

Clinical Study

Reoperation rates after anterior cervical discectomy and fusion versus posterior cervical foraminotomy: a propensity-matched analysis

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Abstract

BACKGROUND CONTEXT: Anterior cervical discectomy and fusion (ACDF) and posterior cervical foraminotomy (PCF) are both used to surgically treat patients with cervical radiculopathy and have been shown to have similar outcomes. Nonetheless, ACDF has become increasingly more commonplace compared with PCF, in part because of a pervasive belief that PCF has a higher incidence of required reoperations.

PURPOSE: To determine the reoperation rate at the index level of ACDF versus PCF 2 years postoperatively.

STUDY DESIGN: A retrospective case-control.

PATIENT SAMPLE: All patients that underwent ACDF and PCF for radiculopathy (excluding myelopathy indications) between January 2005 and December 2011.

OUTCOME MEASURES: Revision surgery within 2 years, at the index level, was recorded.

METHODS: Propensity score analysis between the ACDF and PCF groups was done, matching for age, gender, race, body mass index, tobacco use, median income and insurance status, primary surgeon, level of surgery, surgery duration, and length of hospital stay.

RESULTS: Seven hundred ninety patients met the inclusion/exclusion criteria, including 627 ACDF and 163 PCF. Before propensity matching, the PCF group was found to be significantly older and more likely to be male. After matching, there were no significant differences between groups

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for any baseline characteristics. Reoperation rate at the index level was 4.8% for the ACDF group and 6.4% for the PCF group ($p=.7$) within 2 years of the initial surgery. Using equivalence testing, based on an a priori null hypothesis that a clinically meaningful difference between the two groups would be $\geq 5\%$, we found that the absolute difference of 1.6% was significantly ($p=.01$) less than our hypothesized difference.

CONCLUSIONS: This study demonstrates that even after accounting for patient demographics, operative characteristics, and primary surgeon, there are no significant differences in 2-year reoperation rates at the index level between ACDF and PCF. The reoperation rates are statistically equivalent. Thus, spine surgeons can operate via the posterior approach without putting patients at increased risk for revision surgery at the index level. © 2015 Elsevier Inc. All rights reserved.

Keywords: Anterior cervical discectomy and fusion; Posterior cervical foraminotomy; Reoperation rates; Propensity matching; Foraminal stenosis; Cervical radiculopathy

Introduction

Anterior cervical discectomy and fusion (ACDF) and posterior cervical foraminotomy (PCF) are two mainstay approaches to decompress foraminal stenosis in patients with radiculopathy that are refractory to conservative management. These surgical procedures were both initially described in the 1940s to 1950s and modified over time [1–4]. Although both have been shown to be safe and equally effective [4–7], ACDF has become more prevalent in recent years [8,9].

The relative advantages and disadvantages of each approach are well described. With the ACDF, there is a risk of pseudoarthrosis and adjacent segment degeneration, as well as ventral approach-related complications [4,7,10,11]. Posterior cervical foraminotomy does not require stabilization, which allows the surgeon and patient to circumvent the fusion related complications of pseudoarthrosis, and instrumentation failure, and also can preserve the motion-segment mobility. In addition, it avoids complications associated with an anterior approach, such as dysphagia, dysphonia, and injury to the vertebral artery, sympathetic chain, esophagus, and other structures. Exposure through the dorsal cervical musculature, however, has a potential for greater postoperative neck pain and blood loss [4,12–14]. Furthermore, PCF does not allow reconstruction and stabilization of the intervertebral space. It, therefore, may be associated with a greater incidence of revision surgery than ACDF [7].

In a retrospective cohort study, Wang et al. [7] demonstrated that relative to historical controls, PCF has a similar reoperation rate (5%). These findings, however, were limited in that they compared rates from two disparate populations. No randomized controlled trials (RCTs) or matched-cohort retrospective studies have compared the reoperation rates of ACDF versus PCF. Accordingly, we sought to use a propensity-matched analysis (the gold standard for retrospective studies, second only to prospective randomization) to compare the same-level reoperation rate of these two surgical approaches, while controlling for possible confounding variables such as demographic variables, operative characteristics, level of

surgery, and operating surgeon. We hypothesized that there would be no statistically significant difference in reoperation rates between ACDF and PCF and that the revision rate would be within 5% of each other.

Methods

Study sample

A retrospective study of all patients who underwent ACDF or PCF at C2–C7 for cervical radiculopathy at a single tertiary-care institution between 2005 and 2011 was performed. The electronic medical records were queried to retrieve patient data that met our criteria. Patients were excluded if they were younger than 18 years, if their surgical indication was for myelopathy, or if they had undergone a previous cervical spine surgery. Outcome was defined as whether revision surgery was performed within 2 years at the index level of surgery.

The patient information collected included age, gender, race, body mass index, tobacco use, median income, insurance status, operating surgeon, year of surgery, surgery duration, level of surgery, length of hospital stay (LOS), and primary and revision surgery approach. Propensity matching was based on the aforementioned variables and is described below.

Statistical analysis

Summary statistics (eg, means, standard deviations, counts, percentages) were computed for patients undergoing ACDF and PCF. We knew, a priori, that the two treatment groups would likely differ on certain variables (eg, primary Surgeon and gender). To account for these group differences, we used propensity score matching.

To measure the covariate balance in the two groups, we computed the standardized difference [15] for each variable, both before and after propensity score matching. We considered standardized differences less than 10.0 in absolute value to be balanced. In addition to examining standardized differences for each continuous variable, we compared density

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