

Takes the pressure

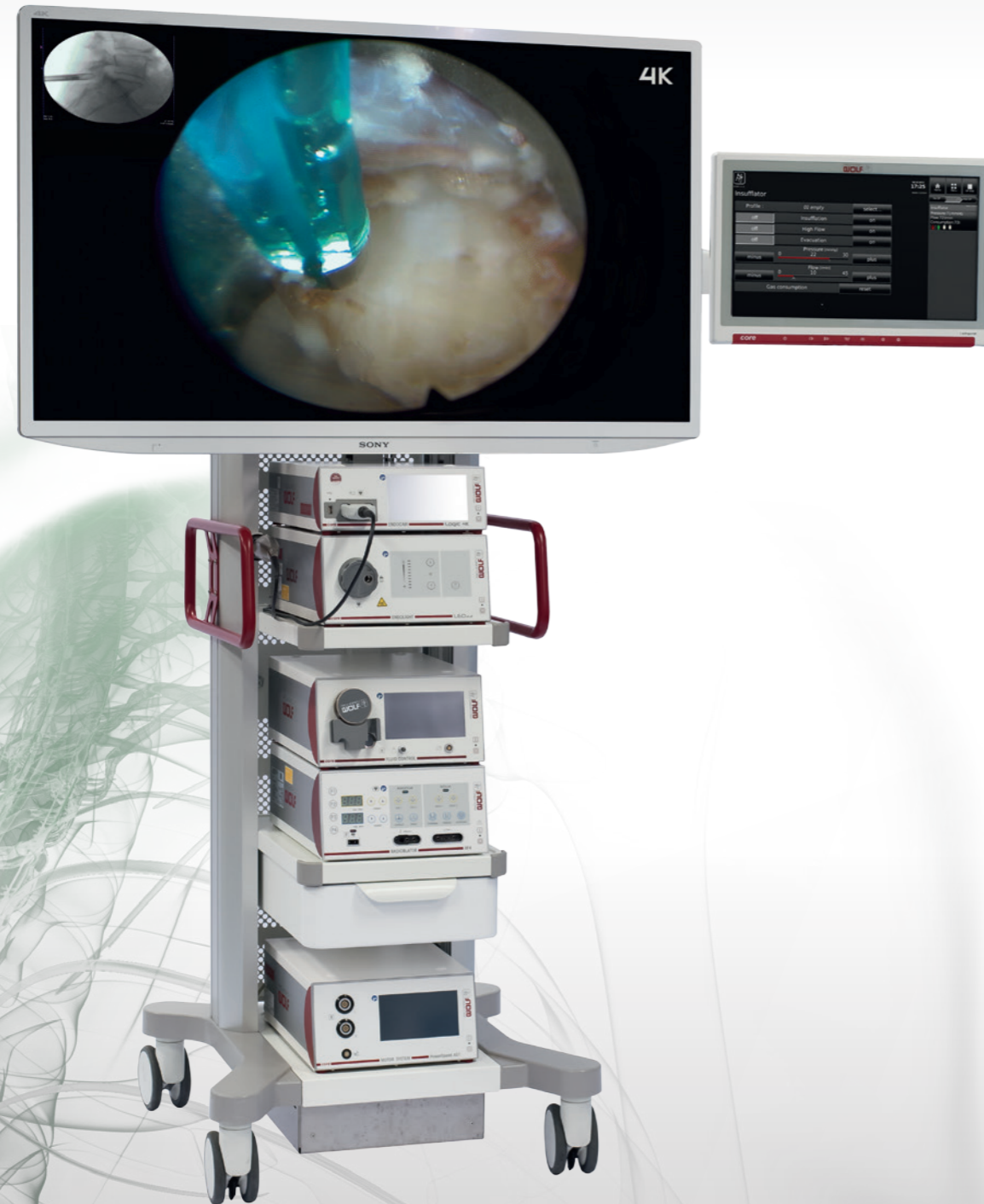


## **VERTEBRIS cervical**

Full-endoscopic decompression of the cervical spine –  
posterior and anterior techniques

# VERTEBRIS cervical

Full-endoscopic Spine Instrumentation



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# VERTEBRIS cervical

## Foreword

In the area of the cervical spine, radicular symptoms due to degenerative causes, in other words pain in the arms, are typically caused by mediolateral to lateral spinal disc herniations or stenoses of the intervertebral foramen. At the beginning of the 1940s, the clinical symptoms of this nature with a topographical reference to changes in the cervical discs were classified for the first time. Although good results are frequently obtained using conservative methods, surgical intervention may become necessary in the presence of pain or neurological deficits.

The development of the posterior surgical access to the cervical spine was also initiated at the beginning of the 1940s. Surgical procedures with anterior access were described at the end of the 1950s. Right up to the present day, anterior decompression and fusion has developed into a standard procedure when operating on cervical radicular pathologies. This procedure is regarded as safe and adequate with good fusion rates. However, specific problems, e.g. sintering of implants, pseudoarthrosis and access complications, have been described. Subsequent cases of degeneration are discussed as specific disadvantages of fusion. An attempt is made here to reconstruct the intervertebral space while retaining segment mobility. The most frequent alternative to the anterior approach is provided by posterior foraminotomy in the case of lateral pathologies. This procedure is carried out without additional stabilization and therefore retains the mobility of the segment. Access-related neck pain and intraoperative bleeding may prove problematic. There can be no reconstruction of the intervertebral space.

In the case of cervical spinal disc herniations with radicular symptoms, the volume of the herniating disk material is generally low. The anterior and posterior open standard procedure therefore frequently involves a relatively extended intervention due to issues relating to access in relation to the limited pathology. In order to reduce the disadvantages of the conventional procedure, modifications were described, e.g. anterior decompression without fusion, anterior foraminotomy with various techniques, or posterior microscopically assisted or endoscopically assisted "Keyhole Foraminotomy". The potential problems of sintering and segmental kyphosis are discussed, particularly in relation to anterior interventions without reconstruction of the intervertebral space.

Since the 1990s, full-endoscopic operations of the cervical spine have primarily been discussed in terms of the anterior, transdiscal intervention. The constricted anatomical conditions were problematic since they only permitted small telescopes and working sheaths. This gave rise to technical problems, e.g. poor visibility, working under X-ray control without direct visualization or restricted bone resection. Foraminal hernias could not be operated from an anterior position.

Today, the development of new endoscopes, instrument sets and operating procedures, offers the enablers for operating on cervical disc herniations using full-endoscopic methods under continuous visualization through the anterior and posterior access. The possibility of adequate bone resection under visualization – e.g. in the area of the foramen, the uncinat process or the posterior edge of



Posterior access for the full-endoscopic cervical operation



Anterior access for full-endoscopic cervical operation



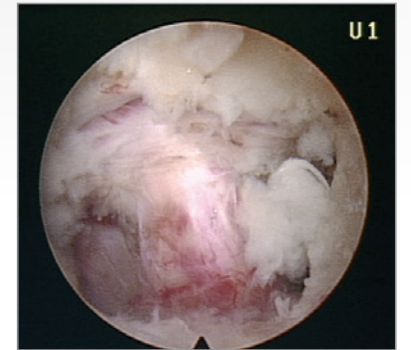
Soft spinal disk herniations are the main indication

the spinal column – and different surgical instruments provide technical conditions akin to conventional microscopically assisted surgical inventions with the simultaneous advantages of the full-endoscopic approach with 25° telescopes with a continuous flow of fluid.\*

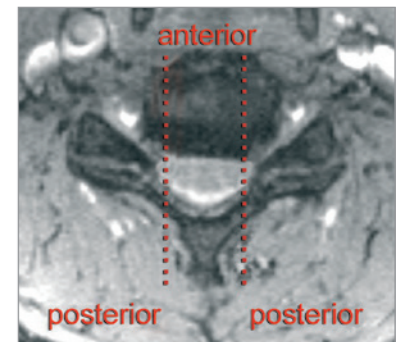
The main indications for cervical full-endoscopic operations are "soft" spinal disc herniations with radicular symptoms, in other words pain in the arms. Since the cervical spinal cord cannot be manipulated medially, the posterior approach is used for herniations where the main section is localized laterally to the lateral edge of the spinal cord. Reaching the pathology cannot be guaranteed here if an anterior approach is adopted even with resection of the uncinat process. Herniations presenting with their main part located medially to the lateral spinal edge are regarded as indications for anterior access, since there the spinal cord precludes a posterior approach. Furthermore, the height of the ventral edge of the intervertebral space must be at least 4 mm when the patient assumes a reclining position in order to prevent injury resulting from the approach. Potential cranio-caudal sequestration must not exceed half of the body of the vertebra in either of the two approaches.

The surgeon also needs to have the skills to perform conventional and maximally invasive procedures on the cervical spine. Potential problems and complications arising from cervical operations may have significant consequences. For example, the possibility of vascular injuries can never be entirely excluded in cervical spine surgery. If these injuries occur, the surgeon has to move to open surgery immediately. The personnel and equipment should always be available to adopt this approach if necessary.

\* see literature



Cervical spinal cord with spinal nerve and spinal disk herniation



The lateral boundary of the spinal cord is the indication line for posterior or anterior access

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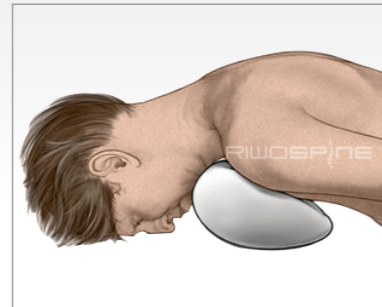
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# VERTEBRIS cervical

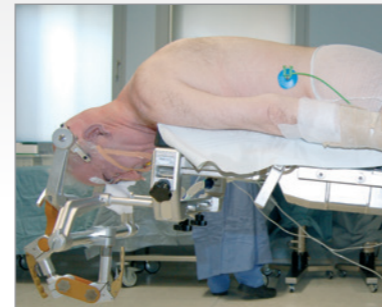
## The full-endoscopic posterior technique

### Positioning

The operation is performed with the patient in the prone position lying on a hip and thorax roll. The head and the cervical spine must be resting with correct lordotic adjustment in a fixed position in keeping with a posterior intervention on the cervical spine. X-ray monitoring should be permitted during the operation in two planes. General fixation in the Mayfield Clip or a similar holder offers excellent prerequisites and always provides the circumstances for an open intervention if an emer-



Prone position, fixation of the head in the Mayfield Clip, traction on the arms in a caudal direction



gency occurs. Particularly in the case of the lower cervical spine, it may be necessary to tape the shoulders caudally or to extend the arms in a caudal direction by means of traction. Application of a C-arm is required during the operation.

### Determination of the access

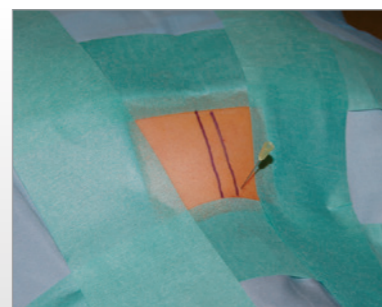
The access is determined under X-ray control on the basis of anatomical landmarks in the AP X-ray path and taking into account the anatomy and pathology in the orthograde lateral and anterior-lateral X-ray path. The access must be precisely positioned through the zygoapophyseal joint at the disk level.



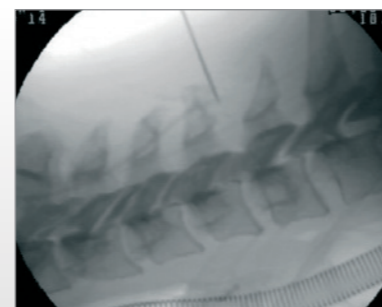
Drawing the line of the of the zygoapophyseal joints in the anterior-posterior beam path



Stab incision

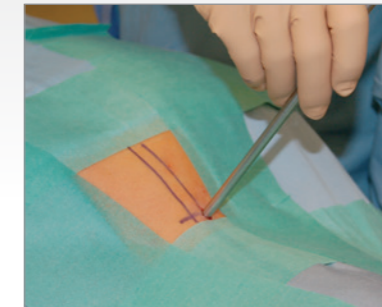


Determination of the spinal disk level in the orthograde lateral beam path using cannulas and definition of the entry point

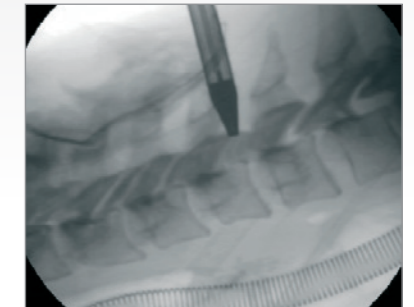


### Implementation of the access

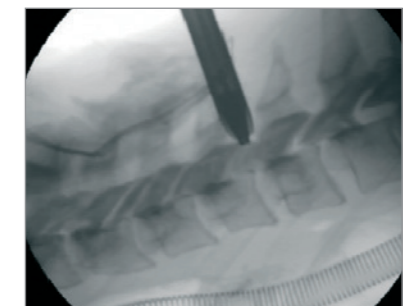
After determining the entry point in the skin and carrying out a stab incision, the dilator is inserted until contact is made with bone on the zygoapophyseal joint under lateral image X-ray control. The working sleeve with oblique opening is pushed through the dilator in a medial direction and the dilator is removed.



Insertion of the dilator in the zygoapophyseal joint



The operating sleeve is inserted through the dilator



### Operating procedure

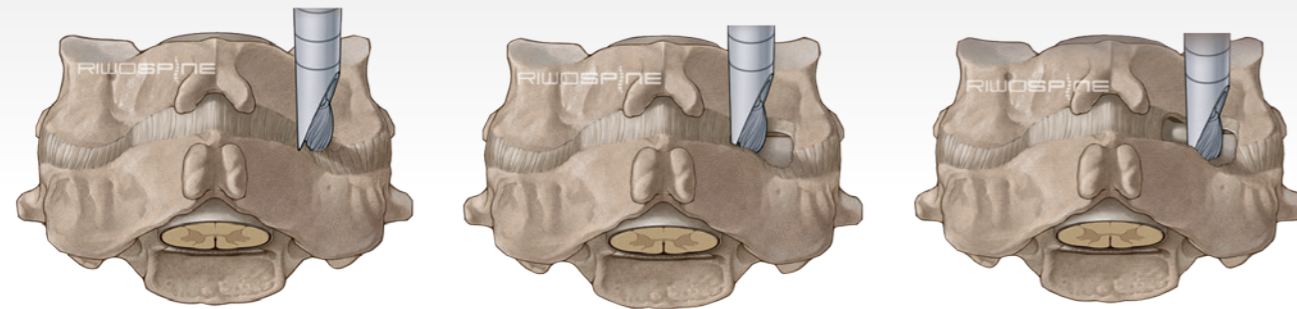
The endoscope is inserted through the working sleeve. The operation is carried out in endoscopic vision using different instrument sets positioned through the intraendoscopic working channel and with a continuous flow of liquid. A foraminotomy bone resection carried out with different instruments is necessary in virtually all cases. After exposure of the bony structures, this procedure is commenced on the descending part of the joint and the cranial lamina taking the anatomy and pathology into account. Parts of the caudal lamina and ascending facets are then resected. At this stage it is important to safeguard the spinal nerves and arteries. The ligamentum flavum is then opened and it is now possible to access the spinal canal for resection of the spinal disc herniation.



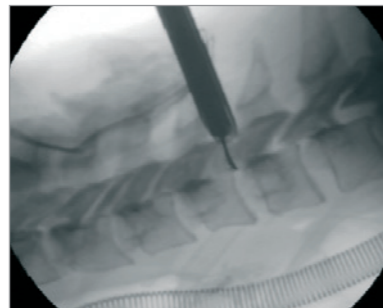
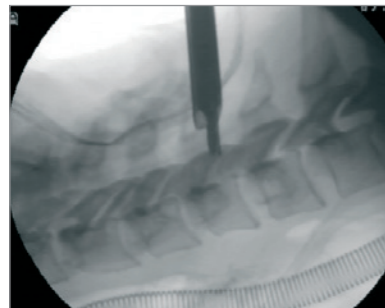
The endoscope is used in conjunction with the surgical sleeve

# VERTEBRIS cervical

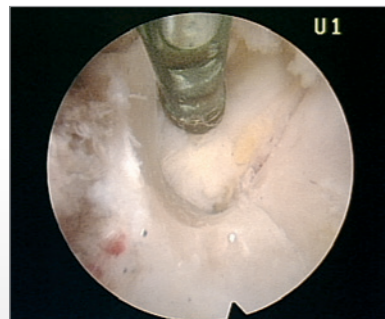
The full-endoscopic posterior technique



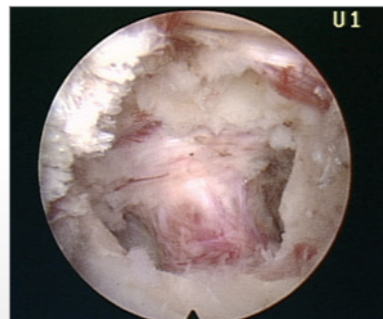
Bony parts of the joint and the lamina are resected to open the foramen



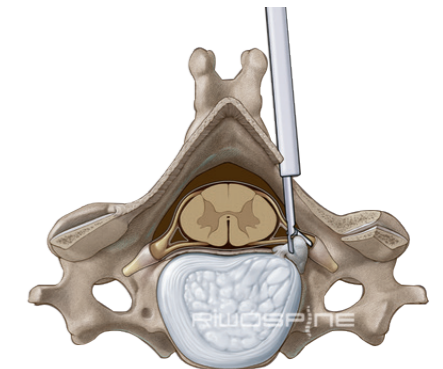
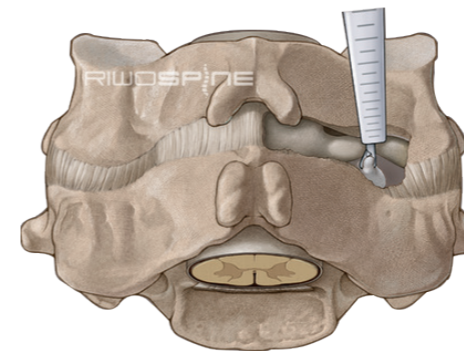
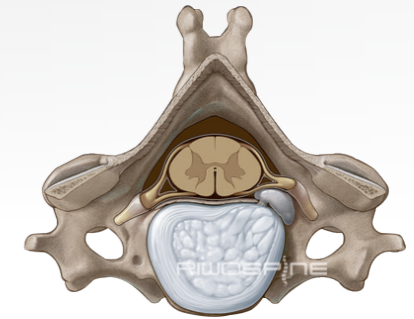
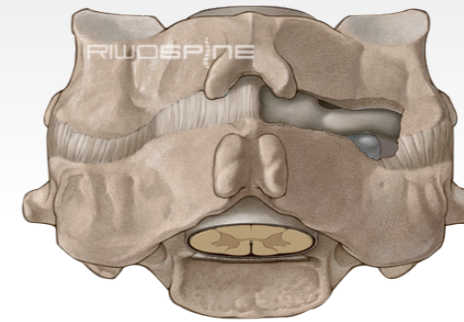
The X-ray monitoring can help with orientation during cutting or when working in the spinal canal



Reamed foramen with view of the ligamentum flavum



View in the lateral spinal canal with cervical spinal cord and spinal nerve



After removal of the lateral ligamentum flavum and exposure of the neural structures, the spinal disk herniation can be removed

The locking caps for endoscope and working sleeve should only be used briefly if bleeding obstructs vision. since when operations last a long time and the drainage of fluid is prevented without being noticed, the consequences of volume overload and elevated pressure within the spinal canal and the associated and neighboring structures cannot theoretically be completely excluded.

Any manipulation of the spinal cord must be avoided. Experience indicates that generally speaking there is an increased risk of complications when new procedures are carried out, in particular during the learning curve. This risk may be higher as a result of the general anatomical conditions in the cervical spine compared with the lumbar spine.

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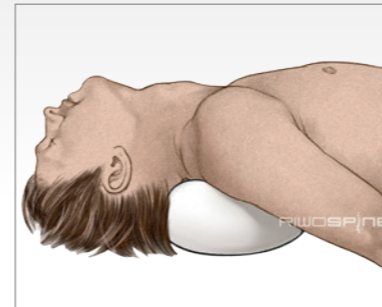
## The full-endoscopic anterior technique

### Positioning

The patient is placed in a supine position. The head and cervical spine must be placed in a slightly reclined position and fixed in keeping with an anterior approach to the cervical spine enabling X-Ray monitoring in two planes during the procedure. General fixation in the Mayfield Clip or a similar holder offers excellent prerequisites and always provides the circumstances for an open intervention if an emergency occurs. Particularly in the



Supine position, fixation of the head in the Mayfield Clip, traction on the arms in a caudal direction



case of the lower cervical spine, it may be necessary to tape the shoulders caudally or to extend the arms

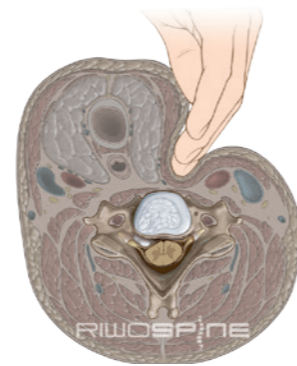
in a caudal direction by means of traction. Application of a X-ray C-arm is required during the operation.

### Determination of the access

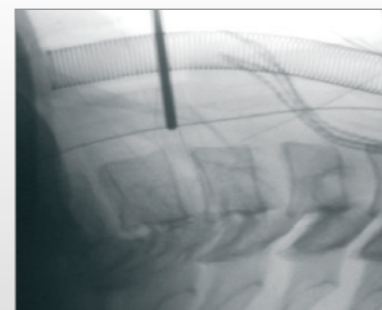
Access is made on the contralateral side of the pathology. The fingers are used to palpate the anterior spine. The esophagus and the trachea sections are manipulated medially and the vessel-nerve bundle are manipulated laterally. The access is determined using X-ray monitoring while taking account of the anatomy and pathology in the orthograde lateral and anterior lateral X-ray path.



Determination of the access through the intervertebral space



The access must be precisely positioned through the zygoapophyseal joint

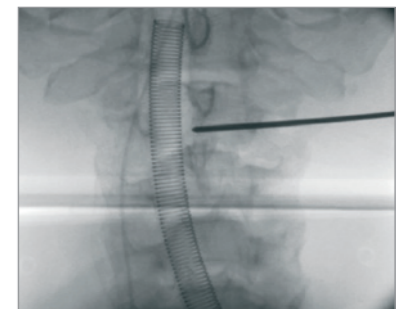
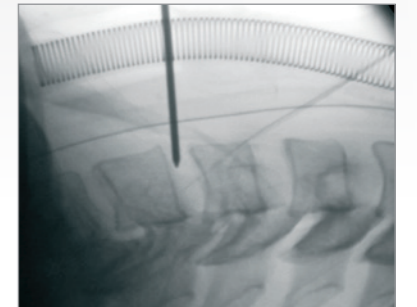


### Implementation of the access

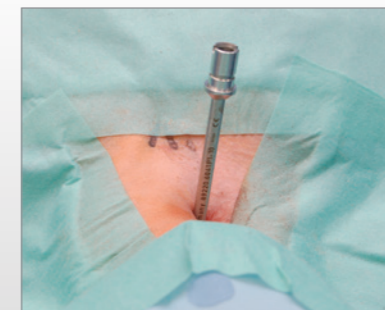
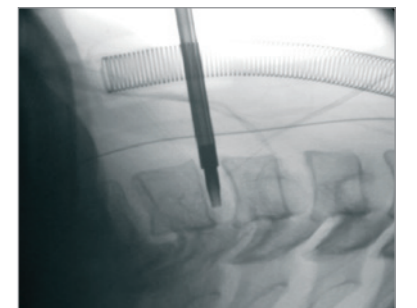
After determining the entry point in the skin and carrying out a stab incision in the skin, the first thin dilator is inserted in the intervertebral space under lateral image X-ray control. It is important to make an anterior puncture in the spinal disk and not to miss laterally. This not only precludes further operations but can also lead to injury of the vertebral artery, spinal nerve or esophagus. Alternatively, the spinal disc can be punctured using a spinal cannula and a guide wire is inserted through the annulus. The first dilator can then be pushed through the annulus. After the spinal disk has been punctured with the dilator or with the spinal cannula, the position is then checked under AP X-ray control. The ongoing intervention is then carried out in the lateral X-ray view. The combined dilator-sleeve system is inserted in the intervertebral space through the first dilatory. The dilators are removed, the surgical sleeve remains in the intervertebral space.



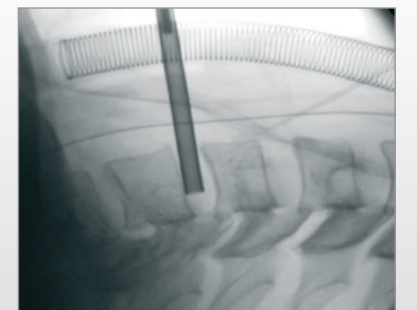
Insertion of the dilator in the intervertebral space



Insertion of the combined dilator sleeve system



The surgical sleeve remains in the intervertebral space



# VERTEBRIS cervical

## The full-endoscopic anterior technique

### Operating procedure

The endoscope is inserted through the working sleeve. The operation is carried out in endoscopic vision using different instrument sets positioned through the intra-endoscopic working channel and with a continuous flow of liquid.

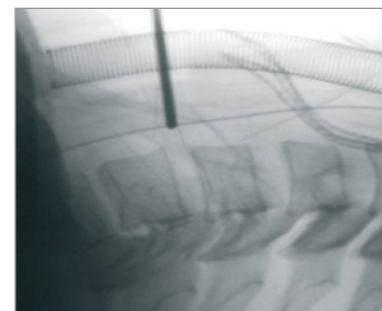
On the side of the pathology, the uncinate process, posterior edge of the spine vertebral body and the posterior annulus are dissected contralaterally for purposes of topographical orientation. Bone resection with different instrument is necessary in many cases in order to reach the epidural space. The posterior annulus and the dorsal longitudinal ligament are opened, depending on the anatomy and pathology, and the spinal canal can be accessed for resection of the spinal disk herniation.



Working with the endoscope through the surgical sleeve

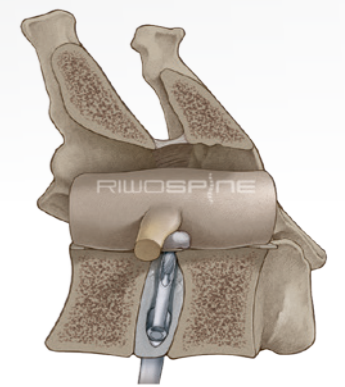
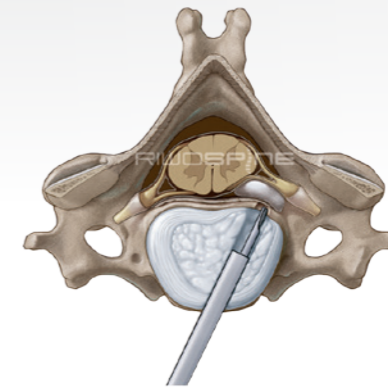


The X-ray monitoring can help with orientation during the operation

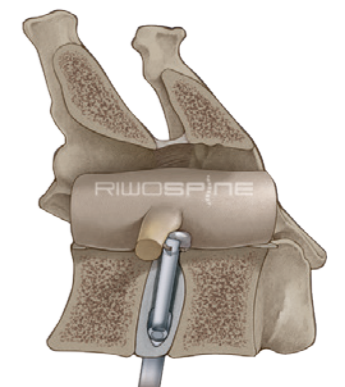
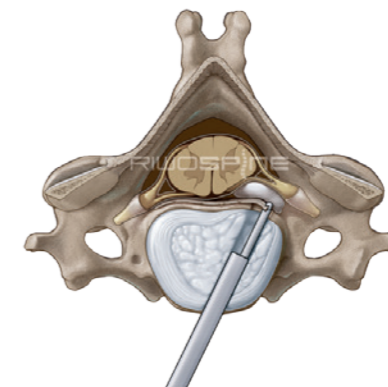


The locking caps for the endoscope and the working sleeve should only be used at short notice for hemostasis that obscures vision because if operations extend over a long period and if the drainage of the irrigation fluid is inadvertently obstructed the consequences of volume strain and pressure increase cannot be entirely excluded within the spinal canal and the associated and adjacent structures.

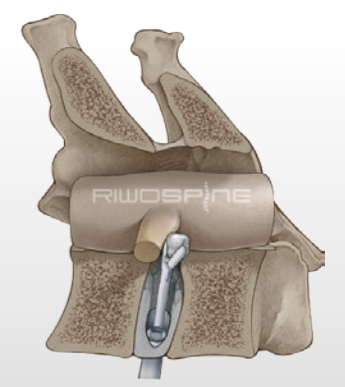
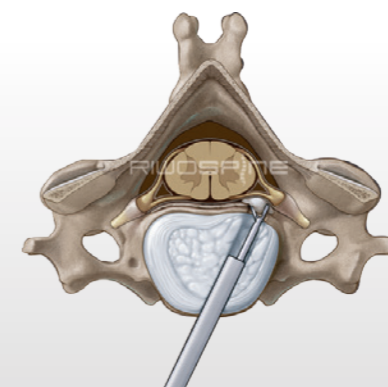
Any manipulation of the cervical spinal cord must be avoided. Experience indicates that there is an increased risk of complications when new procedures are carried out, in particular during the learning curve. This risk may be higher as a result of the general anatomical conditions in the cervical spine compared with the lumbar spine.



Bony resection is frequently necessary to reach the spinal canal



Depending on the findings, the dorsal longitudinal ligament should be opened



Removing the spinal disc herniation

# VERTEBRIS cervical

For your notes

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# pioneering endoscopic spine surgery