

Minimally Invasive Decompression vs. Fusion in Degenerative Lumbar Scoliosis with Stenosis

Functional outcomes, reoperation rates, and patient satisfaction: A Systematic Review and Meta-analysis

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INTRODUCTION: Degenerative lumbar scoliosis complicated by spinal stenosis is a frequent source of pain and disability in older adults. Debate persists over whether the extra stability achieved with instrumented fusion justifies its greater operative burden when compared with minimally invasive decompression (MID) alone.

METHODS: PubMed, Embase, the Cochrane Library, Scopus and Web of Science were searched from inception to January 2025. Randomised controlled trials and comparative cohort or case-control studies enrolling adults with degenerative lumbar scoliosis + stenosis who underwent either fusion (intervention) or MID (comparator) were eligible. Primary outcomes were changes in Visual Analogue Scale (VAS) pain, Oswestry Disability Index (ODI), re-operation rate and patient satisfaction; secondary outcomes included peri-operative complications and length of stay. Two reviewers independently screened records, extracted data and appraised risk of bias (RoB-2 or Newcastle-Ottawa Scale). Random-effects meta-analyses were performed where appropriate.

RESULTS: PRISMA flow: Of 860 records identified, 422 duplicates were removed; 438 titles/abstracts were screened, leaving 29 full texts. Seventeen were excluded (wrong comparator 10, inaccessible full text 2, wrong intervention 2, wrong design 2, wrong outcomes 1). Twelve studies met all criteria and eight contributed quantitative data (fusion n = 551; MID n = 394).

Fusion reduced mean VAS from 6.3 (95 % CI 5.9–6.7) to 2.8 (2.2–3.3), whereas MID reduced VAS from 5.8 (5.2–6.3) to 3.0 (2.1–4.0); the pooled between-group difference favoured fusion (–0.4, $p < 0.05$). ODI improved from 48.3 (41.2–55.4) to 22.2 (16.8–27.5) after fusion and from 51.3 (43.2–59.2) to 26.5 (20.1–33.0) after MID (mean difference –4.3, $p < 0.05$). Re-operation was required in 7.2 % of fusion cases versus 9.0 % with MID (RR 0.80), but complications were higher with fusion (22.3 % vs 8.9 %; RR 2.51). Heterogeneity was moderate (I^2 42–58 %). Substantial variability in surgical definitions prevented differentiation of specific fusion or decompression techniques.

DISCUSSION AND CONCLUSION: Fusion yields slightly greater pain relief, superior functional improvement and marginally fewer re-operations than minimally invasive decompression, but at the cost of a markedly higher complication rate. The overall minimally invasive approach remains safe and efficient, yet technique-specific conclusions cannot be drawn owing to heterogeneity. Robust, adequately powered randomised trials with long-term follow-up are required to determine the optimal surgical strategy and refine patient selection.