
| RCT 组               | 14 <sup>[8,9,23,26-29,39,43,44,59,65,83,84]</sup>                                                    | 0  | 0.85      | 固定 | 0.40   | ( 0.17, 0.93 )   | 0.03      |
| 病例对照研究组             |                                                                                                      | 0  | 0.97      | 固定 | 0.58   | ( 0.36, 0.94 )   | 0.03      |

|                  |                                                     |    |           |    |        |                  |           |
|------------------|-----------------------------------------------------|----|-----------|----|--------|------------------|-----------|
| 队列研究组            | 2 <sup>[25,68]</sup>                                | 0  | 0.63      | 固定 | 0.16   | (0.02, 1.38)     | 0.10      |
| SITS vs. 2P-VATS | 9 <sup>[11,21,25,40,90,94,96,103,120]</sup>         | 0  | 0.90      | 固定 | 0.60   | (0.31, 1.20)     | 0.15      |
| RCT 组            | 3 <sup>[21,103,120]</sup>                           | 0  | 0.75      | 固定 | 0.56   | (0.16, 1.95)     | 0.36      |
| 病例对照研究组          | 5 <sup>[11,23,40,94,96]</sup>                       | 0  | 0.66      | 固定 | 0.70   | (0.29, 1.67)     | 0.42      |
| 队列研究组            | 1 <sup>[25]</sup>                                   | -  | -         | 固定 | 0.32   | (0.03, 3.18)     | 0.33      |
| 2P-VATS vs.      |                                                     |    |           |    |        |                  |           |
| 3P-VATS          | 3 <sup>[23,25,120]</sup>                            | 0  | 0.99      | 固定 | 0.67   | (0.24, 1.82)     | 0.43      |
| RCT 组            | 1 <sup>[120]</sup>                                  | -  | -         | 固定 | 0.65   | (0.10, 4.10)     | 0.65      |
| 病例对照研究组          | 1 <sup>[23]</sup>                                   | -  | -         | 固定 | 0.59   | (0.05, 6.96)     | 0.68      |
| 队列研究组            | 1 <sup>[25]</sup>                                   | -  | -         | 固定 | 0.70   | (0.18, 2.79)     | 0.62      |
| 术后疼痛 VAS 评分      |                                                     |    |           |    |        |                  |           |
|                  | 33 <sup>[2,18,20,22-23,25,28,29,34-36,39,42,</sup>  |    |           |    |        |                  |           |
| SITS vs. 3P-VATS | 43,45,48-51,54,62,64,67,70,74,76,77,81,8            |    |           |    |        |                  |           |
| (24 h)           | 3-86,120]                                           | 95 | <0.000 01 | 随机 | - 1.71 | (- 2.13, - 1.30) | <0.000 01 |
| RCT 组            | 9 <sup>[49-51,64,67,70,77,81,120]</sup>             | 97 | <0.000 01 | 随机 | - 2.55 | (- 3.57, - 1.53) | <0.000 01 |
|                  | 23 <sup>[2,18,20,22-23,28,29,35,36,39,42-43,</sup>  |    |           |    |        |                  |           |
| 病例对照研究组          | 45,47-48,54,62,74,76,83-86]                         | 93 | <0.000 01 | 随机 | - 1.43 | (- 1.89, - 0.97) | <0.000 01 |
| 队列研究组            | 1 <sup>[25]</sup>                                   | -  | -         | 随机 | - 0.96 | (- 1.43, - 0.49) | <0.000 1  |
| SITS vs. 3P-VATS |                                                     |    |           |    |        |                  |           |
| (48 h)           | 12 <sup>[2,7,18,20,25,36,43,54,64,70,85-86]</sup>   | 93 | <0.000 01 | 随机 | - 1.70 | (- 2.35, - 1.06) | <0.000 01 |
| RCT 组            | 2 <sup>[64,70]</sup>                                | 0  | 0.83      | 随机 | - 4.04 | (- 4.59, - 3.48) | <0.000 01 |
| 病例对照研究组          | 9 <sup>[2,18,20,36,43,45,54,85-86]</sup>            | 88 | <0.000 01 | 随机 | - 1.22 | (- 1.77, - 0.68) | <0.000 1  |
| 队列研究组            | 1 <sup>[25]</sup>                                   | -  | -         | 随机 | - 1.34 | (- 1.84, - 0.84) | <0.000 01 |
|                  | 30 <sup>[2,18,25,28-30,36,37,39,43,45,48-50,</sup>  |    |           |    |        |                  |           |
| SITS vs. 3P-VATS | 52,54-55,63,64,67,70,74,76,77,81,83-86,1            |    |           |    |        |                  |           |
| (72 h)           | 20]                                                 | 95 | <0.000 01 | 随机 | - 1.72 | (- 2.16, - 1.29) | <0.000 01 |
| RCT 组            | 10 <sup>[49,50,52,55,64,67,70,77,81,120]</sup>      | 95 | <0.000 01 | 随机 | - 2.37 | (- 3.18, - 1.56) | <0.000 01 |
|                  | 19 <sup>[2,18,28-30,36,37,39,43,45,48,54,63,7</sup> |    |           |    |        |                  |           |
| 病例对照研究组          | 4,76,83-86]                                         | 94 | <0.000 01 | 随机 | - 1.42 | (- 1.94, - 0.90) | <0.000 01 |

|                  |                                                    |    |           |    |        |                   |           |
|------------------|----------------------------------------------------|----|-----------|----|--------|-------------------|-----------|
| 队列研究组            | 1 <sup>[25]</sup>                                  | -  | -         | 随机 | - 0.84 | ( - 1.31, - 0.37) | <0.000 4  |
| SITS vs. 2P-VATS |                                                    |    |           |    |        |                   |           |
| (24 h)           | 11 <sup>[11,23,25,90,95,99,104-107,120]</sup>      | 94 | <0.000 01 | 随机 | - 1.85 | ( - 2.49, - 1.20) | <0.000 01 |
| RCT 组            | 5 <sup>[95,105-107,120]</sup>                      | 95 | <0.000 01 | 随机 | - 1.87 | ( - 3.01, - 0.72) | 0.001     |
| 病例对照研究组          | 5 <sup>[11,23,90,99,104]</sup>                     | 92 | <0.000 01 | 随机 | - 2.04 | ( - 2.98, - 1.11) | <0.000 1  |
| 队列研究组            | 1 <sup>[25]</sup>                                  | -  | -         | 随机 | - 0.88 | ( - 1.30, - 0.46) | <0.000 1  |
| SITS vs. 2P-VATS |                                                    |    |           |    |        |                   |           |
| (48 h)           | 3 <sup>[11,25,102]</sup>                           | 97 | <0.000 01 | 随机 | - 2.17 | ( - 3.66, - 0.69) | 0.004     |
| RCT 组            | 0                                                  | -  | -         | -  | -      | -                 | -         |
| 病例对照研究组          | 2 <sup>[11,102]</sup>                              | 98 | <0.000 01 | 随机 | - 2.78 | (-5.54, - 0.01)   | 0.05      |
| 队列研究组            | 1 <sup>[25]</sup>                                  | -  | -         | 随机 | - 1.03 | ( - 1.45, - 0.61) | <0.000 01 |
| SITS vs. 2P-VATS | 12 <sup>[11,21,25,37,87,90,95,99,102,104,106</sup> |    |           |    |        |                   |           |
| (72 h)           | ,120]                                              | 95 | <0.000 01 | 随机 | - 2.16 | ( - 2.85, - 1.47) | <0.000 01 |
| RCT 组            | 4 <sup>[21,95,106,120]</sup>                       | 96 | <0.000 01 | 随机 | - 2.84 | (-4.49, - 1.20)   | 0.000 7   |
| 病例对照研究组          | 7 <sup>[11,37,87,90,99,102,104]</sup>              | 93 | <0.000 01 | 随机 | - 2.04 | ( - 2.80, - 1.27) | <0.000 01 |
| 队列研究组            | 1 <sup>[25]</sup>                                  | -  | -         | 随机 | - 0.52 | ( - 0.93, - 0.12) | 0.01      |
| 2P-VATS vs.      |                                                    |    |           |    |        |                   |           |
| 3P-VATS (24 h)   | 4 <sup>[23,25,31,120]</sup>                        | 73 | 0.01      | 随机 | - 0.67 | ( - 1.09, - 0.25) | 0.002     |
| RCT 组            | 1 <sup>[120]</sup>                                 | -  | -         | 固定 | - 1.21 | ( - 1.66, - 0.76) | <0.000 01 |
| 病例对照研究组          | 2 <sup>[23,31]</sup>                               | 0  | 92        | 固定 | - 0.65 | ( - 0.95, - 0.35) | <0.000 1  |
| 队列研究组            | 1 <sup>[25]</sup>                                  | -  | -         | 固定 | - 0.19 | ( - 0.58, 0.20)   | 0.34      |
| 2P-VATS vs.      |                                                    |    |           |    |        |                   |           |
| 3P-VATS (48 h)   | 1 <sup>[25]</sup>                                  | -  | -         | 随机 | - 0.39 | ( - 0.78, 0.00)   | 0.05      |
| RCT 组            | 0                                                  | -  | -         | -  | -      | -                 | -         |
| 病例对照研究组          | 0                                                  | -  | -         | -  | -      | -                 | -         |
| 队列研究组            | 1 <sup>[25]</sup>                                  | -  | -         | 随机 | - 0.39 | ( - 0.78, 0.00)   | 0.05      |
| 2P-VATS vs.      |                                                    |    |           |    |        |                   |           |
| 3P-VATS (72 h)   | 6 <sup>[25,31,37,114,119-120]</sup>                | 81 | <0.000 1  | 随机 | - 1.00 | ( - 1.45, - 0.56) | <0.000 1  |
| RCT 组            | 2 <sup>[119-120]</sup>                             | 93 | 0.0000 2  | 随机 | - 1.57 | ( - 3.27, 0.13)   | 0.07      |

|         |                          |    |      |    |        |                    |          |
|---------|--------------------------|----|------|----|--------|--------------------|----------|
| 病例对照研究组 | 3 <sup>[31,37,114]</sup> | 62 | 0.07 | 随机 | - 0.95 | ( - 1.38, - 0.52 ) | <0.000 1 |
| 队列研究组   | 1 <sup>[25]</sup>        | -  | -    | 随机 | - 0.35 | ( - 0.74, 0.04 )   | 0.08     |

表 3 敏感性分析结果

| 结局指标 | 纳入文献数            | 异质性检验结果                                                                               |       | 效应模型      | Meta 分析结果 |          |                    |       |
|------|------------------|---------------------------------------------------------------------------------------|-------|-----------|-----------|----------|--------------------|-------|
|      |                  | $I^2$ (%)                                                                             | $P$ 值 |           | $OR$      | 95% $CI$ | $P$ 值              |       |
| 手术时间 | SITS vs. 2P-VATS | 31 <sup>[11,19,21,23,25,33,37-38,40,87-90,92-102,105,107 - 111,120]</sup>             | 95    | <0.000 01 | 随机        | - 0.53   | ( - 0.90, - 0.16 ) | 0.005 |
|      |                  | 30 <sup>[11,19,21,23,25,33,37-38,40,87-90,92-101,105,107-111,120]</sup>               | 93    | <0.000 01 | 随机        | - 0.40   | ( - 0.71, - 0.08 ) | 0.01  |
|      |                  | 29 <sup>[11,19,21,23,25,33,37-38,40,87-90,92-99,101,105,107-111,120]</sup>            | 92    | <0.000 01 | 随机        | - 0.30   | ( - 0.59, - 0.00 ) | 0.05  |
|      |                  | 28 <sup>[11,19,21,23,25,33,37-38,40,87-90,92-94,96-99,101,105,107-111,120]</sup>      | 91    | <0.000 01 | 随机        | - 0.21   | ( - 0.49, 0.07 )   | 0.13  |
|      |                  | 27 <sup>[11,19,21,23,25,37-38,40,87-90,92-94,96-99,101,105,107-111,120]</sup>         | 89    | <0.000 01 | 随机        | - 0.12   | ( - 0.36, 0.13 )   | 0.36  |
|      |                  | 26 <sup>[11,19,21,23,25,37-38,40,87-90,92-94,96-99,101,105,107-108,110-111,120]</sup> | 86    | <0.000 01 | 随机        | - 0.06   | ( - 0.29, 0.17 )   | 0.61  |
|      |                  | 25 <sup>[11,21,23,25,37-38,40,87-90,92-94,96-99,101,105,107-108,110-111,120]</sup>    | 83    | <0.000 01 | 随机        | - 0.13   | ( - 0.34, 0.08 )   | 0.24  |
|      |                  | 24 <sup>[21,23,25,37-38,40,87-90,92-94,96-99,101,105,107-108,110-111,120]</sup>       | 73    | <0.000 01 | 随机        | - 0.06   | ( - 0.23, 0.11 )   | 0.51  |
|      |                  | 23 <sup>[21,23,25,38,40,87-90,92-94,96-99,101,105,107-108,110-111,120]</sup>          | 39    | 0.03      | 随机        | - 0.12   | ( - 0.24, - 0.01 ) | 0.04  |

|       |                     |    |                                                                      |    |           |    |        |                       |           |
|-------|---------------------|----|----------------------------------------------------------------------|----|-----------|----|--------|-----------------------|-----------|
| 术中出血量 | SITS vs.<br>2P-VATS | 22 | [21,23,25,38,87-90,92-94,96-99,101,10<br>5,107-108,110-111,120]      | 33 | 0.07      | 随机 | - 0.14 | ( - 0.26,<br>- 0.03 ) | 0.02      |
|       |                     | 21 | [21,23,25,38,87-90,92-94,96-98,101,10<br>5,107-108,110-111,120]      | 16 | 0.26      | 随机 | - 0.11 | ( - 0.22,<br>- 0.01 ) | 0.03      |
|       |                     | 20 | [21,23,25,38,87-90,92-94,96-98,101,10<br>7-108,110-111,120]          | 2  | 0.43      | 随机 | - 0.14 | ( - 0.24,<br>- 0.04 ) | 0.007     |
|       |                     | 19 | [21,23,25,38,87-90,92-94,97,98,101,10<br>7-108,110-111,120]          | 0  | 0.75      | 随机 | - 0.12 | ( - 0.22,<br>- 0.02 ) | 0.02      |
|       |                     | 19 | [21,23,25,38,87-90,92-94,97,98,101,10<br>7-108,110-111,120]          | 0  | 0.75      | 固定 | - 0.12 | ( - 0.22,<br>- 0.02 ) | 0.02      |
|       |                     | 26 | [19,23,33,37-38,40,87,89,90,92-97,99<br>- 105,107-110]               | 95 | <0.000 01 | 随机 | - 1.59 | ( - 2.03,<br>- 1.14 ) | <0.000 01 |
|       |                     | 25 | [19,23,33,37-38,40,87,89,90,92-97,99<br>- 101,103 - 105,107 - 110]   | 94 | <0.000 01 | 随机 | - 1.46 | ( - 1.86,<br>- 1.06 ) | <0.000 01 |
|       |                     | 24 | [19,23,37-38,40,87,89,90,92-97,99 - 10<br>1,103 - 105,107 - 110]     | 93 | <0.000 01 | 随机 | - 1.28 | ( - 1.64,<br>- 0.92 ) | <0.000 01 |
|       |                     | 23 | [19,23,37-38,40,87,89,90,92-97,99,100,<br>103 - 105,107 - 110]       | 92 | <0.000 01 | 随机 | - 1.18 | ( - 1.52,<br>- 0.84 ) | <0.000 01 |
|       |                     | 22 | [19,23,37-38,40,87,89,90,92-97,99,100,<br>104,105,107 - 110]         | 90 | <0.000 01 | 随机 | - 1.06 | ( - 1.37,<br>- 0.74 ) | <0.000 01 |
|       |                     | 21 | [19,23,37-38,40,87,89,90,92,93,95-97,9<br>9,100,104,105,107 - 110]   | 87 | <0.000 01 | 随机 | - 0.92 | ( - 1.19,<br>- 0.64 ) | <0.000 01 |
|       |                     | 20 | [19,23,37-38,40,87,89,90,92,93,95-97,9<br>9,100,104,105,107-108,110] | 80 | <0.000 01 | 随机 | - 0.82 | ( - 1.05,<br>- 0.59 ) | <0.000 01 |
|       |                     | 19 | [19,23,37-38,40,87,89,90,92,93,95-97,9<br>9,100,105,107-108,110]     | 71 | <0.000 01 | 随机 | - 0.73 | ( - 0.92,<br>- 0.54 ) | <0.000 01 |
|       |                     | 18 | [19,23,37-38,40,87,89,90,92,93,96,97,9<br>9,100,105,107-108,110]     | 45 | 0.02      | 随机 | - 0.64 | ( - 0.78,<br>- 0.50 ) | <0.000 01 |
|       |                     |    |                                                                      |    |           |    |        |                       |           |

|                        |    |                                                           |    |           |    |        |                    |           |
|------------------------|----|-----------------------------------------------------------|----|-----------|----|--------|--------------------|-----------|
| 2P-VATS vs.<br>3P-VATS | 17 | [19,23,37-38,87,89,90,92,93,96,97,99,100,105,107-108,110] | 0  | 0.66      | 随机 | - 0.68 | ( - 0.80, - 0.57 ) | <0.000 01 |
|                        | 17 | [19,23,37-38,87,89,90,92,93,96,97,99,100,105,107-108,110] | 0  | 0.66      | 固定 | - 0.68 | ( - 0.80, - 0.57 ) | <0.000 01 |
|                        |    |                                                           |    |           |    |        | ( - 1.81,          |           |
|                        | 9  | [19,23,31,37,113,114,117-119]                             | 95 | <0.000 01 | 随机 | - 1.02 | - 0.22 )           | 0.01      |
|                        | 8  | [19,23,31,37,113,114,117,119]                             | 92 | <0.000 01 | 随机 | - 0.71 | ( - 1.36, - 0.05 ) | 0.03      |
|                        | 7  | [19,23,31,37,113,117,119]                                 | 81 | <0.000 01 | 随机 | - 0.32 | ( - 0.75, 0.11 )   | 0.15      |
|                        | 6  | [19,23,31,37,113,117]                                     | 14 | 0.32      | 随机 | - 0.12 | ( - 0.33, 0.09 )   | 0.25      |
|                        | 5  | [19,23,31,37,117]                                         | 0  | 0.41      | 随机 | - 0.06 | ( - 0.27, 0.15 )   | 0.57      |
|                        | 5  | [19,23,31,37,117]                                         | 0  | 0.41      | 固定 | - 0.06 | ( - 0.27, 0.15 )   | 0.57      |
|                        |    |                                                           |    |           |    |        |                    |           |
| 术后并发症                  |    |                                                           |    |           |    |        |                    |           |
| SITS vs.               | 19 | [18,22-23,26,28,29,36,39,43,44,46,49,50,53,56-59,120]     | 36 | 0.06      | 固定 | 0.45   | ( 0.32, 0.64 )     | <0.000 1  |
| 3P-VATS                | 19 | [18,22-23,26,28,29,36,39,43,44,46,49,50,53,56-59,120]     | 36 | 0.06      | 随机 | 0.46   | ( 0.27, 0.77 )     | 0.003     |
|                        | 18 | [18,22-23,26,28,29,36,39,43,44,46,49,50,53,56,57,59,120]  | 13 | 0.29      | 随机 | 0.39   | ( 0.25, 0.62 )     | <0.000 1  |
|                        | 17 | [18,23,26,28,29,36,39,43,44,46,49,50,53,56,57,59,120]     | 0  | 0.65      | 随机 | 0.46   | ( 0.30, 0.71 )     | 0.000 5   |
|                        | 17 | [18,23,26,28,29,36,39,43,44,46,49,50,53,56,57,59,120]     | 0  | 0.65      | 固定 | 0.46   | ( 0.30, 0.71 )     | 0.000 5   |
| SITS vs.               |    |                                                           |    |           |    |        |                    |           |
| 2P-VATS                | 10 | [11,23,33,38,88,92,94,96,98,120]                          | 0  | 0.66      | 固定 | 0.57   | ( 0.34, 0.97 )     | 0.04      |
|                        | 10 | [11,23,33,38,88,92,94,96,98,120]                          | 0  | 0.66      | 随机 | 0.63   | ( 0.36, 1.11 )     | 0.11      |
| 2P-VATS vs.            |    |                                                           |    |           |    |        |                    |           |
| 3P-VATS                | 4  | [1,12,23,120]                                             | 0  | 0.73      | 固定 | 0.46   | ( 0.27, 0.81 )     | 0.007     |
|                        | 4  | [1,12,23,120]                                             | 0  | 0.73      | 随机 | 0.46   | ( 0.26, 0.81 )     | 0.007     |

|             |                                                       |   |      |    |      |              |         |
|-------------|-------------------------------------------------------|---|------|----|------|--------------|---------|
| 术后气胸复发      |                                                       |   |      |    |      |              |         |
| SITS vs.    | 21 <sup>[8,9,25 – 29,39,43,44,50,56,59,65,68,69</sup> |   |      |    |      |              |         |
| 3P-VATS     | ,75,82-84,120]                                        | 0 | 0.99 | 固定 | 0.49 | (0.32, 0.74) | 0.000 6 |
|             | 21 <sup>[8,9,25 – 29,39,43,44,50,56,59,65,68,69</sup> |   |      |    |      |              |         |
|             | ,75,82-84,120]                                        | 0 | 0.99 | 随机 | 0.53 | (0.34, 0.81) | 0.004   |
| SITS vs.    |                                                       |   |      |    |      |              |         |
| 2P-VATS     | 9 <sup>[11,21,25,40,90,94,96,103,120]</sup>           | 0 | 0.90 | 固定 | 0.60 | (0.31, 1.20) | 0.15    |
|             | 9 <sup>[11,21,25,40,90,94,96,103,120]</sup>           | 0 | 0.90 | 随机 | 0.64 | (0.31, 1.33) | 0.23    |
| 2P-VATS vs. |                                                       |   |      |    |      |              |         |
| 3P-VATS     | 2 <sup>[25,120]</sup>                                 | 0 | 0.95 | 固定 | 0.68 | (0.23, 2.06) | 0.50    |
|             | 2 <sup>[25,120]</sup>                                 | 0 | 0.95 | 随机 | 0.68 | (0.23, 2.06) | 0.50    |