The Effect of Obesity on Clinical Outcomes After Minimally Invasive Surgery of the Spine: A Systematic Review and Meta-Analysis

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BACKGROUND: Obesity is associated with increasing morbidity and mortality in many prevalent diseases, especially lumbar degenerative disease. The relationship between minimally invasive surgery (MIS) of the spine and perioperative adverse events in obese patients with lumbar degenerative disease has not been well evaluated.

METHODS: We conducted a systematic review and meta-analysis to identify relevant studies involving obese patients with spine MIS in electronic databases up to June 2017, including Web of Science, Embase, PubMed, the Cochrane Controlled Trials Register, and the Cochrane Library. The PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines, GRADE (Grading of Recommendations, Assessment, Development and Evaluation) system, and Cochrane Handbook were applied to assess the quality of the results published in all included studies.

RESULTS: No significant difference was found in postoperative complications between obese and nonobese patients, according to the Oswestry Disability Index, and visual analog scale. However, there were significant differences between the 2 groups in surgery time, blood loss, and length of hospital stay.

CONCLUSIONS: There does not seem to be an increased risk of developing perioperative complications in obese patients undergoing spine MIS. Spine MIS was a safe and effective technique for obese patients. However, according to our pooled data, longer surgery time was observed in obese patients.

INTRODUCTION

Prevalence of overweight and obesity has increased dramatically over the past decades, and the global epidemiologic estimate shows that more than one third of adults are overweight or obese. Furthermore, the prevalence of obesity is increasing steadily, and more than two thirds of the population is projected to be overweight or obese by 2025. In China, nearly one third of young Chinese men in rural areas are overweight or obese; moreover, the increased trend of overweight and obesity is common in young men, especially among those in higher socioeconomic strata. Obesity is associated with increasing morbidity and mortality in many prevalent diseases such as cardiovascular diseases, diabetes, and osteoarthritis. A prospective cohort study reported in 2010 showed that overweight and obesity have already caused 3.4 million deaths, 3.9% years of life lost, and 3.8% of disability-adjusted life years globally. Recently, several clinical studies and systematic reviews have reported a consistent association between obesity and low back pain. Moreover, Liuke et al. reported that body mass index (BMI) >25 kg/m² increased the risk of lumbar degenerative disease.

Conventional open surgical treatments in obese patients with lumbar degenerative disease used a large incision to allow adequate visualization at depth; however, the large wound surface was usually associated with soft tissue injury, which was possibly the reason for perioperative morbidity. Recently, minimally invasive spine surgery is a promising minimally invasive technique for the treatment of lumbar degenerative disease in obese patients. There have been many reports on the clinical outcomes and complications of MIS for lumbar degenerative disease in obese patients; however, the relationship between MIS and perioperative adverse events in obese patients is not well understood.

Key words
- Meta-analysis
- Minimally invasive spine surgery
- Obesity

Abbreviations and Acronyms
- BMI: Body mass index
- CI: Confidence interval
- GRADE: Grading of Recommendations, Assessment, Development and Evaluation
- MD: Mean difference
- MIS: Minimally invasive surgery
- ODI: Oswestry Disability Index
- RCT: Randomized controlled trial

SD: Standard deviation
VAS: Visual analog scale

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invasive surgery (MIS) of the spine has been a commonly used surgical technique for the treatment of lumbar degenerative disease. Several prospective clinical studies reported that spine MIS was associated with less soft tissue injury and less blood loss and yielded similar functional recovery to those after open procedures, although some previous cohort studies reported that spine MIS for obese patients were promising in terms of functional outcomes. However, the relationship between spine MIS and perioperative adverse events in obese patients with lumbar degenerative disease has not been well evaluated. Moreover, no randomized controlled trial (RCT) has been conducted to assess the safety and efficacy of spine MIS among obese patients, and no definite conclusions have been reached. Therefore, to investigate the safety and efficacy of spine MIS for obese patients, we performed a meta-analysis to evaluate evidence systematically from all available studies that compared obese patients with normal weight patients undergoing spine MIS and to propose recommendations for clinicians by using the GRADE (Grading of Recommendations, Assessment, Development and Evaluation) system.

METHODS

Search Strategy
The PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines, GRADE system, and the Cochrane Handbook were applied to assess the quality of the results reported in all studies included to make sure the results of our meta-analysis were reliable and verifiable. We conducted a systematic review and meta-analysis to identify relevant studies up to June 2017 involving obese patients with spine MIS in electronic databases, including Web of Science, Embase, PubMed, the Cochrane Controlled Trials Register, and the Cochrane Library. Only studies performed on human beings were included. The search strategy is presented in Supplementary Table 1. A flow chart of the trial selection process is presented in Figure 1.

Inclusion and Exclusion Criteria
Included studies were considered eligible if they met the PICOS (Participants, Interventions, Comparisons, Outcomes, and Study) criteria as follows.

Figure 1. The search results of studies included.
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