The surgical management of degenerative lumbar spondylolisthesis: a systematic review

CRD summary
This review concluded that a better clinical outcome may be possible using spinal fusion rather than decompression alone for the treatment of degenerative lumbar spondylolisthesis. Limited data also suggested that instrumentation may improve the solid fusion rate, but any clinical benefit was unclear. The authors considered the limitations of the data and their cautious conclusions appear reliable.

Authors' objectives
To compare spinal fusion (instrumented or non-instrumented) with decompression for the treatment of patients with degenerative lumbar spondylolisthesis.

Searching
MEDLINE, EMBASE and the Cochrane Controlled Trials Register were searched up to June 2005. Search terms were available from the authors. The European Spine Journal, Spine, Journal of Spinal Disorders and Techniques and abstracts from the Study of the Lumbar Spine (2001 onwards) were searched. The reference lists of included studies and relevant reviews were checked for additional studies. Studies written in English, German and French were included.

Study selection
Randomised controlled trials (RCTs) and comparative observational studies comparing spinal fusion with decompression and/or instrumented and non-instrumented fusion for the treatment of degenerative lumbar spondylolisthesis were included in the review. Studies had to report follow-up data for at least five patients per treatment group for a minimum period of one year. Eligible outcomes included clinical outcome, re-operation rate and solid fusion status. Studies that included patients who had received previous surgery or who had cervical injuries, spinal fractures or isthmic spondylolisthesis were excluded from the review.

The method of quantifying dylolisthesis and the degree and extent of spondylolisthesis varied between the included studies. Surgical decompression was most commonly performed using laminectomy; five studies reporting the extent of decompression. Fusion was most commonly performed using a postlateral technique. Where reported, study populations usually included more females than males. Participant ages ranged from 23 to 89 years. Most included observational studies were retrospective.

Two independent reviewers assessed each study for inclusion. Disagreements were resolved through consensus or through the intervention of a third independent reviewer.

Assessment of study quality
Two independent reviewers assessed study validity using a modified version of the Cochrane RCT/CCT/Crossover Studies Checklist; further details of the individual criteria were reported. In addition, an additional criterion that observational studies had to include a consecutive series of patients was included.

Data extraction
Data for only those patients with degenerative spondylolisthesis were extracted independently by two reviewers using a standardised form. Clinical outcome data from rating scales were transformed in dichotomous data by grouping as either satisfactory or unsatisfactory. Relative risks were then calculated for all outcomes with 95% confidence intervals (CIs).

Methods of synthesis
Studies were grouped according to outcome and the interventions compared. Pooled relative risks with 95% CI were calculated using a random-effects model. Statistical heterogeneity was assessed using the I² statistic. Further analyses were conducted to assess the influence of study design, patient type and intervention technique. Study quality was
discussed with respect to the various analyses.

**Results of the review**

Thirteen studies comprising four RCTs (n=253) and nine observational studies (n=325) were included in the review. Overall, study quality was low. All of the RCTs and most of the observational studies had limitations in their methodology, details of which were reported in the review. Sample sizes ranged from 19 to 102.

All of the studies with the exception of one observational study (n=55) reported a beneficial effect with fusion. An overall statistically significant benefit for clinical outcome was reported for fusion in comparison with decompression alone (relative risk was 1.40; 95% CI: 1.04 to 1.89, p<0.05; two RCTs and five comparative observational studies). However, this finding was associated with significant statistical heterogeneity ($I^2=59.3\%$), which was mainly due to the inclusion of one observational study.

Sensitivity analyses suggested that RCTs reported a larger effect size and did not show significant levels of heterogeneity. Instrumented spinal fusion was associated with a significantly increased probability of solid fusion (relative risk was 1.37; 95% CI: 1.07 to 1.75, p<0.05; two RCTs and three comparative observational studies) in comparison with non-instrumented fusion; no significant improvement in clinical outcome was reported. Both analyses were associated with significant levels of heterogeneity ($I^2=69.9\%$ and 59%) that were shown in further analyses to be due to the inclusion of particular studies. Again RCTs were reported as showing greater effect sizes.

Details of further analyses were reported in the review.

**Authors’ conclusions**

A better clinical outcome may be possible using spinal fusion rather than decompression alone. Moderate evidence suggested instrumentation improved the opportunities for solid fusion, however, no conclusions could be drawn about the clinical benefit of instrumented spinal fusion.

**CRD commentary**

This review answered a clear and well-defined research question. A number of electronic databases and other sources were searched to identify both published and unpublished studies, thereby reducing the risk of publication bias. However, language limitations were applied and this may have introduced language bias. Appropriate precautions were taken during the review process to reduce the risk of reviewer error and bias. The methodological quality of the data was assessed using appropriate criteria. The overall quality of the data was poor and sample sizes were small. In addition, differences particularly in the characteristics of the intervention groups and study populations suggested that it may not always have been appropriate to calculate overall pooled effect sizes. But, further analyses were carried out to investigate the effects of different study designs, study quality and patient characteristics. Statistical heterogeneity was also assessed. Overall, the authors were careful to take care into account the differences between studies and the poor quality of data and so their cautious conclusions appear to be reliable.

**Implications of the review for practice and research**

**Practice:** The authors did not state any implications for practice.

**Research:** The authors stated that a large adequately powered well-controlled long-term study comparing instrumented and non-instrumented spinal fusion was required. This study should use validated outcome measures to delineate the role of the two types of surgery for degenerative lumbar spondylolisthesis.

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**Bibliographic details**

This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.