Cost-effectiveness of open transforaminal lumbar interbody fusion (OTLIF) versus minimally invasive transforaminal lumbar interbody fusion (MITLIF)

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Systematic Review / Meta-Analysis

Cost-effectiveness of open transforaminal lumbar interbody fusion (OTLIF) versus minimally invasive transforaminal lumbar interbody fusion (MITLIF): a systematic review and meta-analysis

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Abstract

BACKGROUND CONTEXT: The number of performed instrumented lumbar spine surgeries and associated health-care-related costs has increased over the last decades, and will increase further in the future. With the consistent growth of health-care-related costs, cost-effectiveness of surgical techniques is of major relevance. Common indications for instrumented lumbar spine surgery are spondylolisthesis and degenerative disease. A commonly used technique is the open transforaminal lumbar interbody fusion (OTLIF). Nowadays, there is an increasing interest in the minimally invasive variation of this technique (minimally invasive transforaminal lumbar interbody fusion [MITLIF]). Currently available literature describes that MITLIF has comparable or even better clinical results compared to OTLIF. Cost-effectiveness of MITLIF and OTLIF is important considering the growing health-care related costs, although no consensus has been reached regarding the most cost-effective technique. In this systematic review, previous literature concerning costs and cost-effectiveness of OTLIF was compared with MITLIF in patients with lumbar spondylolisthesis or degenerative disease. Furthermore, methodological quality of included studies was assessed.

PURPOSE: This study aims to evaluate the current literature on cost-effectiveness of OTLIF compared MITLIF to in patients with lumbar spondylolisthesis or degenerative disease.

STUDY DESIGN: This study is a systematic literature review and meta-analysis.

STUDY SAMPLE: Clinical studies reporting costs or cost-effectiveness for either OTLIF or MITLIF in patients with spondylolisthesis, lumbar instability, or degenerative disease were included.

OUTCOME MEASURES: The following data items were evaluated: study design, study population, utility measurement tool, gained quality adjusted life years (QALYs), cost sources, health care and societal perspective costs, total costs, costs per QALY (cost-effectiveness) and incremental cost-effectiveness ratio (ICER).

METHODS: A systematic search was conducted using databases PubMed, CINAHL, EMBASE, Cochrane, Clinical Trials, Current Controlled Trials, ClinicalTrials.gov, NHS Centre for Review and Dissemination, Econlit and Web of Science on studies reporting OTLIF or MITLIF,

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spondylolisthesis or lumbar instability or degenerative disease, and costs. Relevant studies were selected and reviewed independently by two authors. For comparison, all costs were converted to American dollars with the reference year 2018.

RESULTS: After duplicate removal, a total of 892 studies were identified. Eventually, 32 studies were included. Nine studies compared OTLIF and MITLIF directly. All studies mentioned health care perspective costs. Seven studies mentioned societal perspective costs. Cost-effectiveness of OTLIF was mentioned in five studies, ranging from $47,303/QALY to $218,766/QALY. Cost-effectiveness of MITLIF was mentioned in one study, $121,105/QALY. Meta-analysis of hospital perspective costs showed a significant overall effect in favor of MITLIF, with a mean difference of $2,650. There was great heterogeneity in health care and societal perspective costs due to different in-, and exclusion factors, baseline characteristics, and calculation methods. Overall quality of studies was low.

CONCLUSIONS: OTLIF and MITLIF appear to be expensive interventions when using a threshold of $50,000/QALY. Results of this study and previous literature suggest that MITLIF is more cost-effective compared to OTLIF. Considering the increase in health care costs of instrumented spine surgery, cost-effectiveness could be one of the factors in surgical decision-making. Prospective randomized studies directly comparing cost-effectiveness of OTLIF and MITLIF from both hospital and societal perspectives are needed to obtain higher level of evidence.

Keywords: Cost; Cost-effectiveness; Cost-utility; Economic evaluations; MITLIF; OTLIF; QALY; Spinal fusion surgery; Systematic review; TLIF

Introduction

Since 1980, the global population of people older than 60 years has doubled. This number is expected to double again by 2050 [1]. The ageing population is one of the most prominent factors by which the number of instrumented spine surgeries has increased and will even increase further in the future [2,3]. This results in higher health-care-related costs. Previous studies, concerning the national US bill for instrumented spine surgery, have shown a 7.9 fold increase between 1998 and 2008 and a 2.8 fold increase between 2004 and 2015 [4,5]. To limit the increase of health-care-related costs concerning instrumented spine surgery in an ageing population, medical practitioners should consider the most cost-effective surgical technique [6,7]. Notwithstanding that surgical experience, availability of the surgical technique and surgical indication is prioritized factors in surgical-decision making.

Common indications for instrumented lumbar spine surgery are lumbar spondylolisthesis and degenerative disease. Spondylolisthesis is instability as a result of facet joint degeneration or lysis in the pars articularis, resulting in slippage of the upper vertebra over the underlying vertebra [8]. Lumbar degenerative disease is caused by disc degeneration and is a major cause of back pain and associated disability, especially in aged individuals [9,10]. Lumbar spondylolisthesis and degenerative disease can cause back pain, neurogenic claudication and lumbar radiculopathy. Instrumented spine surgery can be performed to relieve complaints and restore spinal stability. A widely used surgical technique is the open transforaminal lumbar interbody fusion (OTLIF). In OTLIF, a unilateral transforaminal approach with unilateral facetectomy is used to insert a single cage; although, several surgeons might prefer bilateral decompression. Additionally, posterior pedicle-screw fixation is performed [11]. A newer, minimally invasive variation to this technique (minimally invasive transforaminal lumbar interbody fusion [MITLIF]) is gaining popularity. In MITLIF, decompression and cage insertion are performed through tubular retractors, followed by percutaneous posterior pedicle-screw fixation. Previous literature generally describes comparable or improved clinical effectiveness for MITLIF compared to OTLIF. Furthermore, studies reported significantly less blood loss, less complications and shorter duration of hospitalization associated with MITLIF compared to OTLIF. The difference in operating room time remains unclear [12−16].

Comparable clinical outcome, but lower blood loss, shorter duration of hospitalization, lower pharmacy and laboratory costs, lower implant costs and lower physical therapy costs could result in MITLIF being more cost-effective compared to OTLIF. Hitherto, no insight has been attained regarding the cost-effectiveness, although this is of importance regarding rising health-care-related costs. This systematic review aimed to evaluate the current literature on cost-effectiveness of MITLIF compared to OTLIF in patients with lumbar spondylolisthesis or degenerative disease. Furthermore, methodological quality of the included studies was assessed and taken into account.

Materials and methods

Review protocol

This systematic review was executed in accordance with the PRISMA statement and the five-step approach on preparing a systematic review of economic evaluations by Van Mastrigt et al. [17−21].

The review protocol consisted of a research question, search strategy and eligibility criteria for assessing full-text studies. The research questions were formulated as follows:

1. Is MITLIF in adults with lumbar spondylolisthesis or degenerative disease more cost-effective than open transforaminal lumbar interbody fusion (OTLIF)?
2. What is the methodological quality of the included studies?

Search strategy and eligibility criteria

A systematic search of databases PubMed, CINAHL, EMBASE, Cochrane, Clinical Trials, Current Controlled Trials, ClinicalTrials.gov, NHS Centre for Review and Dissemination, Econlit, and Web of Science was conducted without using filters. Furthermore, reference lists of cost-effectiveness studies for either OTLIF or MITLIF were manually searched for additional studies. Detailed search strategies for each database are available in Additional File 1, included in the appendix. Our last search was conducted on April 3rd, 2020. Studies were included if they met all of the following eligibility criteria: (i) OTLIF and/or MITLIF, (ii) lumbar spondylolisthesis and/or lumbar instability and/or degenerative disease, (iii) cost.

Study selection and data collection process

Selection of studies was performed by two authors (RD and SH). Duplicates were removed, potentially eligible studies were screened on title and abstract, and full texts were assessed using abovementioned eligibility criteria. Data were collected using a prospectively designed data collection sheet. Data were independently extracted by two authors (RD and SH). The following data items were considered: study design, study population, utility measurement tool, gained Quality Adjusted Life Years (QALYs), cost sources, health care and societal perspective costs, total costs, costs per QALY (cost-effectiveness) and incremental cost-effectiveness ratio (ICER). If necessary, consensus was reached between both authors through discussion or with assistance of a third reviewer (IC). The complete data collection sheet can be found in Additional File 2 in the appendix. To determine cost-effectiveness, difference in total costs has to be divided by difference in QALY-gain. Total costs can be determined using both health care perspective costs (costs for health care resources that an intervention requires, like operating room time) and societal perspective costs (all resource costs associated with an intervention, including costs for caregiver time or absenteeism) [22].

All costs were converted to American Dollars with the reference year 2018 with the use of a web-based tool developed by the Campbell and Cochrane Economics Methods Group and the Evidence for Policy and Practice Information and Coordinating Centre (v.1.6) [23]. If the index year was not mentioned in the study, the last year of patient inclusion was used for this calculation. Subsequently, if the last year of patient inclusion was not described, the year of publication was used as index year.

Quality assessment

Two authors (RD and SH) performed quality assessments on the included studies. Risk of bias was assessed with the bias assessment tool of Cochrane Handbook for Systematic Reviews of Interventions [24]. Risk of bias was based on different domains; confounding, selecting patients, classification of interventions, deviation from intended intervention, missing data, measure outcome, selection of the reported results and other types of bias. Criteria were scored with “low”, “high” or “unclear” risk of bias for randomized studies, and “low”, “moderate”, “serious” or “unclear” risk of bias for non-randomized studies. Levels of evidence were determined with guidelines of Oxford Centre for Evidence-based Medicine (2011) [25] and are summarized in Additional File 3 in the appendix. Methodological quality of economic evaluations was analyzed using The Consensus Health Economic Criteria (CHEC) list [26]. Full risk of bias assessment sheets and CHEC list scores can be found in Additional File 4 and Additional File 5 in the appendix. Consensus was reached between both authors through discussion.

Meta-analysis

A meta-analysis of the study data was performed using the Cochrane Collaborations Review Manager version 5.3 [27]. A meta-analysis was conducted for outcomes of which data were sufficiently reported.

Calculations were performed using Random Effects, Fixed Effects, Mean Difference and a 95% Confidence Interval (CI). p values $\leq$0.05 were regarded as statistically significant. We quantified heterogeneity between studies using the I^2test. Heterogeneity was regarded as low with an $I^2 \leq 50\%$, moderate with a $50\% < I^2 < 75\%$, and high with an $I^2 \geq 75\%$.

An ICER was estimated for studies providing sufficient data. Necessary data for an ICER estimation are differences in costs and differences in clinical effectiveness, usually expressed in QALY gain. ICER = (C1−C0)/(E1−E0). C1 and E1 indicate costs and effectiveness of the intervention group, whereas C0 and E0 indicate costs and effectiveness of the control group.

Protocol registration

This review protocol has been registered in the PROSPERO Database [28].

Results

Study selection

The systematic database search resulted in 1405 studies. Three additional studies were identified through manual searches of relevant reference lists. After removing duplicates, 892 studies were screened on title and abstract. Sixty-six studies were eligible for full-text analysis, resulting in exclusion of 34 studies; 17 studies did not describe one of the interventions of interest, 11 studies did not report the outcome of interest, three studies used similar patient cohorts, two studies did not include patients with lumbar spondylolisthesis or degenerative disease and for one study full text was unavailable. Results of the study selection process are summarized in Fig. 1 in the appendix.

Study characteristics

Study characteristics of the 32 included studies are summarized in Additional File 3 in the appendix.

Thirteen studies were cost-effectiveness studies [29−41] and 19 were financial studies [42−60]. Reported costs varied from implant costs only, to all resource costs associated with an intervention, including costs for caregiver time or absenteeism. Publication years ranged from 2001 to 2020. Follow-up time ranged from time of hospitalization to four years postoperative. Twenty-two studies were performed in the United States of America [29,30,32−39,41,43,45−47,50,51,53,54,56−58], five in China [42,44,55,59,60], two in Europe (Denmark and Turkey) [31,48], one in Canada [40], and one in Iran [49].

Nine studies compared OTLIF and MITLIF directly [32,37,38,40,51,53,54,56,58]. Thirteen studies compared

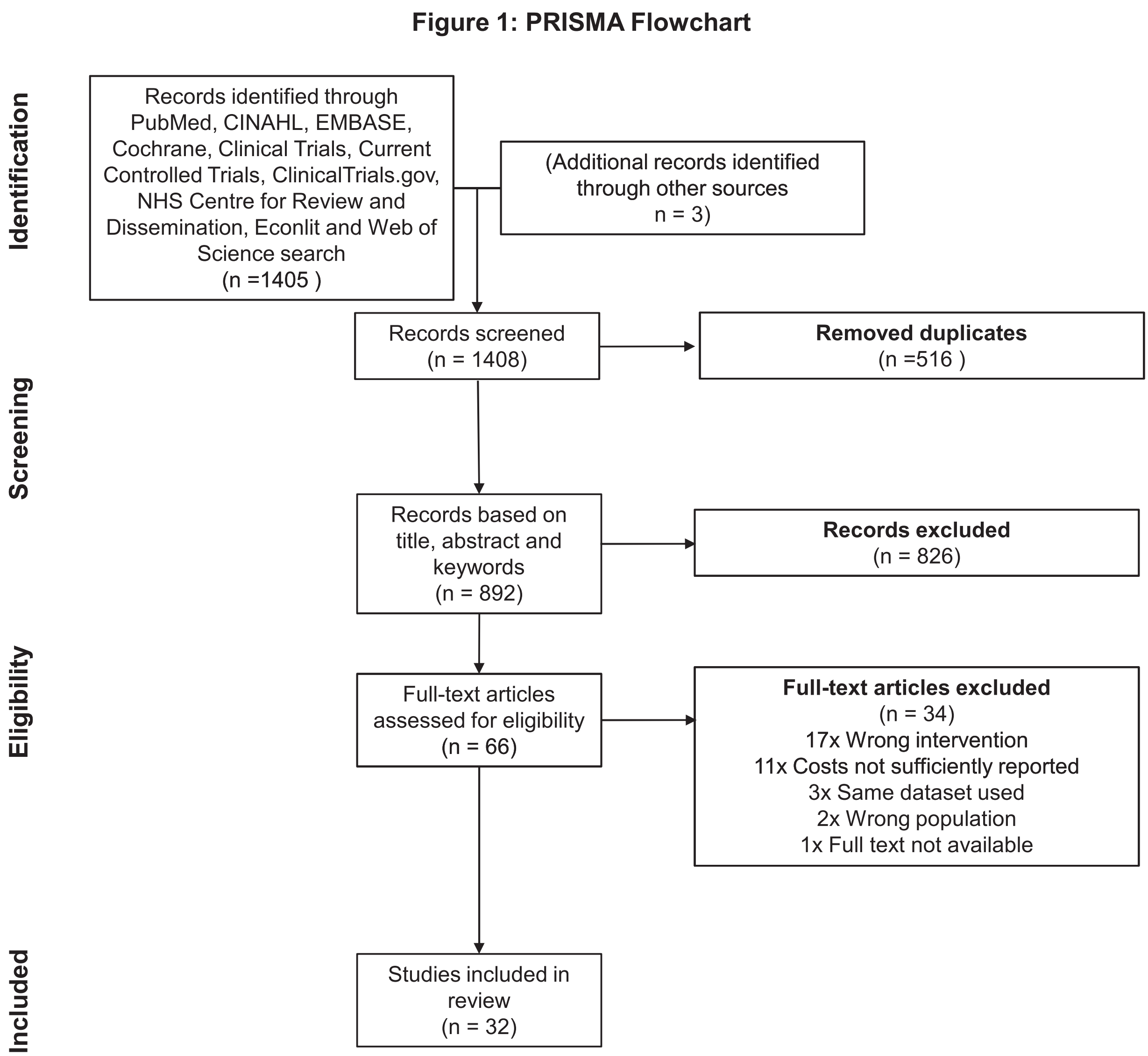

Fig. 1. PRISMA flowchart. PRISMA, Preferred Reporting Items for Systematic reviews and Meta-Analyses.

OTLIF with other instrumented spine surgery techniques [31,33,35,36,41,42,46,48−50,57,59,60], two studies described costs of OTLIF without comparative cohort [29,39]. Seven studies compared MITLIF with other instrumented spine surgery techniques [30,34,43−45,52,55], and one study described costs of MITLIF without comparative cohort [47].

All studies reported health care perspective costs. The cost-sources included hospital databases, Medicare (official site of the U.S. Government), Current Procedural Terminology Codes (CPT Codes), Diagnosis-Related Group Codes (DRG Codes), Redbook (drug pricing resource), and National health insurance registers. Health care perspective costs were mostly determined by using actual hospital costs. However, in seven studies (one OTLIF-, vs. MITLIF-study, and six OTLIF-studies), health care perspective costs were determined using charges (amount paid by patient or insurance) [33,50,57] or a combination of costs and charges [36,41,46,53].

Societal perspective costs were described in two studies comparing OTLIF and MITLIF directly [37,38], and five studies comparing OTLIF with other surgical techniques [29,31,33,36,39]. To determine societal perspective costs, one Danish study used the DREAM database to determine societal perspective costs based on productivity losses [31]. The DREAM Group is a governmental institution that conducts statistical and descriptive analyses of the Danish economy [61]. The other six studies included missed working days to estimate productivity losses [29,33,36-39]. Additionally, two of these studies included unpaid caregiver opportunity costs [29,36], one study included missed homemaking days in patients with housekeeping as primary activity [37] and two studies included both [38,39]. In all six studies, costs for missed days of unpaid caregivers were estimated based on average gross wages plus nonhealth benefits. The hours of missed work were patient-reported through either a questionnaire or an interview. Using the standard human capital approach, costs were estimated by multiplying the change in hours worked by the gross-of-tax wage rate based on self-reported wages at study entry.

Eleven studies used SF-6D, EQ-5D, or the Oswestry Disability Index to determine mean or cumulative QALY gain, whereof four studies comparing OTLIF and MITLIF directly [32,37,38,40] and seven OTLIF-studies [29,31,33,35,36,39,41]. Cost-effectiveness was calculated in five studies, one study comparing OTLIF and MITLIF [40] and four OTLIF-studies [29,33,36,39].

Quality of identified studies

Methodological quality assessment can be found in Additional Files 4 and 5 in the appendix. Based on the criteria for randomized studies, all three randomized studies had a high risk of bias, mainly due to lack of blinding [31,55,60]. Based on the criteria for nonrandomized studies, three nonrandomized studies had a serious risk of bias [29,50,57] and the remaining twenty-four nonrandomized studies had a moderate risk of bias [30,32−49,51−54,56,58,59].

The three randomized studies reached evidence level 2 [31,55,60]. All other studies reached evidence level 3 or 4.

Quality of the included studies using CHEC-scores was low. Scores range from 5.5 to 14.5 with a mean of 9.7. Low quality was mainly caused by insufficient information in the following domains: economic study design, time horizon, competing alternatives, perspective, ICER analysis, discounting, generalization, and ethical issues.

Study results

Results of the studies are summarized in Additional File 2 in the appendix. Costs mentioned in studies ranged from implant costs to full hospital and societal perspective costs. Calculations of costs varied from costs, charges, or a combination of both. Due to heterogeneity between studies, we decided to mention cost ranges instead of means.

All studies mentioned health care perspective costs, ranging from $2,589 to $41,593 (costs) and from $34,255 to$49,535 (charges) for OTLIF and from $13,311 to $76,061 (costs) for MITLIF. Societal perspective costs ranged from $5,584 to $49,947 (costs) for OTLIF [29,31,33,36−39] and from $11,649 to $13,020 for MITLIF (costs) [37,38].

QALY gain for OTLIF was mentioned in ten studies [29,32,33,35−41]. Eight studies used EQ-5D to determine one-year mean QALY gain. This ranged from 0.100 to 0.440 [29,32,33,36−39,41]. Two studies used SF-6D and found a one-year mean QALY gain of 0.057 and 0.079 [32,40]. One study used SF-6D and reported a two-year QALY gain of 0.140 [35].

QALY gain for MITLIF was mentioned in four studies [32,37,38,40]. Two studies determined 1-year QALY gain using the EQ-5D (0.500 and 0.470) [37,38], one study used the SF-6D (0.113) [40] and one studies used both (EQ-5D 0.160, SF-6D 0.071) [32]. In all studies directly comparing OTLIF and MITLIF, QALY gain was higher in the MITLIF group [32,37,38,40].

Cost-effectiveness of OTLIF was mentioned in five studies, ranging from $47,303/QALY to $218,766/QALY [29,33,36,39,40]. Cost-effectiveness of MITLIF was mentioned in one study, $121,105/QALY [40]. One study directly comparing OTLIF and MITLIF showed comparable outcome in terms of QALY gain, and a nonsignificant trend of mean two-year savings of $9,637 in favour of MITLIF [37].

Four studies provided sufficient data to determine an ICER [32,37,38,40]. The ICER was estimated as (MITLIF Costs−OTLIF Costs)/(MITLIF QALY Gain−OTLIF QALY Gain). The results of the ICER estimations were -105,533 [32], -107,077 [37], -329,900 [38], -123,235 [40].

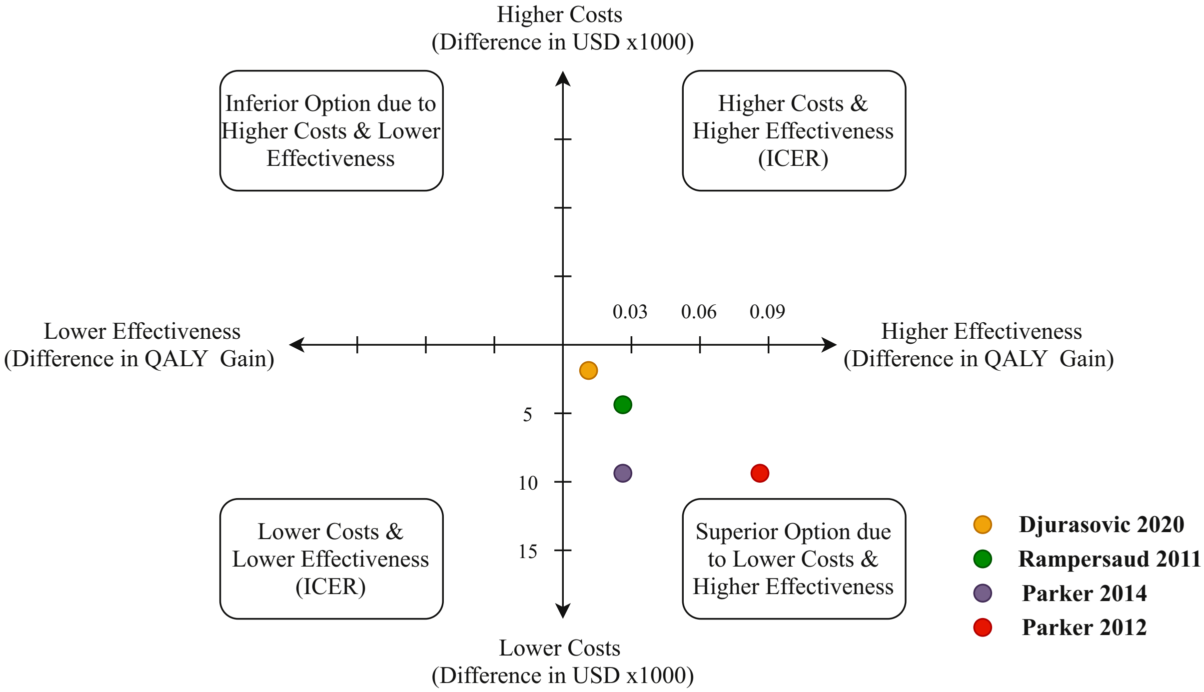

Fig. 2. Cost-effectiveness of MITLIF compared to OTLIF (ICER). ICER, incremental cost-effectiveness ratio; MITLIF, minimally invasive transforaminal lumbar interbody fusion; OTLIF, open transforaminal lumbar interbody fusion

These negative ICERs suggest that MITLIF might be both less costly and more effective than OTLIF. We included a diagram to visualize the ICER estimates of the individual studies (Fig. 2 in the appendix).

Meta-analysis

A meta-analysis was performed using health care perspective costs data of seven studies comparing OTLIF and MITLIF directly [32,37,38,40,51,53,56]. Two studies directly comparing both techniques were not included in the meta-analysis due to missing ranges or standard deviations [54,58].

The data table and forest plot can be found in Additional File 6 in the appendix. Study heterogeneity was low, with an I^2 of 44% (p=.10) for both fixed and random effects analysis. The overall effect was in favor of MITLIF, with a significant mean difference of $2,650(95% CI [1.52, 3.78], p<.001).

Discussion

The aim of this systematic review and meta-analysis comparing costs and cost-effectiveness of OTLIF and MITLIF was to present an overview of the literature mentioning costs for OTLIF or MITLIF in patients with lumbar spondylolisthesis or lumbar degenerative disease. Furthermore, the methodological quality of the included studies was assessed and taken into account.

There was great heterogeneity in health care and societal perspective costs due to differences in calculation methods of costs, included costs, different in-, and exclusion factors and baseline characteristics. For example, four studies only included implant costs to determine health care perspective costs [46,48,49,60]. Due to variance in included cost data and cost calculations between studies, costs were reported in ranges instead of means. Health care perspective costs ranged from $2,589 to $49,535 for OTLIF and from $13,311 to $76,061 for MITLIF. Societal perspective costs ranged from $5,584 to $49,947 for OTLIF and from $11,649 to $13,020 for MITLIF. Cost-effectiveness of OTLIF to range from $47,303/QALY to $218,766/QALY, cost-effectiveness of MITLIF, mentioned in only one study, was $121,105/QALY. Meta-analysis of hospital perspective costs from seven studies directly comparing OTLIF with MITLIF resulted in a mean difference of $2,650 (95% CI [1.52, 3.78], p<.001). This indicates that the hospital perspective costs for MITLIF are significantly lower than OTLIF. Furthermore, none of the studies comparing OTLIF with MITLIF found that OTLIF was less expensive than MITLIF. We estimated an ICER for four studies. In all four studies, costs associated with MITLIF were significantly lower. Furthermore, QALY gain based on EQ-5D was higher for MITLIF compared to OTLIF, although this difference was not statistically significant. The lower costs and higher QALY gain result in negative ICER estimates. This suggests that MITLIF might be a superior option when compared to OTLIF in terms of cost-effectiveness.

For the included studies, the overall risk of bias was high and quality using CHEC-list was low.

Combining all available information, we can state that the hospital perspective costs are relevantly lower for MITLIF compared with OTLIF. Studies directly comparing both techniques suggest this could be a consequence of lower transfusion rates due to lower blood loss, shorter duration of hospitalization, lower pharmacy and laboratory costs, lower implant costs and lower physical therapy costs associated with MITLIF compared to OTLIF [32,37,38,40,51,53,54,56,58]. There is no consensus concerning the operating room time for MITLIF compared to OTLIF [62], consequently, it is unclear to which extend the operating room time influences hospital perspective costs.

Furthermore, two studies directly comparing OTLIF and MITLIF including societal perspective costs found that these were lower in MITLIF [37,38]. These studies suggest that societal perspective costs are lower in MITLIF, mainly caused by lower absenteeism.

Comparison of the differences in QALY gain was difficult, as studies used different questionnaires to calculate QALY. Mean one-year QALY gain of OTLIF and MITLIF were comparable, ranging from 0.10 to 0.44 for OTLIF and from 0.16 to 0.50 for MITLIF. Although MITLIF seems to result in a slightly higher QALY gain, no studies directly comparing the effectiveness of OTLIF versus MITLIF found a statistically significant difference in QALY gain. Lower overall costs combined with comparable or slightly increased clinical outcomes could potentially lead to increased cost-effectiveness for MITLIF compared to OTLIF. For comparison; 2-year QALY gain (EQ-5D) is 0.25 ± 0.2 after total hip arthroplasty, 0.17 ± 0.19 after total knee arthroplasty and 0.16 ± 0.17 after unicompartmental knee arthroplasty [63].

The cost-effectiveness of MITLIF was mentioned in only one study; $121,105/QALY. The threshold for cost-effectiveness is subject to debate and may differ per country. The threshold of $50.000/QALY is mostly used in comparable economic evaluations. For OTLIF, two studies reported costs/QALY below this threshold [29,39], while all others, including the MITLIF study, reported costs/QALY well above this $50,000 threshold [33,36,40].

Our findings are in line with the findings of a review and meta-analysis published in 2015 [62]. This review described a trend of reduction in perioperative costs for MITLIF compared with OTLIF. However, only six cost-effectiveness studies directly comparing the two techniques were included, resulting in a moderate heterogeneity in the meta-analysis of hospital costs (I^2=61%, p=.04). All studies included in this review were likewise included in our review. Due to a broader search strategy and the availability of literature published after 2015, our review includes nine studies directly comparing OTLIF and MITLIF. Furthermore, the addition of two extra studies in the meta-analysis resulted in low heterogeneity. In order to include all valuable literature on costs, studies comparing OTLIF or MITLIF with other surgical techniques were also included; thus, minimizing the possibility of missing relevant data.

As a result of the variety in reported data between studies, the only cost variable available and potentially interesting for meta-analysis was health care perspective costs reported in studies directly comparing OTLIF and MITLIF. Furthermore, comparison of the included studies was difficult due to variability in reporting and analyzing both health care and societal perspective costs. Compiled guidelines for economic evaluations of several countries are available. For instance, in the United States, the Panel on Cost-Effectiveness in Health and Medicine recommends performing cost-effectiveness studies from the societal perspective, which incorporates both direct (for instance health care costs) and indirect costs (for instance productivity losses) [64]. Nevertheless, only seven out of 32 studies reported on societal perspective costs. Definitions and sources differed between these studies, resulting in a broad cost range. For this reason, transferability of results to other countries, as well as comparison between studies, is challenging [65,66].

The review is also limited by several constraints. Our review and meta-analysis were limited to cost data. We did not individually analyze variables possibly affecting costs (eg, blood loss, length of hospital stay, operating room time, missed working days, unpaid caregiver costs, etc). Likewise, we did not include studies concerning QALY without mentioning costs. This could lead to missing relevant data on difference in QALY gain.

Furthermore, we did not use the Consolidated Health Economic Evaluation Reporting Standards checklist to evaluate the quality of each study individually [67]. This checklist evaluates the quality of the studies, focusing on the reporting of relevant items in an economic evaluation study. We choose not to conduct individual assessments mainly due to the overall low quality of reporting in the included studies. Another limitation of this study was the inclusion of only full text, published studies and not conference proceedings, PhD dissertations or grey literature. This might have biased the results of the study. However, we believe that most eligible studies are included in this cost-effectiveness review.

The existing literature provided limited data on both societal and perspective costs and cost-effectiveness. Nonetheless, based on the assessment of the included studies, significant and clinically relevant differences were demonstrated concerning health care perspective costs and variables possibly affecting cost-effectiveness between OTLIF and MITLIF. However, more data are required from well-powered prospective randomized studies directly comparing the cost-effectiveness of OTLIF and MITLIF from both hospital and societal perspectives to obtain higher level of evidence. To improve the quality, transparency and comparability of economic evaluations in lumbar spine surgery, we suggest that international guidelines on conducting and reporting economic evaluations would be beneficial. Recommendations for the conduct of economic evaluations are available for other medical specialities. An example of this is the recommendations for the conduct of economic evaluations in osteoporosis, in which a working group was convened by the European Society for Clinical and Economic Aspects of Osteoporosis and Osteoarthritis to make recommendations for the design, conduct and reporting of economic evaluations in osteoporosis [68].

Conclusion

Results suggest that MITLIF might be more cost-effective than OTLIF, especially when comparing health-care-related costs. However, both techniques are expensive when using a threshold of $50,000/QALY. Furthermore, it should be noted that the literature related to this topic is not of high quality and therefore these results should be interpreted with caution.

Both techniques are frequently used for patients with the same indication. When a surgical decision cannot be based on other important factors such as the surgeons' experience, availability of the surgical technique, or surgical indication, cost-effectiveness should be an important factor in surgical decision-making. Prospective randomized studies directly comparing the cost-effectiveness of OTLIF and MITLIF from both hospital and societal perspectives are needed to obtain higher level of evidence. It is recommended that standardized measurement tools are used to determine quality of life, hospital perspective costs, and societal perspective costs to determine cost-effectiveness.

We suggest that international guidelines on conducting and reporting economic evaluations would be beneficial to improve the quality, transparency, and comparability of economic evaluations in lumbar spine surgery.

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Supplementary materials

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