10 Anterior Cervical Foraminotomy (Microsurgical and Endoscopic)

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10.1 Terminology

Anterior cervical foraminotomy performed microsurgically or endoscopically is defined as a mono- or multisegmental unilateral direct resection of an offending lesion, either a posterolateral spondylotic spur or a disc fragment compressing the nerve root, from anterior between its origin in the spinal cord and its passing behind the vertebral artery (VA) while maintaining the form and function of the intervertebral disc of the affected level.

10.2 Surgical Principle

- The approach to the anterior vertebral column is performed using a microsurgical technique at the side of the radiculopathy in an almost similar fashion to conventional anterior cervical discectomy (ACD).

10.3 History

The following table outlines approaches for anterior cervical foraminotomy and nerve root decompression in chronological order.

<table>
<thead>
<tr>
<th>Author (year)</th>
<th>Procedure</th>
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</thead>
<tbody>
<tr>
<td>Verbiest (1968) [13]</td>
<td>Anterolateral approach with displacement of the VA laterally and ACD, performed with and without fusion</td>
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<tr>
<td>Hakuba (1976) [3]</td>
<td>Transuncodiscal approach without displacement of the VA and ACD, performed with and without fusion</td>
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<tr>
<td>Lesoin et al. (1987) [6]</td>
<td>ACD and anterolateral foraminotomy, with fusion</td>
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<tr>
<td>Jho (1996) [4]</td>
<td>Anterior cervical foraminotomy with resection of the “uncovertebral joint” (the UP, the lateral portion of the cephalic endplate and lateral portion of the intervertebral disc), technical note</td>
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<tr>
<td>Johnson et al. (2000) [5]</td>
<td>Anterior cervical foraminotomy: technique as described by Jho, clinical results, 21 cases</td>
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<tr>
<td>Tascioglu et al. (2001) [12]</td>
<td>Anterior cervical foraminotomy: slightly modified technique as described by Jho, 3 cases</td>
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<tr>
<td>Saringer et al. (2002) [7]</td>
<td>Microsurgical anterior cervical foraminotomy: resection of the UP and fragmentectomy leaving the intervertebral disc untouched, clinical results</td>
</tr>
<tr>
<td>Saringer et al. (2003) [8]</td>
<td>Endoscopic anterior cervical foraminotomy: same surgical procedure as microsurgical, minimally invasive</td>
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</tbody>
</table>
10.4 Advantages

The technical advantages are:

- Direct resection of an offending lesion compared to posterior foraminotomy
- Complete decompression of the nerve root and the spinal cord under visual control reducing the risk of injury to those structures
- Preservation of the motion segment by maintaining the form and function of the intervertebral disc of the affected level
- Avoiding the application of an implant
- Avoiding fusion-related complications including graft-related complications, graft site complications and adjacent-level disease
- Short operative time compared to ACD and fusion due to the avoidance of the fusion procedure
- Additionally, the use of an endoscope provides an improvement of the visualisation and a more intense light.

The clinical advantages are:

- Reduced operative trauma compared to ACD and fusion and even posterior foraminotomy, which allows patients a shorter hospital stay and to resume full activity sooner

10.5 Disadvantages

- Decompression of the contralateral side is impossible via the ipsilateral approach.
- It is a technically demanding procedure that requires practice in order to become familiar with the instruments and in particular with the endoscope.

10.6 Indications

This procedure is indicated in patients with unilateral mono- or multilevel radicular symptoms caused by unilateral mono- or multilevel cervical foraminal stenosis due to:

- Posterolateral spondylotic appositions
- A posterolateral disc fragment

The patients have to have the offending lesion in a lateral or foraminal location, compressing the nerve root from ventral between its origin in the spinal cord and its passing behind the VA.

10.7 Contraindications

This procedure is contraindicated in patients with:

- Bilateral syndromes
- Significant spinal canal stenosis (median soft or hard disc) and myelopathy
- Alignment abnormalities
- Foraminal stenosis caused by arthrosis of the facet joint (dorsal stenosis)

These patients should be referred for ACD and fusion or laminectomy.

10.8 Patient’s Informed Consent

Patients should be informed about the risks inherent to mono- or multilevel anterior approaches to the cervical spine, to the neural foramen and to the spinal cervical canal:

- Nerve root and/or spinal cord lesions with postoperative neurological deficits including radicular symptoms and para- or tetraparesis, and bladder and bowel dysfunction
- Dural leaks with cerebrospinal fluid (CSF) fistulas and/or cysts
- Vertebral artery lesions with major intraoperative bleeding and possible postoperative development of a spurious aneurysm and possible postoperative neurological deficits due to brainstem and cerebellar infarction
- Meningitis
- Spondylodiscitis with epidural abscess
- Segmental instability with chronic cervical pain requiring an ACD and fusion
- Postoperative hoarseness due to excessive retraction (transient) or transection of the recurrent laryngeal nerve

10.9 Surgical Technique

10.9.1 Diagnostic Evaluation

Anterior-posterior, lateral and oblique standard radiographs of the cervical spine and magnetic resonance imaging (MRI) evaluation of the cervical spine was performed in all patients. In case of insufficient visualisation of the foraminal anatomy, which may occur when MRI is utilised in spondylotic disease, a thin-slice computed tomography (CT) and high-resolution computed tomography (hrCT) were obtained for a definite accurate diagnosis.