

Clinical Study

Complications, outcomes, and need for fusion after minimally invasive posterior cervical foraminotomy and microdiscectomy

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Abstract

BACKGROUND CONTEXT: Posterior cervical foraminotomy (PCF) with or without microdiscectomy (posterior cervical discectomy [PCD]) is a frequently used surgical technique for cervical radiculopathy secondary to foraminal stenosis or a laterally located herniated disc. Currently, these procedures are being performed with increasing frequency using advanced minimally invasive techniques. Although the safety and efficacy of minimally invasive PCF/PCD (MI-PCF/PCD) have been established, reports on long-term outcome and need for secondary surgical intervention at the index or adjacent level are lacking.

PURPOSE: To determine the rates of complications, long-term outcomes, and need for secondary surgical intervention at the index or adjacent level after MI-PCF and microdiscectomy.

STUDY DESIGN: Retrospective analysis of a prospective cohort.

PATIENT SAMPLE: Seventy patients treated with MI-PCF and/or MI-PCD for cervical radiculopathy.

OUTCOME MEASURES: Visual Analog Scale for neck/arm (VAS_{N/A}) pain and Neck Disability Index (NDI).

METHODS: Ninety-seven patients underwent MI-PCF with or without MI-PCD between 2002 and 2011. Adequate prospective follow-up was available for 70 patients (95 cervical levels). The primary outcome assessed was need for secondary surgical intervention at the index or adjacent level. The secondary outcomes assessed included complications and improvements in NDI and VAS_{N/A} scores. All complications were reviewed. Mixed-model analyses of variance with random subject effects and autoregressive first-order correlation structures were used to test for differences among NDI, VAS_A, and VAS_N measurements made over time while accounting for the correlation among repeated observations within a patient. All statistical hypothesis tests were conducted at the 5% level of significance.

RESULTS: Patients were followed for a mean of 32.1 months. Of 70 patients operated, there were 3 (4.3%) complications (1 cerebrospinal fluid leak, 1 postoperative wound hematoma, and 1 radiculitis), none of which required a secondary operative intervention. Five patients required an anterior cervical discectomy and fusion (eight total levels fused) on average 44.4 months after the index surgery. Of those, five (5.3%) were at the index level and three (2.1%) were at adjacent levels. Neck Disability Index scores improved significantly ($p < .0001$) immediately postoperatively and continued to decrease gradually with time. Visual Analog Scale for neck/arm scores improved significantly ($p < .0001$) from baseline immediately postoperatively but tended to plateau with time.

FDA device/drug status: Not applicable.

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CONCLUSIONS: Minimally invasive PCF with or without MI-PCD is an excellent alternative for cervical radiculopathy secondary to foraminal stenosis or a laterally located herniated disc. There is a low rate (1.1% per index level per year) of future index site fusion and a very low rate (0.9% per adjacent level per year) of adjacent-level disease requiring surgery. © 2014 Elsevier Inc. All rights reserved.

Keywords: Posterior cervical foraminotomy; Microdiscectomy; Adjacent-level disease; Anterior cervical fusion; Outcome scores; Complications

Introduction

Cervical radiculopathy is one of the most common pathologies treated by spinal surgeons. Although many patients will respond to appropriate nonoperative measures, those who continue to be symptomatic have several surgical options available. Whereas anterior cervical discectomy and fusion (ACDF) remains the gold standard for the surgical treatment of cervical radiculopathy, motion-preserving procedures including disc replacement and posterior cervical foraminotomy (PCF) have become popular alternatives [1].

Posterior cervical foraminotomy is a motion-preserving technique that was first described by Spurling and Scoville in 1944 [2], but today, it can be performed using advanced minimally invasive techniques. When performed minimally invasively, authors have shown equivalent efficacy to open procedures with a significant reduction in blood loss, postoperative length of stay, and postoperative medication use [4–7]. The procedure can be divided into minimally invasive PCF (MI-PCF) or MI posterior cervical discectomy (MI-PCD) that includes a foraminotomy. Candidates for this surgical technique include patients with a soft-disc herniation lateral to the spinal cord and compressing the nerve root or with foraminal osteophytes originating from the facet joint [3]. Contraindications to PCF/PCD include pure axial neck pain without neurologic symptoms, gross cervical instability, symptomatic central disc herniation, diffuse ossification of the posterior longitudinal ligament, and a kyphotic deformity of the cervical spine [4]. Although several studies have shown that MI-PCF/PCD is an effective option in the treatment of cervical radiculopathy, to our knowledge, no study has investigated the need for secondary surgery at the index or adjacent level after this procedure. The purpose of our study was to report on the long-term outcomes and need for secondary surgical intervention at the index or adjacent level after MI-PCF/PCD.

Methods

Study design

We performed a retrospective analysis of a prospective cohort of patients presenting with radiating arm pain, with an associated varying degree of neck pain, who underwent MI-PCF or MI-PCD at a tertiary care center between 2002 and 2011. Ninety-seven patients were selected who

qualified for the study. Of those, 70 patients with adequate follow-up were identified. Institutional review board approval was obtained for this investigation.

Surgical technique

The surgical technique employed in MI-PCF/PCD has been described extensively elsewhere [4–6,8–10]. Briefly, patients were placed in a Mayfield three-point head fixation in a semi-sitting position with the neck slightly flexed with the long axis of the cervical spine perpendicular to the floor allowing for improved radiographic visualization of the cervical spine and decreased blood accumulation in the operative field. The operative level was confirmed with fluoroscopy using a long Kirschner wire (K-wire) held over the lateral side of the patient's neck. An 18-mm longitudinal incision was demarcated approximately 1.5 cm off midline on the operative site. For two-level procedures, an incision placed midway between the two levels of interest was performed. For bilateral procedures, a midline incision was used. The K-wire was docked at the inferomedial edge of the rostral lateral mass of the index level followed by the placement of serial tubular dilators. A Kerrison or high-speed drill was used to perform the bone removal once the ligamentum flavum was detached from the inferior edge of the lamina using an up-angled curette. A partial medial facetectomy with at least 50% sparing of the facet was performed to prevent iatrogenic destabilization of the facet joint while appropriately decompressing the nerve root. Additional drilling of the superomedial aspect of the caudal pedicle was performed for greater access to the pathology and because it decreased the need for nerve root retraction during removal of the disc herniation and/or foraminal osteophytes.

Clinical follow-up

Disability and pain levels, measured at baseline, 6 weeks, 3 months, 6 months, 1 year, 2 years, and 3 years or greater, were assessed using the Neck Disability Index (NDI) and Visual Analog Scale (VAS) instruments. Neck Disability Index is a patient-completed, condition-specific functional status questionnaire with 10 items including pain, personal care, lifting, reading, headaches, concentration, work, driving, sleeping, and recreation. Visual Analog Scale is a psychometric response scale used to measure

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