A critical analysis of the literature regarding surgical approach and outcome for adult low-grade isthmic spondylolisthesis


CRD summary
This review assessed posterior, anterior and combined surgical approaches for adults with low-grade isthmic spondylolisthesis. The authors concluded that combined approaches improve fusion rates and clinical outcomes but further studies are required. Poor reporting of the review process and weaknesses in the analysis mean that the authors’ conclusions may not be reliable.

Authors’ objectives
To evaluate posterior, anterior and combined surgical approaches for adults with low-grade isthmic spondylolisthesis.

Searching
MEDLINE was searched from 1955 to December 2003 for reports in the English language. The bibliographies of relevant papers were also reviewed for potential additional studies.

Study selection
Study designs of evaluations included in the review
Studies with at least 5 patients were eligible for inclusion.

Specific interventions included in the review
Studies that evaluated surgical interventions were eligible for inclusion. Studies that evaluated laminectomy alone or repair of a pars defect alone were excluded. The review evaluated posterior surgical approaches (posterior or posterolateral fusion with or without spinal fixation or laminectomy), anterior surgical approaches (interbody fusion) and combined surgical approaches (interbody fusion plus some type of posterior or posterolateral fusion). Anterior and posterior approaches could include both stand-alone anterior lumbar interbody fusion and posterior lumbar interbody fusion in which no posterior or posterolateral fusion was attempted.

Participants included in the review
Studies of adults (aged 18 years or older) with low-grade isthmic spondylolisthesis (Meyerding grade 0, 1 or 2) were eligible for inclusion. Studies of patients with other conditions were only included if they reported the results for the population of interest separately.

Outcomes assessed in the review
Studies that assessed the radiographic fusion rate or clinical outcomes were eligible for inclusion. Most of the included studies assessed clinical outcomes using 3- or 4-point scales; one study used the Ostewery scale and another used the Japanese Orthopedic Association scale. Follow-up of the outcomes was reported.

How were decisions on the relevance of primary studies made?
Three spinal surgeons screened the identified abstracts.

Assessment of study quality
The authors did not state that they assessed validity. However, they did report on the independence of the outcome assessment.

Data extraction
The authors did not state how the data were extracted for the review, or how many reviewers performed the data extraction.

For each study, the number of patients (and percentage) with each outcome of interest was extracted. The reviewers classified radiographic outcomes as 'solid', 'fusion' or 'pseudoarthrosis' based on the authors' description; for studies reporting grading scales, only outcomes reported as 'definitely solid' were classified as fused. The clinical outcomes were classified as 'success' if outcomes were reported as excellent or good on a 4-point scale or the middle rating on a 3-point scale if patients were reported as returned to work or required non-narcotic analgesics. Results data were extracted separately for the three different surgical approaches.

Methods of synthesis
How were the studies combined?
The studies were grouped by outcome and percentage event rates were calculated separately for the three different surgical approaches.

How were differences between studies investigated?
The influence of patient covariates (smoking, worker's compensation/involvement in litigation) and surgical covariates (use of spinal internal fixation and laminectomy for posterior procedures) on clinical and radiographic outcomes were examined. There were insufficient data to examine the influence of these factors on outcomes for the other surgical approaches. Fisher's exact test chi-squared analysis was used to determine the relationship between surgical approach and covariate (smoker versus nonsmoker) and outcome.

Results of the review
Thirty-four studies (n=1,137 reported in tables) were included: 4 randomised controlled trials (RCTs; n=178) and 30 retrospective studies.

Twenty-six studies (n=890) evaluated isolated posterior fusion procedures, 5 studies (n=77) evaluated isolated anterior lumbar interbody fusion procedures and 9 studies (n=170) evaluated combined anterior and posterior stabilisation procedures. Some studies evaluated more than one type of procedure.

Ten studies reported blinding of the assessment of radiological and functional outcomes. Nineteen studies reported follow-up of at least 24 months after surgery.

Radiographic outcomes.
Fusion rates were 98.2% (167 out of 170) for combined procedures, 74% (57 out of 77) for anterior procedures and 83.3% (741 out of 890) for posterior approaches. The combined procedure was associated with a statistically significantly higher fusion rate than either the solely posterior or the anterior approach (p<0.0001 for both). Fusion rates were higher with the posterior approach than with the anterior approach, but the difference was not statistically significant (p=0.059).

Clinical outcomes.
Clinical success rates were 86.4% (108 out of 125) for combined procedures, 89.6% (60 out of 67) for anterior procedures and 74.8% (608 out of 814) for posterior approaches. The combined procedure was associated with a statistically significant higher clinical success rate than the posterior approach (p=0.0045) but not when compared with the anterior approach (p=0.65). Success rates were statistically significantly higher with the anterior approach than with the posterior approach (p=0.0047).

Influences on outcomes of posterior surgery.
Posterolateral fusion plus internal fixation was associated with statistically significant higher fusion rates (90.2% versus 77.4%, p<0.0001) and clinical success rates (84.9% versus 64.4%, p<0.0001) than posterior fusion without spinal fixation.
Smokers had statistically significant lower fusion rates (74.4% versus 91.4%, p=0.0023) and lower clinical success rates (59.6% versus 80.6%, p=0.0017) than nonsmokers.

Patients involved in compensation or litigation claims had similar fusion rates compared with others, but clinical success rates were significantly lower (35.6% versus 81.8%, p<0.0001).

Authors' conclusions
Combined anterior and posterior approaches improve fusion rates and clinical outcomes. The evidence was limited and further studies are required.

CRD commentary
The review addressed a clear question that was defined in terms of the participants, intervention and outcomes; for study design, only the minimum number of patients per study was specified. Limiting the search to English language reports listed in one database is likely to have resulted in the omission of other relevant studies and raises the possibility of language and publication bias. The methods used to select the studies and extract the data were not described clearly (it was not specified if the surgeons independently selected studies), thus it is not known whether any efforts were made to reduce reviewer errors and bias.

In the analyses, data from studies of differing design were combined using methods appropriate for calculating means in individual studies. The included studies were predominantly retrospective studies and these poor-quality studies tended to overestimate treatment effects. In addition, since there was no assessment of statistical heterogeneity, it was not possible to assess the level of differences between the studies. This is of particular importance given the reported between-study variation in patients and outcome measures. Statements on relative efficacy were based on indirect comparisons; direct comparisons of surgical interventions would be required to adequately compare surgical approaches. The limited search and weaknesses in the analysis mean that the authors' conclusions regarding the relative efficacy of surgical approaches may not be reliable.

Implications of the review for practice and research
Practice: The authors stated that surgeons should take the poor clinical outcomes in smokers and patients on worker's compensation into account when discussing expectations of surgery with these groups.

Research: The authors stated the need for RCTs that directly compare surgical approaches.

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Record Status
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.