Anterior Cervical Disc Replacement (ACDR) versus Minimally Invasive Posterior Cervical Foraminotomy (MI-PCF) in the Treatment of Cervical Radiculopathy: A 5-Year Retrospective Analysis

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INTRODUCTION: Cervical radiculopathy is a prevalent condition that often necessitates surgical intervention when conservative management fails. While anterior cervical discectomy and fusion (ACDF) has long been the standard, anterior cervical disc replacement (ACDR) and minimally invasive posterior cervical foraminotomy (MI-PCF) have gained popularity due to their ability to preserve segmental motion and reduce the risk of adjacent segment degeneration (ASD). However, comparative data between ACDR and MI-PCF using long-term follow-up remains limited. This study aims to compare the clinical and functional outcomes of patients undergoing single-level ACDR or MI-PCF for unilateral cervical radiculopathy over a minimum 5-year period.

METHODS: A retrospective cohort study was conducted at a single institution to identify patients who underwent single-level ACDR or MI-PCF between 2012 and 2017. Inclusion criteria included: age >18 years, single-level surgery from C3–C7, minimum 5-year follow-up, and complete clinical documentation including patient-reported outcome measures. Demographic variables, operative details, and perioperative complications were collected. Outcomes included operative time, estimated blood loss, complications (e.g., dysphagia, dysphonia, infection, ASD), and revisions. Functional results were evaluated using the Visual Analog Scale (VAS) and Neck Disability Index (NDI).

RESULTS: Fifty-seven patients were included (23 ACDR, 34 MI-PCF). The MI-PCF group was significantly older (51.6 vs. 43.1 years, $p=0.007$) and had fewer smokers (14.7% vs. 39.1%, $p=0.036$). Operative time and estimated blood loss were significantly higher in the ACDR group (91.2 vs. 66.0 minutes; 22.9 mL vs. 12.2 mL; both $p<0.001$). ACDR had a higher overall complication rate (39.1% vs. 0.0%, $p=0.003$), primarily driven by transient dysphagia (30.4%) that resolved within 12 weeks. Conversely, MI-PCF had a higher revision rate (14.7% vs. 0.0%, $p=0.048$) with a mean time to revision of 23.2 months. Both groups showed significant postoperative improvements in VAS and NDI scores ($p<0.001$), but the ACDR group experienced greater mean improvements in VAS (3.5 vs. 2.1, $p<0.001$) and NDI (23.7 vs. 13.6, $p<0.001$) at final follow-up.

DISCUSSION AND CONCLUSION: Both ACDR and MI-PCF are effective in treating unilateral cervical radiculopathy, offering significant improvements in pain and disability. While ACDR was associated with a higher transient complication rate, it resulted in better long-term patient-reported outcomes and no revisions. In contrast, MI-PCF was associated with fewer complications but a higher rate of revision surgery. These findings suggest that ACDR may provide superior long-term clinical benefit compared to MI-PCF, though patient-specific factors should guide surgical decision-making.