



VERTEBRIS cervical
Full-endoscopic Spinal
Instrumentation



VERTEBRIS cervical, full-endoscopic techniques

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VERTEBRIS cervical

Introduction



Posterior access for the full-endoscopic cervical operation

In the area of the cervical spine, radicular symptoms such as pain in the arm are caused by degeneration typically from mediolateral to lateral herniated discs or stenoses of the intervertebral foramen. Such clinical symptoms were first classified as being topographically related to changes in the cervical discs at the beginning of the 1940's. Despite the often good results achieved with conservative procedures, a surgical approach can become necessary in cases of persistent pain or neurological deficits.

The posterior surgical access to the cervical spine was also developed in the 1940's. The anterior access was described at the end of the 1950's. In the meantime, anterior decompression and fusion has become a standard procedure in the surgical treatment of cervical radiculopathy. It is considered a safe and adequate procedure with good fusion rates. Nevertheless, specific problems, such as sintering of the implants, pseudarthroses or access complications

are reported. Adjacent disc degeneration has been discussed as one particular disadvantage of fusion. Here, an attempt is made to reconstruct the intervertebral space with disc prostheses while retaining mobility of the segment. With lateral pathology, the most common alternative to the anterior procedure is the posterior foraminotomy. This is performed without additional stabilisation and therefore allows the segment to retain its mobility. The problems that can occur here include neck pain resulting from the access or intraoperative bleeding. A reconstruction of the intervertebral space is not possible.

In cervical disc herniations with radicular symptoms, the volume of the escaped disc material is usually small. This means that due to the access in the anterior and posterior standard technique, the operation is comparatively extensive relative to the limited pathology. To reduce the disadvantages of the conventional procedure, modifications have been described such as anterior decompression without fusion, various techniques of anterior foraminotomy or posterior microscopically assisted or endoscopically assisted "keyhole foraminotomy". With anterior techniques without reconstruction of the intervertebral space, in particular, possible problems of sintering and segmental kyphosis have been discussed.

Full-endoscopic operations on the cervical spine have been described since the 1990's mainly using an anterior, transdiscal approach. The narrow anatomical situation represented a problem and allowed only the use of small endoscopes and working sleeves. This, in turn, presented technical problems, such as the poor view, working under X-ray control without direct visualisation

or restricted bone resection. Foraminal herniations could not be operated on ventrally.



Anterior access for the full-endoscopic cervical operation



Soft disc herniations are the main indication

With the development of new endoscopes, instrument sets and operating techniques, the technical problems have been overcome and today it is possible to treat cervical herniated discs full-endoscopically and with continual visualisation using an anterior or posterior approach. The possibility of adequate bone resection under vision (for example in the area of the foramen, the uncinat process or posterior edge of the body of a vertebra) and various

operating instruments create technical conditions similar to those of conventional microscopically assisted surgery however with the advantages of a full-endoscopic procedure with 25° telescopes and continuous irrigation.*

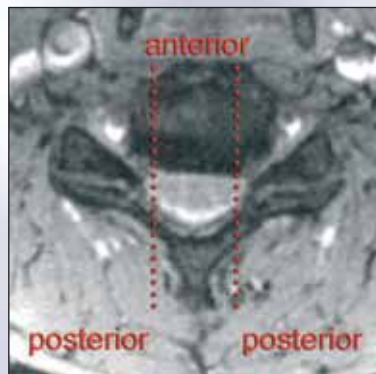
The main indications for cervical full-endoscopic operations are "soft" hernia-



Cervical myelom with spinal nerve and disc herniation

ted discs with radicular symptoms, in other words, pain in the arm. Since the cervical myelom must not be manipulated in a medial direction, the posterior access is used in herniations in which the main part is located lateral to the lateral edge of the myelom. Using an anterior approach in this situation, there is no guarantee of reaching the pathology even with resection of the dorsal uncinat process. Herniations located mainly medial to the lateral edge of the myelom count as indications for the anterior access, since here the myelom prevents the posterior approach. For an anterior access, the height of the ventral edge of the intervertebral space in reclination must be at least 4 mm to prevent injury resulting from the approach. With either access, possible craniocaudal sequestration must not exceed half the body of the vertebra.

The surgeon must also be capable of the conventional and maximally invasive procedures on the cervical spine. Possible problems and complications of cervical interventions may, in some cases, have serious repercussions. Injury to blood vessels can never be fully excluded in cervical spine surgery and, if this occurs, immediate conversion



The lateral margin of the myelom is the line indicating posterior or anterior access

to an open technique is necessary. Personnel and equipment must always be available for this emergency option.

* Ruetten S, Komp M, Merk H, Godolias G: Full-endoscopic cervical posterior foraminotomy for the operation of lateral disc herniations using 5.9-mm endoscopes: A prospective, randomized, controlled study. *Spine* 2008; 30:940-948

Ruetten S, Komp M, Merk H, Godolias G: A new full-endoscopic technique for cervical posterior foraminotomy in the treatment of lateral disc herniations using 6.9-mm endoscopes: prospective 2-year results of 87 patients. *Minim Invas Neurosurg* 2007;50:219-226



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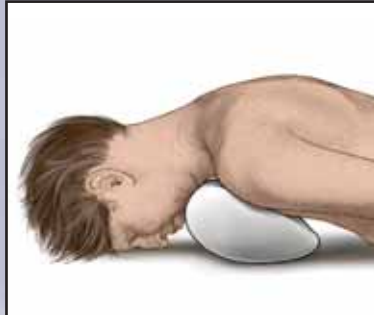


VERTEBRIS cervical

The full-endoscopic posterior technique

1. Positioning of patient

The patient is prone with a pelvic and thoracic cushion. For a posterior approach to the cervical spine, lordosis of the head and cervical spine must be straightened and fixed permitting intra-operative X-ray control in two planes. Stabilisation with Mayfield tongs or similar is helpful and allows conversion to an open intervention in an emergency. For the lower cervical spine, in particular, it may be necessary to tape the shoulders in a caudal direction or to apply caudal traction to the arms to relocate the shoulders. A C-arm is required during the operation.



Prone position, head stabilised in Mayfield tongs, caudal traction applied to arms

2. Determination of access route

Using fluoroscopic guidance, the access is selected in the orthograde lateral and posterior anterior view based on the anatomical landmarks. It must be located precisely over the zygapophyseal joints at the level of the disc.



Drawing the line of the zygapophyseal joints in posterior anterior view



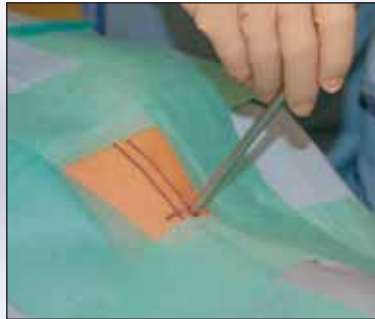
Skin incision



Identifying the level of the disc in orthograde lateral view with a cannula and selecting the point of entry

3. Creation of access

After selecting the point of entry through the skin and the incision, the dilator is introduced under lateral fluoroscopic guidance control until it contacts the bone of the zygapophyseal joints. The working sleeve with an oblique opening is inserted over the dilator and the dilator is removed.



Introducing the dilator as far as the zygapophyseal joints



The operating sleeve is introduced over the dilator



4. Performance of operation

The endoscope is introduced through the working sleeve. The operation is performed under vision using different instrument sets via the intraendoscopic working channel and under continuous irrigation. In almost all cases, foraminotomy requires bone resection with various instruments. After dissecting the bony structures, this begins at the descending part of the joint and the cranial lamina depending on the anatomy and pathology. Following this, parts of the

caudal lamina and ascending facet are resected. Even at this stage, care must be taken to avoid spinal nerves and the vertebral artery. The ligamentum flavum is opened and the spinal channel can be entered to resect the herniated disc.



The surgeon works with the endoscope through the operating sleeve

VERTEBRIS cervical

The full-endoscopic posterior technique



Bony parts of the joint and the laminae are resected to open the foramen



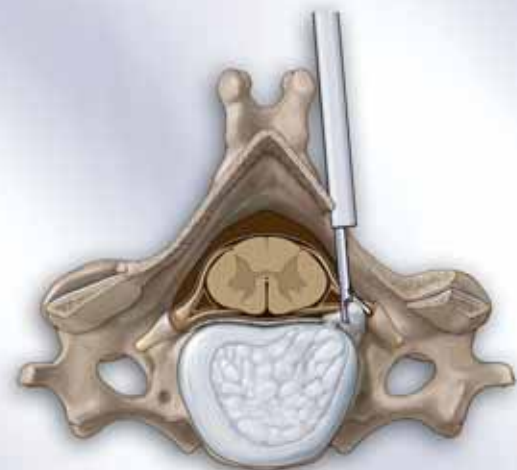
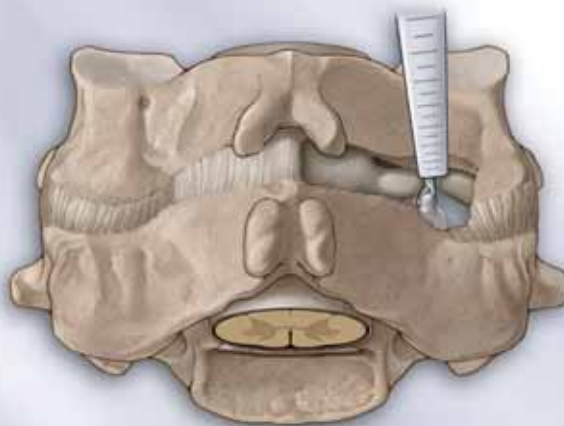
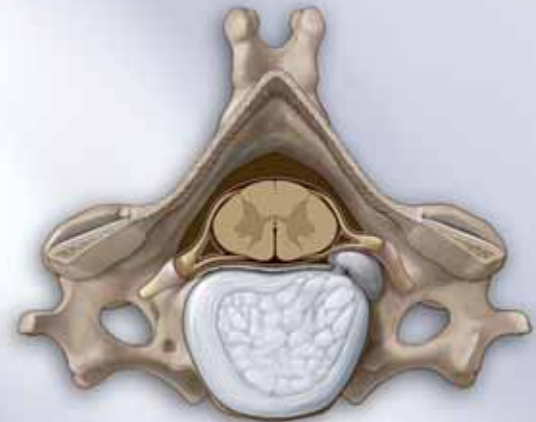
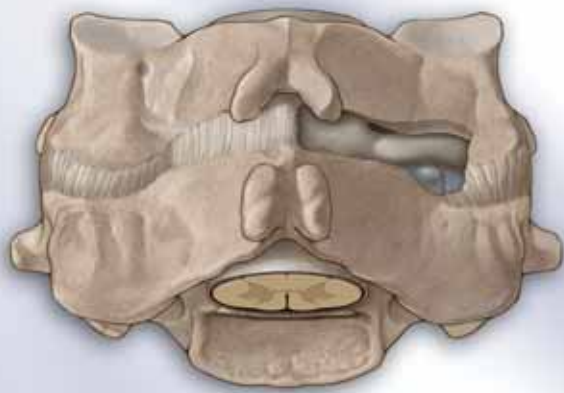
Fluoroscopic guidance can be useful while using the burrs and working in the spinal canal



Opened foramen with a view of the ligamentum flavum



View into the spinal channel with the cervical myelon and spinal nerve



After removal of the lateral ligamentum flavum and dissection of the neural structures, the disc herniation can be removed

The sealing caps for the telescope and working sleeve should only be used briefly if bleeding impairs the view. If an operation takes a long time and the blockage of the outflow of irrigation fluid goes unnoticed, effects of volume overload and increased pressure within the spinal channel and neighbouring structures cannot be fully excluded.

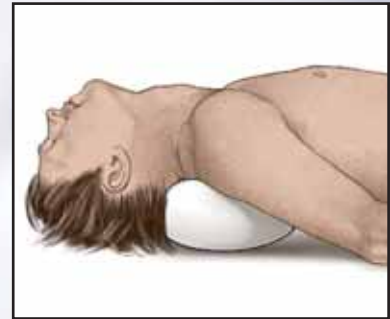
Manipulation of the cervical myelon must be avoided at all costs. In general, as with all new techniques, there is an increased risk of complications during the learning phase. This can be further increased due the general anatomical conditions in the area of the cervical spine as compared with the lumbar spine.

VERTEBRIS cervical

The full-endoscopic anterior technique

1. Positioning of patient

The patient is in the supine position. For an anterior approach to the cervical spine, the head and cervical spine must be slightly reclined and stabilised permitting intraoperative X-ray control in two planes. Stabilisation with Mayfield tongs or similar is helpful and allows conversion to an open intervention in an emergency. For the lower cervical spine, in particular, it may be necessary to tape the shoulders in a caudal direction or to apply caudal traction to the arms to relocate the shoulders. A C-arm is required during the operation.



Dorsal position, head stabilised in Mayfield tongs, caudal traction applied to arms

2. Determination of access route

The access is established contralateral to the pathology. The ventral spine is palpated with the fingers while the oesophagus and parts of the trachea are displaced medially and the vessels and nerves laterally. Under fluoroscopic guidance and taking into account the anatomy and pathology, the access is selected precisely over the intervertebral space in the orthograde lateral view.



The ventral spine is palpated

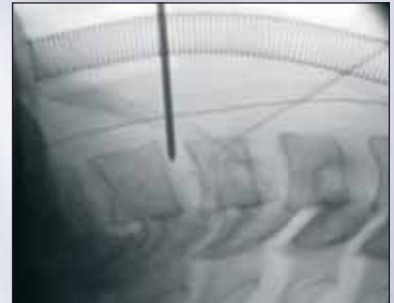


The access is selected over the intervertebral space



3. Creation of access

After selecting the point of entry through the skin and the incision, the first thin dilator is introduced into the intervertebral space under lateral fluoroscopic guidance. Care must be taken to puncture the disc anteriorly and avoid missing it laterally. This prevents not only the subsequent operation but can also lead to injury to the vertebral artery, spinal nerve or oesophagus. As an alternative, the disc can be punctured with a spinal cannula introduced over a guide wire. The first dilator can then be introduced over this. After puncture of the disc with the dilator or spinal cannula, the position is checked in a posterior anterior C-arm view. The remainder of the intervention is performed in the lateral view. The combined dilator sleeve system is introduced into the intervertebral space over the first dilator. The dilators are removed, the operating sleeve remains in the intervertebral space.



Introduction of the thin dilator into the intervertebral space



Introduction of the combined dilator-sleeve system



The operating sleeve remains in the intervertebral space

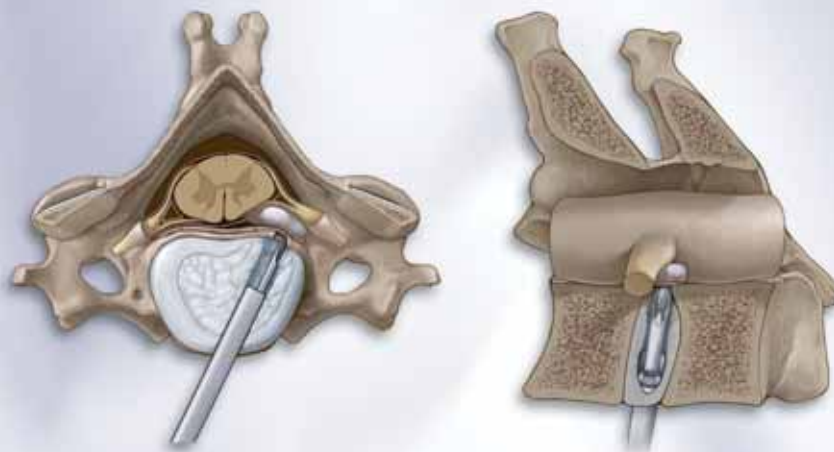
VERTEBRIS cervical

The full-endoscopic anterior technique

4. Performance of operation

The endoscope is introduced through the working sleeve. The operation is performed under vision using different instrument sets via the intraendoscopic working channel and under continuous irrigation.

To achieve topographic orientation, dissection of the unciniate process, dorsal edge of the body of the vertebra and dorsal anulus is performed. In many cases, bone resection with various instruments is necessary to reach the epidural space. Depending on the anatomy and pathology, the dorsal anulus and posterior longitudinal ligament are opened to gain access to the spinal canal and resect the disc herniation.



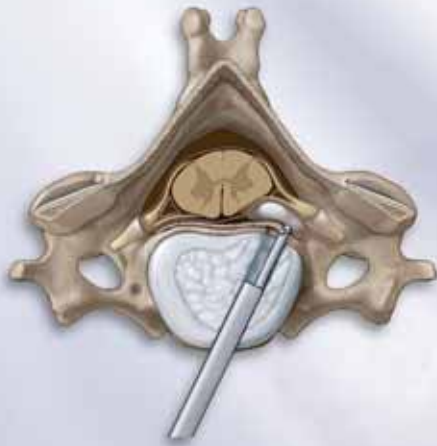
Bone resection is often necessary to reach the spinal canal



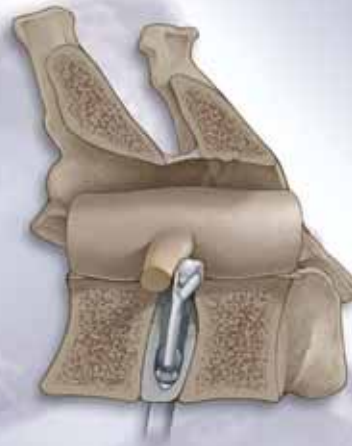
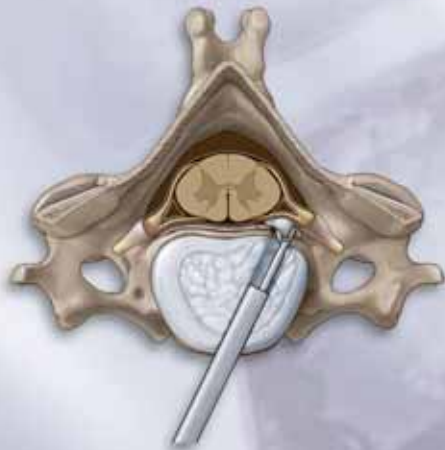
Working with the endoscope through the operating sleeve



The fluoroscopic guidance can be helpful for orientation during the intervention



Depending on the findings, the posterior longitudinal ligament is opened













Removal of the disc herniation

The sealing caps for the telescope and working sleeve should only be used briefly if bleeding impairs the view. If an operation takes a long time and the blockage of the outflow of irrigation fluid goes unnoticed, effects of volume overload and increased pressure within the spinal channel and neighbouring structures cannot be fully excluded.

Manipulation of the cervical myelon must be avoided at all costs. In general, as with all new techniques, there is an increased risk of complications during the learning phase. This can be further increased due the general anatomical conditions in the area of the cervical spine as compared with the lumbar spine.

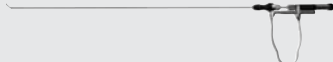

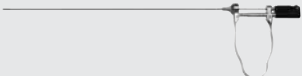

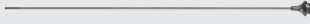

VERTEBRIS

Basic set, **VERTEBRIS** cervical posterior
devised by Dr. Ruetten

Article		Types
	Discoscope, 25°, WC 3.1 mm	892108253
	Light cable	8061.353
	Dilator, 2-channel Ø 5.9 mm	8792.764
	Working sleeve, WL 80 mm, 30° bevel	89220.7007
	Working sleeve attachment, Ø 7 mm	89200.1007
	Elevator, Ø 2.5 mm	89250.2025
	Dissector, Ø 2.5 mm	8792.591
	Microrongeur, Ø 2.5 mm, WL 290 mm	89240.2025
	Rongeur, Ø 3 mm, WL 290 mm	89240.3003
	Micropunch, Ø 2.5 mm, WL 290 mm	89240.2225

VERTEBRIS

Basic set, **VERTEBRIS** cervical posterior
devised by Dr. Ruetten

Article	Types
 Bone punch, Ø 2.5 mm, WL 290 mm	89240.2325
 Tube shaft punch, Ø 3 mm, WL 290 mm	89240.3903
 Trigger flex handpiece, complete	8792.6911
 Trigger flex bipolar electrodes (pack of 6)	4792.6912
 Probe with flexible tip, Ø 2.5 mm, WL 290 mm, consisting of:	892506925
 Inner sheath	892506625
 Handpiece	892500600
 Tube sheath	15570644
 Oval burr with lateral guard, Ø 2.5 mm	8792.312
 Oval burr with lateral guard, Ø 3 mm, WL 350 mm	89970.1503
 Oval burr with frontal guard, Ø 3 mm, WL 350 mm	89970.1513



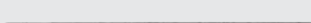

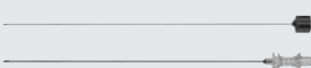







VERTEBRIS

Basic set, **VERTEBRIS** cervical anterior
devised by Dr. Ruetten

Article		Types
	Cervical discoscope, 25°, WL approx. 150 mm	892106250
	Telescope connecting piece	892006000
	Light cable	8061.353
	Working sleeve, 3.8 x 6.2 mm, WL 102 mm	892206038
	Working sleeve, 4.1 x 6.7 mm, WL 102 mm	892206041
	Dilator conical, for working sleeve 892206038	892206438
	Dilator conical, for working sleeve 892206041	892206441
	Dilator, for working sleeve 892206038	892206538
	Dilator, for working sleeve 892206041	892206541
	Handpiece attachment for working sleeve 892206038	892006038
	Handpiece attachment for working sleeve 892206041	892006041

VERTEBRIS

Basic set, **VERTEBRIS** cervical anterior
devised by Dr. Ruetten

Article		Types
	T-handpiece, Ø 12.0 mm	892006120
	Guide rod, Ø 1.8 mm, WL 250 mm	892206318
	Guide cannula, Ø 1.8 mm, IØ 0.9 mm, WL 250 mm	892206118
	Dilatation set, three-part	892206500
	Spinal cannula set, Ø 1.25 mm, WL 90 mm	492206112
	Trepine, Ø 3.6 mm, WL 100 mm, with tissue guard	892606036
	Trepine, Ø 4.0 mm, WL 100 mm, with tissue guard	892606004
	Probe with flexible tip, Ø 2.5 mm, WL 290 mm, consisting of:	892506925
	Inner sheath	892506625
	Handpiece	892500600
	Tube sheath	15570644
	Hooked probe, Ø 2.0 mm, WL 290 mm	892506003

VERTEBRIS

Basic set, **VERTEBRIS** cervical anterior
devised by Dr. Ruetten

Article	Types
 Mikro-rongeur, Ø 2.5 mm, WL 290 mm	89240.2025
 Rongeur, Ø 3 mm, WL 290 mm	89240.3003
 Micropunch, Ø 2.5 mm, WL 290 mm	89240.2225
 Micropunch, Ø 3 mm, WL 290 mm	89240.3023
 Bone punch, Ø 2.5 mm, WL 290 mm	89240.2325
 Bone punch, Ø 3 mm, WL 290 mm	89240.3903
 End-cut burr, Ø 3 mm, WL 350 mm	89260.1113
 Trigger flex handpiece, complete, Ø 2.5 mm	8792.691
 Trigger flex bipolar electrodes (pack of 6)	4792.6912
 Oval burr, Ø 2.5 mm, WL 350 mm	8792.312
 Oval burr with lateral guard, Ø 3 mm, WL 350 mm	89970.1503
 Oval burr with lateral and frontal guard, Ø 3 mm, WL 350 mm	89970.1513

VERTEBRIS

Accessories

Article		Types
	PowerDrive Art1 shaver system, incl. network-cable and CAN-bus connecting cable, 230V, 50/60 Hz	2304.0011
	PowerDrive Art1 shaver system, incl. network-cable and CAN-bus connecting cable, 100V, 50/60 Hz	2304.0021
	PowerDrive Art1 shaver system, incl. network-cable and CAN-bus connecting cable, 110V, 50/60 Hz	2304.0041
	PowerDrive Art1 shaver system, incl. network-cable and CAN-bus connecting cable, 115V, 50/60 Hz	2304.0061
	PowerDrive Art1 shaver system, incl. network-cable and CAN-bus connecting cable, 120V (USA), 50/60 Hz	2304.0071
	PowerDrive Art1 shaver system, incl. network-cable and CAN-bus connecting cable, 127V, 50/60 Hz	2304.00121
	PowerDrive Art1 shaver system, incl. network-cable and CAN-bus connecting cable, 240V, 50/60 Hz	2304.00141
	Power Stick M4 / motor handpiece incl. connecting cable	8564.121
	Double pedal foot-switch	2304.901
	Surgitron radiofrequency unit, 4 Mhz	2343.001/ .002

M E D I C A L

V E T E R I N A R Y

I N D U S T R I A L