Posterior cervical foraminotomy for the treatment of cervical radiculopathy


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Cervical radiculopathy remains a potentially disabling disease with a significant impact on patients’ quality of life. Despite conservative nonoperative treatment, a large number of patients will end up needing surgical treatment. The most prevalent surgical options in this setting include anterior cervical discectomy and fusion (ACDF), posterior cervical foraminotomy, and cervical arthroplasty. Importantly, posterior cervical foraminotomy is an attractive option that may maintain cervical range of motion and minimize adjacent-segment degeneration. There are, however, no good data to guide the optimal timing of surgical treatment. Surgery is generally recommended when cervical-root–related dysfunction persists for more than 6–12 weeks despite nonsurgical treatment. A comparison of medical and surgical treatment published in *Spine* in 1999, showed that surgically treated patients had better outcomes with greater degrees of improvement, even though they had more neurological and nonneurological symptoms and more functional disability before treatment.

In the current issue of *Journal of Neurosurgery: Spine*, Jagannathan et al. have reviewed a series of 162 cases involving patients with cervical radiculopathy who were treated with a posterior cervical foraminotomy, with a mean follow-up of 77.3 months (range 60–177). This review has addressed not only the clinical outcome but also and more importantly the long-term radiological outcome of cervical spinal alignment following posterior cervical foraminotomy. In this current series, 92% of patients showed an improvement of their Neck Disability Index scores from 18 (range 2–39) preoperatively to 8 (range 0–39) postoperatively. Ninety-five percent of patients with cervical radiculopathy experienced improvement of their symptoms. Loss of cervical lordosis (defined as segmental Cobb angle < 10°) was seen in 30 (18.5%) of patients. The overall cohort did not show any statistically significant progression of the focal or segmental kyphosis with time. Age over 60 years at the time of surgery and preoperative lordosis of less than 10° have been identified as risk factors of worsening sagittal alignment.

Since the original description in the late 1940s, the surgical approaches to cervical radiculopathy secondary to laterally based discoligamentous and osseous pathology have been a choice between ACDF and posterior foraminotomy. Many anatomical, pathophysiological, and patient factors influence the choice between these treatment approaches. Multiple studies have shown that in matched cohorts the clinical outcomes of ACDF and posterior foraminotomy are similar. The most important factor that influences the approach to treatment of unilateral single-level radiculopathy is surgeon bias. There has been a resurgence of interest in posterior foraminotomy, especially with recent popularization of minimally invasive surgery (MIS) techniques using tubular access.

The 2 concerns with posterior foraminotomies are same-level degeneration/kyphosis secondary to partial resection of the facet joint and persistent neck and shoulder pain secondary to muscle stripping with the open procedure. In vitro studies have shown that segmental hypermobility of the cervical spine results if a foraminotomy involves resection of more than 50% of the facet. In another cadaveric in vitro study Onan et al. demonstrated that isolated cervical facet joints are highly mobile in comparison with facet joints within the constraints of intact motion segments. This has prompted surgeons to be more conservative with the amount of facet joint resected when performing a posterior foraminotomy.

The surgical technique reported by John Jane’s team in this issue of *Journal of Neurosurgery: Spine*, which involves resecting the medial half of the facet joint to enable excellent nerve root decompression, importantly does not seem to have a deleterious effect on segmental stability or sagittal plane alignment. Jane’s team also identified the risk factors for delayed instability based on observations in a small subset of patients with worsening sagittal balance following surgery. These observations made by Jagannathan et al. in the current review, which were lack-
ing in many previously published studies, are invaluable to the reader. In view of the results of in vitro biomechanical studies, care must be taken to preserve at least 50% of the joint in order to minimize iatrogenic instability. Clarke et al. followed up 303 patients who underwent single-level posterior foraminotomy and demonstrated 5- and 10-year risk rates for developing same-segment disease of 3.2 and 5.0%, respectively. The calculated 10-year rate of adjacent-segment disease was 6.7%. Both the findings of Clarke et al. and the current review suggest that posterior foraminotomy is associated with a low rate of same- and adjacent-segment disease. Postsurgical neck and shoulder pain have been reported frequently in the literature following laminectomy and laminoplasties. It has been less of an issue with single-level posterior foraminotomies, which involve less soft tissue dissection. Grieve et al. reported an incidence of neck pain up to 20% following posterior foraminotomy for spondylitic radiculopathy at a mean follow-up of 40 months. Meticulous care with soft tissue handling and minimal stripping of soft tissue with better localization and smaller incisions will reduce postoperative neck pain. In carefully selected patients, posterior foraminotomy is a safe operation with minimal neurological complications. Associated myelopathy or radiological evidence of central canal stenosis, cord compression, central disc herniation or osteophytic bar, pre-existing cervical kyphosis, and radiological evidence of dynamic segmental instability are some of the potential contraindications for posterior foraminotomy.

The future of posterior foraminotomies is moving in the direction of MIS techniques. The MIS techniques require a steep learning curve but the methodology itself is now well established. Open posterior cervical foraminotomy remains a valid option for treating cervical radiculopathy with low rates of segmental instability and very good long-term results. Currently, open foraminotomies represent an excellent option for managing single-level spondylitic radiculopathy in the absence of central cord compression. The review of Jagannathan et al. gives an excellent insight into its technique, patient selection, potential caveats, and expected outcomes. Nevertheless, the optimal surgical treatment for cervical radiculopathy and indeed the long-term benefits of surgery versus non-operative treatment remain the subject of intense debate, and prospective randomized trials will likely be required in order to produce conclusive answers.

References

Response

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We thank Dr. Fehlings for his insightful and enlightening perspectives. As discussed in the editorial, the optimal management (anterior vs posterior) of disc disease in patients with cervical radiculopathy is a dilemma for all spine surgeons, and the appropriate surgical solution to this problem will not be satisfactorily answered until a carefully designed randomized controlled study is completed.

Although multiple groups have reported favorable outcomes following posterior cervical foraminotomy in patients with radiculopathy, adjacent-segment degeneration and clinical recurrences are common postoperative complications and warrant further discussion.

In reviewing 374 cases involving patients who underwent 409 anterior cervical arthrodeses for cervical spondylosis, Hilibrand and colleagues reported a relatively constant rate of symptomatic adjacent-segment disease of 2.9% per year, with 25.6% of patients developing ad-