High Rates of Spin Bias in Systematic Reviews Regarding Anterior Cervical Discectomy and Fusion vs Posterior Cervical Foraminotomy

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INTRODUCTION: Cervical degenerative disc disease often presents with debilitating neck pain and radiculopathy or myelopathy. Initial treatment is conservative, followed by surgical management for refractory symptoms. Options for surgical management include anterior cervical discectomy and fusion (ACDF – the gold standard) and posterior cervical foraminotomy (PCF); however, current literature remains conflicted over the superiority of one procedure. Systematic reviews and meta-analyses allow for comprehensive synthesis of literature but are susceptible to spin bias that may skew results and affect clinical decision making. We hypothesized that spin bias was present in at least 30% of systematic reviews and meta-analyses comparing ACDF and PCF.

METHODS: A systematic search was conducted on PubMed, Web of Science, Embase, and Scopus for systematic reviews and meta-analyses comparing ACDF and PCF in June 2025. Included articles were assessed by 2 independent reviewers for the 9 most severe types of spin bias established by Yavchitz et al. Articles were also graded on methodological quality using the AMSTAR-2 tool. Any disagreements were resolved through discussion. Associations between AMSTAR-2 rating, number of citations, citations per year, impact factor of publishing journal, reported funding, adherence to PRISMA guidelines, and performance of a meta-analysis and total types of spin bias or presence/absence of spin were assessed using Poisson regression modeling and a Firth's penalized likelihood regression model, respectively.

RESULTS SECTION: Twelve studies met inclusion criteria. Spin bias was found in 11 of 12 (92%) included articles, with number of different types of bias ranging from 0 to 2. Type 9 was the most common type of spin in 5 of 12 (42%) articles. Type 5 spin was found in 4 (33%) articles, Type 3 in 3 (25%) articles, Type 1 in 2 (16%) articles, and Types 2 and 4 in 1 (8%) article each. AMSTAR-2 quality assessments rated 7 of 12 (58%) articles as "critically low", and 5 of 12 (42%) as "low"; none received a "high" quality rating. AMSTAR-2 rating, number of citations, citations per year, impact factor of publishing journal, reported funding, adherence to PRISMA guidelines, and performance of a meta-analysis were not able to significantly predict the quantity or presence of spin bias (all $p > 0.05$).

DISCUSSION: Spin bias is highly prevalent (92%) in systematic reviews and meta-analyses comparing ACDF and PCF, with a maximum of 2 types of spin per article. All studies received either "critically low" or "low" quality ratings according to AMSTAR-2 criteria, emphasizing the need for improving methodological quality in orthopaedic research. Notably, all studies rated as "critically low" quality had at least 1 type of spin bias.

SIGNIFICANCE/CLINICAL RELEVANCE: (1-2 sentences): Spine surgeons should exercise caution when reading systematic reviews comparing ACDF and PCF to inform clinical decision making, due to high prevalence of spin bias. Efforts and strategies to mitigate spin bias in orthopaedic literature are imperative to collectively enhance published literature.

REFERENCES: Yavchitz A, Ravaud P, Altman DG, et al. A new classification of spin in systematic reviews and meta-analyses was developed and ranked according to the severity. *J Clin Epidemiol*. 2016;75:56-65. doi:10.1016/j.jclinepi.2016.01.020

Types of Spin	Articles With Spin: n (%)
1. Conclusion contains recommendations for clinical practice not supported by the findings	2 (16.67%)
2. Title claims or suggests a beneficial effect of the experimental intervention not supported by the findings	1 (8.33%)
3. Selective reporting of or overemphasis on efficacy outcomes or analysis favoring the beneficial effect of the experimental intervention	3 (25%)
4. Conclusion claims safety based on non-statistically significant results with a wide confidence interval	1 (8.33%)
5. Conclusion claims the beneficial effect of the experimental treatment despite high risk of bias in the primary studies	4 (33.33%)
6. Selective reporting of or overemphasis on harm outcomes or analysis favoring the safety of the experimental intervention	0 (0%)
7. Conclusion extrapolates the review's findings to a different intervention	0 (0%)
8. Conclusion extrapolates the review's findings from a surrogate marker of a specific outcome to the global improvement of the disease	0 (0%)
9. Conclusion claims the beneficial effects of the experimental treatment despite reporting bias	5 (41.67%)

Table 1. Nine most severe types of Spin per Yavchitz et al.

	Spin (n = 11)	No Spin (n = 1)
AMSTAR 2 Rating		
High	0	0
Moderate	0	0
Low	4	1
Critically Low	7	0
Impact factor	2.64 ± .68	2.5
Yearly citations	4.84 ± 2.95	3

Table 2. Characteristics of studies which Did and Did Not contain Spin.