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Endoscopic Posterior Cervical Foraminotomy in Bony Stenosis – A Review of the Literature

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Abstract

Background: Posterior cervical foraminotomy is a feasible treatment option for cervical radiculopathy. In this article, we want to give a short review on the advantages, indications and limitations of this treatment procedure.

Methods: A Medline search for endoscopic posterior cervical foraminotomy was done and 13 articles were compared regarding the surgical technique, patient outcome, complications, intraoperative blood loss, surgical time, hospital stay and postoperative need for pain medication.

Results: Compared to patients treated by an open approach, patients treated by endoscopic posterior cervical foraminotomy show equal clinical results, but lower complication rates and less intraoperative blood loss, reduced surgical time, hospital stay and postoperative need for pain medication.

Conclusion: This review shows that posterior endoscopic decompression is a successful option in the treatment of bony cervical foraminal stenosis.

Keywords: Endoscopic posterior; Cervical; Foraminotomy; Bony stenosis

Introduction

Decompression of the cervical spine can traditionally be achieved by an open anterior or posterior approach. The posterior approach is known to cause injuries of the anatomical structures of the neck, but to preserve the cervical spine motion. This can lead to postoperative complications, such as neck pain, shoulder pain or spinal instability. Furthermore, the spinal cord could become an anatomic challenge during the surgery.

To overcome complications due to the open posterior approach, minimally invasive techniques such as tubular systems for microsurgical or fully endoscopic surgeries have been developed over the past decades. Using these systems, the muscle fascia is punctured and the muscles are subsequently dilated with dilators in different sizes resulting in less muscle trauma compared to an open approach.

Methods: With this article, we want to give a short review on the literature about endoscopic posterior cervical foraminotomy in bony stenosis. Therefore, a Medline search was done and 13 studies were compared regarding diagnosis, surgical technique, patient outcome, complications, intraoperative blood loss, surgical time, hospital stay and postoperative need for pain medication. The studies included patients suffering from soft lateral disk herniation and bony foraminal stenosis and were operated either with the microscopic or the endoscopic technique. The microscopic and the endoscopic technique were compared regarding clinical results, feasibility and visualization. In addition, a compilation of 2 studies including patients suffering from bony foraminal stenosis only was done.

Results

There are comparable clinical and functional outcomes of the open and minimally invasive techniques for patients that underwent posterior cervical foraminotomy [1-3]. However, intraoperative blood loss, surgical time, hospital stay and postoperative need for pain medication due to neck pain could be reduced by the minimally invasive techniques [1,2,4].

For radiculopathy caused by bony foraminal stenosis treated with endoscopic posterior cervical foraminotomy, the group of the authors' could show that there are high clinical success rates (90.7% according to Modified Odom's Criteria) [5]. Studies including patients suffering from cervical lateral disc herniation showed clinical success rates of 96.6%-97% [6,7] and reoperation rates of 13.9% versus 18.6% [5,8]. In our study, postoperative complications occurred as 3 patients suffering from neck pain. All 3 patients underwent ACDF after foraminotomy and improved after ACDF.

Table 1 is a compilation of studies for endoscopic posterior cervical foraminotomy in patients suffering from lateral disk herniation and/or bony foraminal stenosis. There are comparable results in clinical outcomes and the Neck Disability Index.

Thus, there are only two studies that only include patients suffering from bony foraminal stenosis only. Oertel et al. [5] included 43 patients that suffered from bony foraminal stenosis in up to 3 segments in their study. Postoperative Neck Disability Index was 18% compared to 3.33% in the group of Ye et al. The group of Ye et al. [12] however only included 9 patients suffering from bony foraminal stenosis in 1 segment only. Nevertheless, both studies could show good clinical patient outcomes (Table 2).

Discussion

Traditionally, an open anterior or posterior approach can be used for decompression of the cervical spine. The anterior approach is known to cause complications due to injuries of the anatomical structures of the neck, whereas the posterior approach often leads to postoperative neck pain due to muscle trauma. Minimally invasive techniques for a posterior approach can overcome these pitfalls. There are equal clinical results for the open and minimally invasive approach [1-3] but less intraoperative blood loss, surgical time, hospital stay and postoperative

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Criteria	Ruetten et al.	Adamsom	Fessler et al.	Lawton et al.	Ye et al.	Youn et al.	Oertel et al.
Number of Patients	100	100	25	38	9	22	43
Age (years)	43	46	49	49	46	56.2	55
Mean Follow-up (months)	24	15	4	24	12	24	28
Diagnosis							
1. Soft disk herniation	87	n.a.	n.a.	13	0	n.a.	0
2. Bony foraminal stenosis	13	n.a.	n.a.	25	9	n.a.	43
Combination auf 1 and 2	Yes	Yes	Yes	No	No	n.a.	No
Analysis separated by diagnosis	No	No	No	No	Yes	No	Yes
Odom's (clinical success) in %	n.a.	96.0	n.a.	n.a.	n.a.	n.a.	90.7
Neck disability index in %	n.a.	n.a.	n.a.	24.0	3.33	10.8	18.0

Table 1: Compilation of studies for endoscopic posterior cervical foraminotomy [3,5,8-13].

Criteria	Ye et al.	Oertel et al.
Number of patients	9	43
Age (years)	46	55
Mean follow-up (months)	12	28
Affected segments		
Bony stenosis in 1 segment	9	31
Bony stenosis in 2 segments	0	11
Bony stenosis in 3 segments	0	1
Odom's (clinical success) in %	n.a.	90.7
Nexk disability index in %	3.33	18.0

Table 2: Compilation of the studies including patients with bony foraminal stenosis only [8,12].

need for pain medication in patients treated by a minimally invasive technique [1,2,4]. In our opinion, the decreased muscle trauma using dilatation systems reduces the postoperative neck pain.

For a minimally invasive technique different systems can be used. On the one hand, there are tubular systems which use a tubular working canal and a microscope and on the other hand, there are endoscopic systems which also use a tubular dilator as a working canal but an endoscope for visualization. However, with an endoscopic system the ray of light can be placed directly in front of the pathology and an angled optic can be used for a better illumination as well as an enlarged view on the surgical field. Furthermore, the intraoperative view on the surgical field is not obstructed by any instruments as it happens in microscopic systems [5].

In patients suffering from soft lateral disk herniation both minimally invasive techniques show equal results in the patients' outcome and complication rates [9]. Furthermore, recent studies could show good clinical results for endoscopic posterior cervical foraminotomy in patients suffering from bony foraminal stenosis [5,12-14]. Thus, by the time, a randomized controlled study for the microscopic vs. endoscopic technique in patients suffering from bony stenosis is still lacking.

Conclusion

Endoscopic posterior cervical foraminotomy is a safe and feasible procedure for patients suffering from bony foraminal stenosis and lateral disc herniation with symptoms of cervical radiculopathy. If the surgeon is familiar with both, the microscopic and the endoscopic technique, the endoscopic technique should be favoured. We assume that postoperative neck pain after endoscopic posterior cervical foraminotomy is caused by facet joint pain. Patients suffering from neck pain after posterior cervical foraminotomy improved after ACDF in the author's group's study. This leads to the conclusion that indications for endoscopic foraminotomy should be carefully evaluated regarding any facet joint problems. Especially patients with preoperative cervical facet joint pain should not undergo a posterior foraminotomy.

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