Adverse Impact of Smoking on Spine Fusion and Patient-Reported Outcomes: A Systematic Review and Meta-Analysis

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INTRODUCTION: Pseudoarthrosis after spinal fusion surgery is a prevalent adverse event, imparting substantial clinical and economic burden also leading to poorer patient-reported outcomes. This systematic review with meta-analysis is aimed at evaluating the impact of smoking (tobacco) on spinal fusion rates and the resulting PROMs.

METHODS: Following the PRISMA guidelines, a systematic literature search was conducted in four databases. Studies focused on adult smokers versus non-smokers undergoing spinal fusion. Odds ratios (ORs) were calculated for dichotomous variables and mean differences or standardized mean differences for continuous variables. Whenever feasible, adjusted data derived from multivariate analyses were extracted to account for potential confounding variables.

RESULTS: This meta-analysis included 29 studies with 305,694 patients. The unadjusted incidence of pseudoarthrosis was significantly higher in smokers than in non-smokers (OR 1.97, 95%CI 1.55-2.52, $p<0.001$). Subgroup analysis revealed significant differences in the cervical (OR 2.09, 95%CI 1.27-3.44, $p<0.05$) and lumbar (OR 1.97, 95%CI 1.45-2.68, $p<0.001$) regions. Adjusted analysis also showed a significantly higher incidence of pseudoarthrosis in smokers (OR 1.38, 95%CI 1.12-1.72, $p<0.05$). Changes in ODI, VAS, EQ-5D, and SF-12 and SF-36, consistently favored nonsmoking patients. Smoking was associated with a lower rate of returning to work (OR 0.70, 95%CI 0.54-0.90, $p<0.05$), and in the lumbar subgroup, reduced satisfaction (OR 0.24, 95%CI 0.12-0.49, $p<0.001$). Former smokers (smoking cessation for at least one year prior to surgery) did not show significant differences compared to nonsmokers in terms of pseudarthrosis rate or pain scores.

DISCUSSION AND CONCLUSION: Smoking is associated with an increased risk of pseudarthrosis and poorer PROMs after spinal fusion surgery. Healthcare providers should emphasize smoking cessation interventions to improve surgical outcomes and patient satisfaction.