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Clinical Study

Persistent axial neck pain after cervical disc arthroplasty: a radiographic analysis

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Abstract

BACKGROUND CONTEXT: There is very little literature examining optimal radiographic parameters for placement of cervical disc arthroplasty (CDA), nor is there substantial evidence evaluating the relationship between persistent postoperative neck pain and radiographic outcomes.

PURPOSE: We set out to perform a single-center evaluation of the radiographic outcomes, including associated complications, of CDA.

DESIGN: This is a retrospective review.

PATIENT SAMPLE: Two hundred eighty-five consecutive patients undergoing CDA were included in the review.

OUTCOME MEASURES: The outcome measures were radiological parameters (preoperative facet arthrosis, disc height, CDA placement in sagittal and coronal planes, heterotopic ossification [HO] formation, etc.) and patient outcomes (persistent pain, recurrent pain, new-onset pain, etc.).

METHODS: We performed a retrospective review of all patients from a single military tertiary medical center from August 2008 to August 2012 undergoing CDA. Preoperative, immediate postoperative, and final follow-up films were evaluated. The clinical outcomes and complications associated with the procedure were also examined.

RESULTS: The average radiographic follow-up was 13.5 months and the rate of persistent axial neck pain was 17.2%. For patients with persistent neck pain, the rate of HO formation per level studied was 22.6%, whereas the rate was significantly lower for patients without neck pain (11.7%, p=.03). There was no significant association between the severity of HO and the presence of neck pain. Patients with a preoperative diagnosis of cervicalgia, compared to those without cervicalgia, were significantly more likely to experience continued neck pain postoperatively (28.6% vs. 13.1%, p=.01). There were no differences in preoperative facet arthrosis, pre- or postoperative disc height, segmental range of motion, or placement of the device relative to the posterior edge of the vertebral body.

FDA device/drug status: Approved (cervical disc arthroplasty).

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The disclosure key can be found on the Table of Contents and at www.TheSpineJournalOnline.com.

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However, patients with implants more centered between the uncovertebral joints were more likely to experience posterior neck pain (p=.03).

CONCLUSIONS: We found that posterior axial neck pain is relatively frequent after CDA, and patients with persistent neck pain were significantly more likely to have preoperative cervicalgia and develop HO postoperatively. We also found that patients with implants that were placed off-centered were less likely to also complain of neck pain, although the reasons for this finding remain unclear. Published by Elsevier Inc.

Keywords: Arthroplasty; Axial neck pain; Cervical disc arthroplasty; Cervical disc arthroplasty placement; Persistent pain following; Posterior neck pain; Radiographic evaluation of cervical disc

Introduction

Cervical disc arthroplasty (CDA) is an increasingly popular alternative to anterior cervical discectomy and fusion (ACDF) in the treatment of cervical radiculopathy and myelopathy resulting from spondylosis and disc herniation. In theory, CDA maintains cervical spine alignment and motion of the involved spinal segment(s), potentially decreasing compensatory motion at adjacent disc spaces and lowering the risk of adjacent level disc degeneration when compared with ACDF [1], although this has not been universally seen clinically [2].

However, CDA is not without complications. A recent review at our institution showed a higher incidence of posterior neck pain in patients treated with single-level CDA (15.8%) than single-level ACDF (12.5%) [3]. In a separate review of 282 patient undergoing CDA at our institution [4], we found 18.4% of patients complained of axial neck pain at 3 months or greater postoperatively. The etiology of neck pain after CDA remains unclear, although potential pain generators include unaddressed facet degeneration, differences in implant positioning, or patient-specific factors. In addition, there has been a high incidence of heterotopic ossification (HO) following CDA [4–8], although there appears to be little association between the occurrence of HO and worse patient outcomes. There are also few studies in the literature that discuss the correlation between radiographic implant placement and clinical outcomes [5], and we sought to further evaluate this relationship in the present study. The purpose of the present study is to perform a single-center evaluation of patients who underwent CDA who experienced postoperative axial neck pain, and compare pre- and postoperative radiographic parameters to determine if there are specific radiological landmarks associated with worse postoperative outcomes.

Materials and methods

Following approval from our institutional review board, the surgical database at this institution was queried to identify all patients who had undergone CDA between August 2008 and August 2012. This search yielded a total of 316 patients, and 285 patients had available radiographic and follow-up information. All construct types (single-level CDA, hybrid, and multilevel CDA) were included. A subgroup analysis was also performed on all single-level CDA neck patients. All data were collected via a retrospective chart analysis, which included inpatient and outpatient clinical notes, in addition to preoperative, immediate postoperative, and final follow-up radiographs. Data collection included patient demographic information (age, sex, tobacco use, body mass index), patient-centered outcomes (complete relief of preoperative symptoms, relief of preoperative neurologic symptoms, return to preoperative level of activity), and clinical complications (persistent postoperative posterior neck pain, revision surgery). Some patients had more than one preoperative diagnosis, in which case both were recorded.

Radiographic analysis included evaluation of preoperative facet arthrosis, evidence of intraoperative fracture, HO formation, osteolysis, pre- and postoperative disc height, implant migration, segmental range of motion, and placement of the device in the coronal and sagittal planes at each instrumented level (Figure). Heterotopic ossification was graded as mild, moderate, or severe, with severe defined as complete ankylosis of the interspace [9]. Persistent posterior neck pain was defined in the study as symptoms lasting longer than 3 months in the postoperative period or requiring secondary intervention.

We performed Student *t* test on all continuous variables assuming unequal variances between groups and used Fisher exact test for categorical data with a two-tailed p-value of <.05 as the criterion for significance. We performed binary logistic regression analysis on all single-level CDA patients to identify risk factors for postoperative neck pain using the SPSS software (version 22.0; IBM Corp [Armonk, NY]). Variables eligible for inclusion in the multivariate model were limited to 1 variable per 50 events, and included those reported to be associated with an increased risk for postoperative neck pain and those with p-values of <.20 in the univariate analysis.

Results

A total of 285 patients with available clinical and radiographic follow-up were included in the review. Demographic data were evenly matched between groups (Table 1). There were morepatients (p=.01) with postoperative neck pain who had a preoperative diagnosis of cervicalgia than those without postoperative neck pain. The average radiographic follow-up was 13.5 months. The PRESTIGE cervical arthroplasty