

## Living FRIendly Summaries of the Body of Evidence using Epistemonikos (FRISBEE)

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# Does adding interbody fusion to posterolateral fusion increase success in the surgical management of degenerative lumbar spondylolisthesis?

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## Abstract

### INTRODUCTION

Surgical treatment of lumbar degenerative spondylolisthesis usually involves an interbody fusion in addition to a posterolateral fusion. However, the value of this procedure has not been established.

### METHODS

To answer this question we used Epistemonikos, the largest database of systematic reviews in health, which is maintained by screening multiple information sources, including MEDLINE, EMBASE, Cochrane, among others. We extracted data from the systematic reviews, reanalyzed data of primary studies, conducted a meta-analysis and generated a summary of findings table using the GRADE approach.

### RESULTS AND CONCLUSIONS

We identified four systematic reviews, including nine primary studies; none of them randomized. We concluded performing interbody fusion in addition to posterolateral fusion during the surgical treatment of lumbar degenerative spondylolisthesis might decrease vertebral body slippage and lead to a slight improvement in quality of life. However, it is associated with higher costs.

### Problem

Spondylolisthesis corresponds to the slippage of one vertebra over the lower one; degenerative spondylolisthesis is secondary to a degenerative process of the articular facets and the intervertebral disc. Degenerative spondylolisthesis is a cause of lumbar pain, radicular pain, and neurological claudication.

Surgical treatment of degenerative spondylolisthesis aims to reduce pain and to improve function and quality of life

by decompressing neural elements. Currently, there is consensus about the need of adding a fusion to the decompression, being the posterolateral fusion, with or without instrumentation, is the most frequently used approach.

The addition of an interbody fusion (IBF), either through an anterior, posterior or transforaminal approach has theoretical benefits since it would increase fusion rate.

Moreover, an interbody fusion would stabilize the anterior column, which supports most of the body weight. However, an interbody fusion also carries a higher risk of complications and cost. So, the value of adding an interbody fusion to a posterolateral arthrodesis has not been established.

## Methods

To answer the question, we used Epistemonikos, the largest database of systematic reviews in health, which is maintained by screening multiple information sources, including MEDLINE, EMBASE, Cochrane, among others, to

identify systematic reviews and their included primary studies. We extracted data from the identified reviews and reanalyzed data from primary studies included in those reviews. With this information, we generated a structured summary denominated FRISBEE (Friendly Summary of Body of Evidence using Epistemonikos) using a pre-established format, which includes key messages, a summary of the body of evidence (presented as an evidence matrix in Epistemonikos), meta-analysis of the total of studies when it is possible, a summary of findings table following the GRADE approach and a table of other considerations for decision-making.

### Key messages

- Adding an interbody fusion to the posterolateral fusion during the surgical treatment of degenerative spondylolisthesis might decrease slippage of the vertebral body, and could slightly improve quality of life.
- It is not clear whether adding an interbody fusion improves fusion rate or clinical outcomes such as pain or disability.
- Adding an interbody fusion is associated with higher costs.

### About the body of evidence for this question

What is the evidence. See evidence matrix in Epistemonikos later	We found four systematic reviews [1],[2],[3],[4], including nine primary studies [5],[6],[7],[8],[9],[10],[11],[12],[13]; none of them corresponding to a randomized trial. Two were prospective cohorts [5],[13] and seven were retrospective cohort studies [6],[7],[8],[9],[10],[11],[12]. One study was excluded from the analysis [13] because it compared two types of lumbar interbody fusion.
What types of patients were included*	All of the studies included patients with lumbar degenerative spondylolisthesis. The average age ranged from 56 to 70 years in the different studies.
What types of interventions were included*	Regarding the type of intervention, all of the studies added an interbody fusion to a posterolateral arthrodesis. Regarding the type of interbody fusion, five studies used a posterior approach [5],[9],[10],[11],[12] and three used a transforaminal approach [6],[7],[8]. Regarding the comparison, all of the studies compared against posterolateral fusion alone.
What types of outcomes were measured	The systematic reviews grouped the outcomes as follows: <ul style="list-style-type: none"> <li>• Pain, either back pain, radicular pain or both (measured as VAS scale).</li> <li>• Disability, measured with Oswestry Disability Index (ODI).</li> <li>• Quality of life, measured with SF-36 health questionnaire.</li> <li>• Complication rate</li> <li>• Hospital stay (days).</li> <li>• Operating time (minutes).</li> <li>• Fusion rate.</li> <li>• Degree of slip (millimeters).</li> <li>• Slip angle (degrees).</li> </ul> The average follow-up of the studies was 32 months, with a range of 12 to 53 months.

\* The information about primary studies is extracted from the systematic reviews identified, unless otherwise specified.

## Summary of Findings

The information on the effects of adding an interbody fusion to a posterolateral fusion in degenerative lumbar spondylolisthesis was based on five studies including 582 patients in total [5],[7],[9],[10],[11].

The remaining three studies [6],[8],[12] were not included in the analysis as none of the identified systematic reviews was able to extract data suitable for meta-analysis from them.

Three studies evaluated pain (277 patients) [7],[9],[10]; three studies assessed disability (277 patients) [7],[9],[10]; three studies determined quality of life (511 patients) [5],[7],[9]; four studies determined complication rate (542 patients) [5],[7],[9],[11]; two studies assessed hospital stay (455 patients) [5],[9]; three studies measured operating time (511 patients), [5],[7],[9]; five studies evaluated fusion rate (521 patients) [5],[7],[9],[10],[11]; two studies measured the degree of slip of the vertebral body (87 patients) [7],[11] and three studies assessed slip angle (127 patients) [7],[10],[11].

The summary of findings is as follows:

- It is not clear whether the addition of an interbody fusion reduces pain, because the certainty of the evidence is very low.
- It is not clear whether the addition of an interbody fusion decreases disability, because the certainty of the evidence is very low.
- It is not clear whether the addition of an interbody fusion reduces complication rates, because the certainty of the evidence is very low.
- It is not clear whether the addition of an interbody fusion decreases hospital stay, because the certainty of the evidence is very low.
- It is not clear whether the addition of an interbody fusion decreases operating time, because the certainty of the evidence is very low.
- It is not clear whether the addition of an interbody fusion decreases slip angle, because the certainty of the evidence is very low.
- The addition of an interbody fusion may produce a slight improvement in quality of life, but the certainty of the evidence is low.
- The addition of an interbody fusion might result in little or no difference in fusion rate, but the certainty of the evidence is low.
- The addition of an interbody fusion might decrease the degree of slip, but the certainty of the evidence is low.

<b>Adding an interbody fusion to a posterolateral fusion in degenerative spondylolisthesis</b>				
Patients	Diagnosed with degenerative spondylolisthesis			
Intervention	Interbody fusion (IBF) + posterolateral fusion (PLF)			
Comparison	posterolateral fusion alone			
Outcome	Absolute effect*		Relative effect (95% CI)	Certainty of evidence (GRADE)
	WITH posterolateral fusion	WITH posterolateral fusion + interbody fusion		
	Difference: patients per 1000			
Pain (VAS)	3.44 points	2.76 points	--	⊕○○○ <sup>1,2</sup> Very Low
	MD: 0.68 points less (Margin of error: 0.09 less to 1.27 more)			
Disability (ODI)	30.3 points	26.91 points	--	⊕○○○ <sup>1,2</sup> Very Low
	MD: 3.39 points less (Margin of error: 7.4 less to 0.63 more)			
Quality of life (SF-36)	30.9 points	35.72 points	--	⊕⊕○○ <sup>1</sup> Low
	MD: 4.82 points more (Margin of error: 1.13 less to 8.5 more)			
Complication rate	135 per 1000	81 per 1000	RR 0.6 (0.19 to 1.87)	⊕○○○ <sup>1,2</sup> Very Low
	Difference: 54 patients less (Margin of error: 116 less to 118 more)			
Hospital stay (days)	4.55 days	4.58 days	--	⊕○○○ <sup>1,2</sup> Very Low
	MD: 0.03 days more (Margin of error: 1.34 less a 1.39 more)			
Operating time (minutes)	200 minutes	201.52 minutes	--	⊕○○○ <sup>1,2</sup> Very Low
	MD: 1.52 minutes more (Margin of error: 10.63 less to 13.67 more)			
Fusion rate	874 per 1000	900 per 1000	RR 1.03 (0.98 a 1.08)	⊕⊕○○ <sup>1</sup> Low
	Difference: 26 patients more (Margin of error: 17 less to 70 more)			
Degree of slip (mm)	4.96 mm	1.74 mm	--	⊕⊕○○ <sup>1</sup> Low
	MD: 3,22 mm less (Margin of error: 1.13 less to 5.3 less)			
Slip angle (degrees)	6	7.87	--	⊕○○○ <sup>1,2</sup> Very Low
	MD: 1.87 more (Margin of error: 3.01 less to 6.75 more)			
Margin of error: 95% confidence interval (CI). RR: Risk ratio. MD: Mean difference. GRADE: Evidence grades of the GRADE Working Group (see later).  *The risk <b>WITH posterolateral fusion</b> is based on the risk in the control group of the trials. The risk <b>WITH posterolateral fusion + interbody fusion</b> (and its margin of error) is calculated from relative effect (and its margin of error).  <sup>1</sup> The certainty of the evidence was downgraded by two levels because the studies have an observational design. <sup>2</sup> The certainty of the evidence was downgraded by one level due to imprecision of the results. <sup>3</sup> The certainty of the evidence was downgraded by one level due to the inconsistency of the results.				

About the certainty of the evidence (GRADE)*
<p>⊕⊕⊕⊕</p> <p><b>High:</b> This research provides a very good indication of the likely effect. The likelihood that the effect will be substantially different† is low.</p>
<p>⊕⊕⊕○</p> <p><b>Moderate:</b> This research provides a good indication of the likely effect. The likelihood that the effect will be substantially different† is moderate</p>
<p>⊕⊕○○</p> <p><b>Low:</b> This research provides some indication of the likely effect. However, the likelihood that it will be substantially different† is high.</p>
<p>⊕○○○</p> <p><b>Very low:</b> This research does not provide a reliable indication of the likely effect. The likelihood that the effect will be substantially different† is very high.</p>
<p>*This concept is also called 'quality of the evidence' or 'confidence in effect estimates'.</p> <p>† Substantially different = a large enough difference that it might affect a decision.</p>

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## Other considerations for decision-making

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### To whom this evidence does and does not apply

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- The evidence presented in this summary applies to patients with degenerative lumbar spondylolisthesis.
  - It does not apply to patients with other types of spondylolisthesis (for instance, spondylolitic) since they are different conditions.
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### About the outcomes included in this summary

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- The outcomes included in this summary are those considered critical for decision-making by the authors of this summary. In general, they coincide with the outcomes most frequently reported by the identified systematic reviews.
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### Balance between benefits and risks, and certainty of the evidence

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- It is important to emphasize that the certainty of the evidence is low or very low for all the outcomes evaluated, especially because they come from observational studies, mostly retrospective, as well as some other limitations.
  - This is why it is not possible to make an adequate balance between risks and benefits. Studies with better methodological quality are required, particularly comparing the risks of both interventions.
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### Resource considerations

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- Two reviews [1],[2] made a cost comparison of both fusion options. The addition of an interbody fusion to a posterolateral fusion is associated with an increase in cost ranging from US\$ 577 to US\$ 5,276.
  - It is not possible to make an adequate balance between benefits and costs, considering the uncertainty associated with the outcomes evaluated.
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### What would patients and their doctors think about this intervention

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- Faced with the evidence presented in this summary, most physicians and patients should decide against using this intervention because it has a small benefit, but it is associated with higher costs.
  - However, in the absence of clearly effective therapeutic alternatives, there could be variability in the clinical decisions for individual patients.
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### Differences between this summary and other sources

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- Most systematic reviews reached similar conclusions to those presented in this summary. However, they are cautious about these results considering the limitations of the primary studies and the risk of bias.
  - The conclusions of this summary are consistent with the recommendations by the North American Spine Society (NASS) guideline [14], which states that the level of evidence is too low to make recommendations on this regard.
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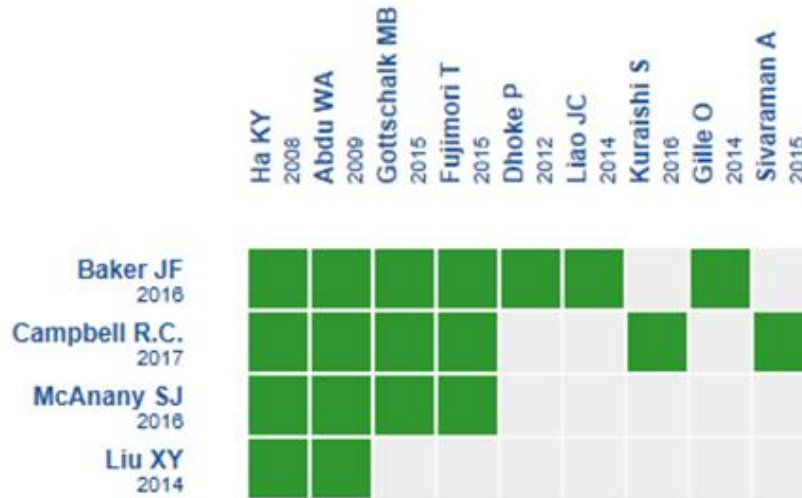
### Could this evidence change in the future?

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- The likelihood of future research changing the conclusions of this summary is high, particularly for outcomes with a high degree of uncertainty.
  - We searched the International Clinical Trial Registry Platform of the World Health Organization and did not find any ongoing trial addressing this question.
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**How we conducted this summary**

Using automated and collaborative means, we compiled all the relevant evidence for the question of interest and we present it as a matrix of evidence.



An evidence matrix is a table that compares systematic reviews that answer the same question. Rows represent systematic reviews, and columns show primary studies. The boxes in green correspond to studies included in the respective revisions. The system automatically detects new systematic reviews including any of the primary studies in the matrix, which will be added if they actually answer the same question.

Follow the link to access the **interactive version**: [Posterolateral fusion with or without interbody fusion for lumbar degenerative spondylolisthesis](#)

**Notes**

The upper portion of the matrix of evidence will display a warning of “new evidence” if new systematic reviews are published after the publication of this summary. Even though the project considers the periodical update of these summaries, users are invited to comment in *Medwave* or to contact the authors through email if they find new evidence and the summary should be updated earlier.

After creating an account in Epistemonikos, users will be able to save the matrixes and to receive automated notifications any time new evidence potentially relevant for the question appears.

This article is part of the Epistemonikos Evidence Synthesis project. It is elaborated with a pre-established methodology, following rigorous methodological standards and internal peer review process. Each of these articles corresponds to a summary, denominated FRISBEE (Friendly Summary of Body of Evidence using

Epistemonikos), whose main objective is to synthesize the body of evidence for a specific question, with a friendly format to clinical professionals. Its main resources are based on the evidence matrix of Epistemonikos and analysis of results using GRADE methodology. Further details of the methods for developing this FRISBEE are described here (<http://dx.doi.org/10.5867/medwave.2014.06.5997>)

Epistemonikos foundation is a non-for-profit organization aiming to bring information closer to health decision-makers with technology. Its main development is Epistemonikos database ([www.epistemonikos.org](http://www.epistemonikos.org)).

**Potential conflicts of interest**

The authors do not have relevant interests to declare.

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