



Review

Systematic review and meta-analysis of minimally invasive transforaminal lumbar interbody fusion rates performed without posterolateral fusion



Adam J. Bevevino, Daniel G. Kang*, Ronald A. Lehman Jr., Gregory S. Van Blarcum, Scott C. Wagner, David E. Gwinn

Walter Reed National Military Medical Center, 8901 Wisconsin Avenue, Building #19, Bethesda, MD 20889, USA

ARTICLE INFO

Article history:

Received 2 December 2013

Accepted 22 February 2014

Keywords:

Fusion rates

Meta-analysis

MIS TLIF

Posterolateral fusion

ABSTRACT

The need for posterolateral fusion (PLF) in addition to interbody fusion during minimally invasive (MIS) transforaminal lumbar interbody fusion (TLIF) has yet to be established. Omitting a PLF significantly reduces overall surface area available for achieving a solid arthrodesis, however it decreases the soft tissue dissection and costs of additional bone graft. The authors sought to perform a meta-analysis to establish the fusion rate of MIS TLIF performed without attempting a PLF. We performed an extensive Medline and Ovid database search through December 2010 revealing 39 articles. Inclusion criteria necessitated that a one or two level TLIF procedure was performed through a paramedian MIS approach with bilateral posterior pedicle screw instrumentation and without posterolateral bone grafting. CT scan verified fusion rates were mandatory for inclusion. Seven studies (case series and case-controls) met inclusion criteria with a total of 408 patients who underwent MIS TLIF as described above. The mean age was 50.7 years and 56.6% of patients were female. A total of 78.9% of patients underwent single level TLIF. Average radiographic follow-up was 15.6 months. All patients had local autologous interbody bone grafting harvested from the pars interarticularis and facet joint of the approach side. Either polyetheretherketone (PEEK) or allograft interbody cages were used in all patients. Overall fusion rate, confirmed by bridging trabecular interbody bone on CT scan, was 94.7%. This meta-analysis suggests that MIS TLIF performed with interbody bone grafting alone has similar fusion rates to MIS or open TLIF performed with interbody supplemented with posterolateral bone grafting and fusion.

Published by Elsevier Ltd.

1. Introduction

Lumbar interbody fusion, indicated for a variety of conditions requiring stabilization, has traditionally been performed as an open procedure through one of several different approach techniques. The transforaminal lumbar interbody fusion (TLIF), introduced in 1982, provides access through a paramedian approach with unilateral facetectomy [1]. This particular technique offers the advantage of avoiding an anterior approach as needed for an anterior interbody fusion (ALIF), and limits the amount of neural retraction when compared to a posterior lumbar interbody fusion (PLIF) [2–4]. The outcomes and complications for open TLIF have been well documented with fusion rates ranging from 88.4–95.7% [4–7]. Despite their success, open interbody fusions are costly secondary to a potentially large amount of

intra-operative blood loss, post-operative pain, and prolonged hospital stays [8,9]. Furthermore several studies have reported on the now well recognized deleterious effects of prolonged paraspinal muscle retraction and extensive subperiosteal dissection required with open techniques [10–13]. In 2003, the minimally invasive (MIS) TLIF as described by Foley et al. [8] was introduced with the goal of minimizing the inherent downsides of the open procedures. An increasing body of literature is now available supporting the use of MIS TLIF, citing less intra-operative blood loss, decreased post-operative pain with lower overall complications rates [4,14–16]. Additionally, fusion rates with MIS TLIF are reported between 91.3 and 99%, which are equivalent if not slightly higher than open TLIF rates [14,16–18].

As MIS TLIF continues to gain merit and become more common, evaluating current evidence and techniques becomes increasingly important to optimize the procedure. Presently, posterolateral bone grafting and fusion following interbody fusion is performed by some surgeons and it is omitted by others [17,19–21].

* Corresponding author. Tel.: +1 301 295 6731; fax: +1 301 295 8280.

E-mail address: daniel.g.kang@gmail.com (D.G. Kang).

The obvious advantage and justification for a supplemental posterolateral fusion (PLF) is the addition of increased surface area available to achieve successful fusion. Augmenting the TLIF with a PLF and bone grafting, however, requires the need for an additional, contralateral paraspinal incision, which in turn leads to a larger surgical dissection with greater trauma to the muscle, greater blood loss, and increased operative time. These are the very factors that the MIS TLIF was intended to avoid. In other words, the additional PLF and bone grafting obviates the potential benefits of the MIS TLIF. Furthermore, posterolateral bone graft and fusion may increase the need for autologous bone graft harvest or the use of bone graft extenders, thus increasing the cost and morbidity of the procedure. Ultimately the utility of a PLF with MIS TLIF remains unknown, and we hypothesize that fusion rates are not adversely affected by its exclusion. With this in mind, the goal of the present study was to perform a meta-analysis/systematic review of MIS TLIF literature to analyze fusion rates in patients who underwent MIS TLIF without the addition of posterolateral bone grafting and fusion.

2. Material and methods

2.1. Literature review

After Institutional Review Board approval, a Medline and Ovid database search was conducted up to December 2010. Search terms included the following: “MIS” or “minimally invasive” AND “TLIF” or “transforaminal lumbar interbody fusion”. For the procedure in a particular study to be considered, MIS was defined as a paramedian approach to the posterior elements with the use of a tubular retraction system. TLIF was defined as placement of a unilateral or bilateral interbody fusion device through a transforaminal approach to the interbody space via a tubular retractor system. Prospective trials, case-controls studies, cohorts, and observational case series were included. Case reports, cadaveric, non-human, and biomechanical studies were excluded. Studies examining both open and MIS TLIF results were included and data pertaining only to the MIS TLIF results were extrapolated. Likewise, studies including ALIF, PLIF, and TLIF results were considered as long as data on patients undergoing MIS TLIF were separated from other procedures. If a study failed to separate the results of the MIS TLIF patients from the results of open TLIF or other interbody procedures, it was excluded. All included studies used bilateral mini-open or percutaneously placed posterior fixation (pedicle screws, translaminar screws, etc), while studies with unilateral fixation constructs were excluded from the analysis. As the primary outcome measure was to assess fusion rates, studies that did not report fusion rates were excluded. Only studies that documented fusion based on post-operative CT imaging were included for analysis. In studies that did not use CT imaging to assess fusion in all patients, only cases in which CT imaging was used to confirm fusion were included. Studies that used plain radiography without CT scan, or reserved CT scan analysis for only questionable cases were excluded. Initial search results were reviewed independently by authors A.J.B. and D.G.K. To be included in the analysis, all reviewers needed to agree that the study met the required inclusion criteria.

2.2. Data extraction

Data from included studies was extracted independently by two authors, A.J.B and D.G.K. Extracted data included the following: demographic information (age and sex characteristics), study type (prospective randomized trials, cohort analysis, case control, case series), number of patients, average follow-up time, average time

fusion confirmed, primary pre-operative diagnosis, lumbar fusion levels, interbody fusion device, use of bone morphogenetic protein (BMP) or other fusion enhancers, fusion rate, complication rate and type. Data were collected on a spreadsheet and merged by the authors listed above.

2.3. Statistical analysis

A random effects model was chosen for analysis secondary to the level of evidence among the included studies and in the inevitable differences between the studies in regards to patient selection, surgeon experience, type and size of interbody graft device, patient medical co-morbidities, etc. Comprehensive meta-analysis V2 was used to create forest and funnel plots. An Egger's regression test [22] was performed to evaluate publication bias within the analyzed studies. Duval and Tweedie's trim and fill [23] was used to adjust for any recognized publication bias should it be found. Weighted averages were calculated to report the following overall study demographics: age, follow-up duration, complication rate, time at which fusion was assessed, and BMP usage.

3. Results

The Medline and Ovid search using a combination of “minimally invasive”, “MIS”, “transforaminal lumbar interbody fusion”, and “TLIF” search terms returned 39 individual studies. Of the initial 39 studies, 12 did not involve MIS techniques and were excluded. Eleven of the remaining studies did not confirm fusion on post-operative CT scan and were subsequently excluded. In the 15 outstanding studies, three did not use bilateral posterior fixation, three studies did not report post-operative fusion rates, two studies included results of MIS TLIF patients with PLF, and one study did not stratify the fusion results of PLIF and TLIF patients. After the above studies were excluded, seven studies which met all listed inclusion criteria remained (Fig. 1). The included studies consisted of five case series and two case control studies. No prospective cohorts or randomized trials were identified that compared MIS TLIF with and without PLF. All seven studies were therefore considered to represent level III/IV evidence.

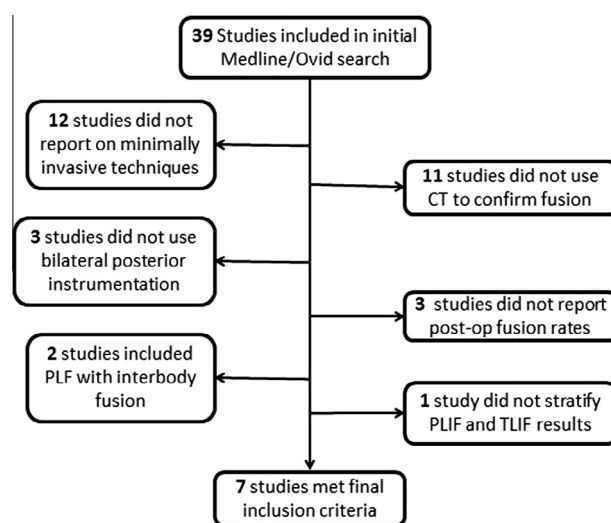


Fig. 1. Study inclusion/exclusion flowsheet. Graphical depiction of initial Medline and Ovid search results, and elimination of studies based on the inclusion/exclusion criteria outlined in the Methods section. Seven studies met all inclusion criteria. PLF = posterolateral fusion, PLIF = posterior lumbar inter body fusion, post-op = post-operative, TLIF = transforaminal lumbar interbody fusion.

Download English Version:

<https://daneshyari.com/en/article/3059331>

Download Persian Version:

<https://daneshyari.com/article/3059331>

[Daneshyari.com](https://daneshyari.com)