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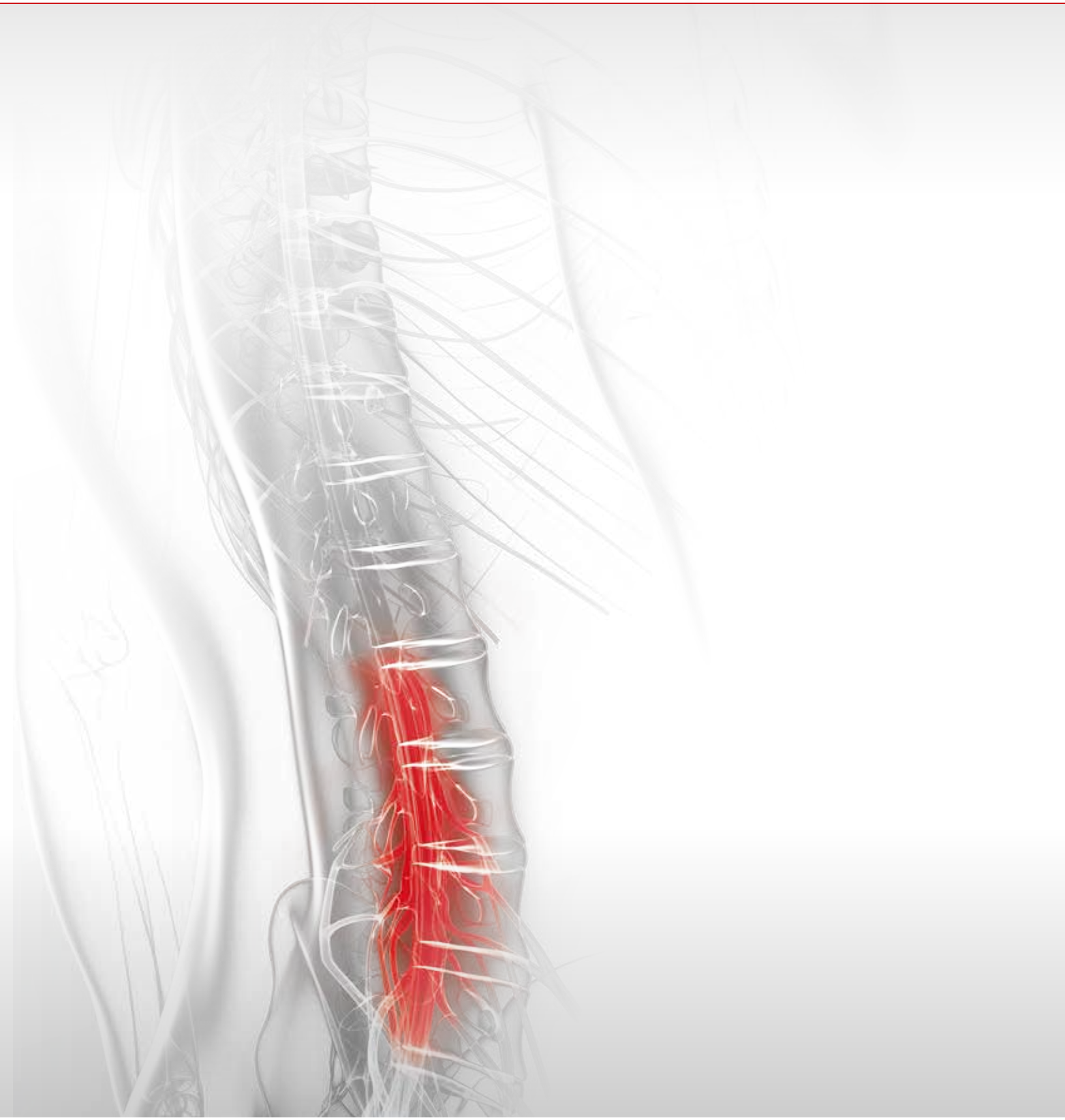
VERTEBRIS lumbar

Full-endoscopic decompression of the lumbar spine – Interlaminar, transforaminal and extraforaminal techniques



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Full-endoscopic Spine Instrument Set

Contents

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Foreword

Musculoskeletal pain ranks among the most frequent reasons for seeking medical help. Degenerative diseases of the spine form a daily focus. The therapy encompasses medical and socioeconomic challenges.

After conservative measures have been exhausted, surgical intervention may be necessary in circumstances of exacerbated pain or neurological deficits. In spite of good therapeutic results from conventional operations, consecutive damage may result from traumatization. It is therefore important to continuously optimize the procedures and workflows. The latest research results and technical innovations need to be critically assessed and used constructively in order to facilitate the best treatment strategies. The aim in this process of continuous improvement is to minimize the trauma induced by the operation and negative long-term effects while observing existing quality standards.

Minimally invasive techniques allow tissue damage and its consequences to be reduced. Endoscopic operations carried out during a continuous flow of fluid demonstrate advantages which these procedures standard practice in many areas. Over the past 20 years, transforaminal procedures with posterolateral access have been used in the area of the lumbar spine. The working area is mainly intradiskal, as well as involving an intraforaminal and extraforaminal approach. Since 1998, our Center for Spine Surgery and Pain Therapy has therefore been developing a transforaminal and an interlaminar access in order to reach the spinal canal full-endoscopically. These expand the indication spectrum and permit an equivalent approach in vision that is comparable with conventional operations taking account of the indication criteria, which offer all the advantages of a genuine, minimally invasive procedure.

Problems on the technical side emerged as a result of the availability of optical systems with a small intraendoscopic working channel and the correspondingly restricted repertoire of instruments. Insurmountable difficulties were liable to arise in respect of the resection of hard tissue, the resection of hard tissue, the surgical access passage, and mobility. Adequate work on the pathology was technically limited and had to be carried out in part without direct visualization. The developed of new rod-lens telescopes with an intraendoscopic 4.1 mm working channel and hence new instruments, as well as shavers and burrs was therefore necessary. This enabled working under continuous, excellent visual conditions. Adequate bony resection was also facilitated for the first time. This expanded the principal indication spectrum to spinal disk herniations, spinal stenoses and stabilizing methods.

Lateral access for the full-endoscopic transforaminal operation

A continuous flow of fluid permits outstanding intraoperative visual conditions

Full-endoscopic surgery on the lumbar spine has now achieved an established status within the overall concept of surgery. Taking due account of the indication criteria, it provides an adequate and safe complement or alternative to conventional surgery. Full-endoscopic operations are also possible on the cervical and thoracic spine.

A change is taking place for the first time as a result of the latest technical developments and new access passages, which appears to be the start of a radical new departure comparable with the establishment of arthroscopic interventions in joints. Nevertheless, conventional and maximally invasive operations will continue to be indispensable in spine surgery today and in the future. Surgeons must be able to perform such operations so that they are in a position to deal safely with any problems and complications that may emerge during full-endoscopic interventions as in any other invasive procedure.

The development of full-endoscopic methods should not be evaluated as a replacement for existing standard operations but as a complementary procedure and alternative within the overall concept of spine surgery.

The telescopes in the current generation have a large 4.1 mm intraendoscopic channel

The development of new instruments offers expanded opportunities for implementation

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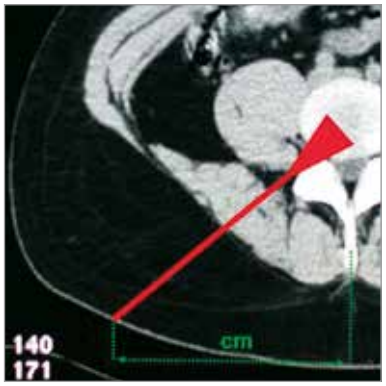
The full-endoscopic transforaminal and extraforaminal techniques

Details of percutaneous operations on lumbar disks to achieve intradiskal decompression were published at the beginning of the 1970s. Optical systems dedicated to inspection of the intervertebral space following an open operation have been used since the early 1980s. A full-endoscopic approach was subsequently developed using a transforaminal technique. In anatomical terms, this means accessing the intervertebral disk in a posterolateral to lateral approach within the area of the intervertebral foramen between the exiting and traversing spinal nerves without the need for resection of bony or ligament structures. The entry point in the skin for the surgical access passage is defined in centimeters from the midline. The applications are generally carried out for intradiskal or extradiskal foraminal therapy. Intradiskal volume and pressure reduction is intended to achieve reduced compression due to the intervertebral disk. Removal of the intraforaminal and extraforaminal intradiskal material is technically possible. Sequestered material located within the spine can generally be resected retrograde intradiscally through the annulus defect. This is carried out within the scope of an "In-out technique".

Nucleus material is located within the spinal canal posterior to the annulus level in the anterior epidural space medial to the medial pedicle line. It frequently reaches to the mid-line or the contralateral side. Clinical experience indicates that the annulus defect is frequently smaller than the diameter of the sequester volume. Furthermore, there is no continuous connection intradiskally in the majority of cases. In cases of advanced disk degeneration or older spinal disk herniations, the sequester frequently does not comprise a contiguous substance. Removal in such cases is not possible in a single piece. These factors frequently prevent the retrograde resection carried intradiskally of sequestered nucleus material. Direct access to the extradiskal ventral epidural space with continuous visualization is hence necessary for adequate decompression.

The most frequent localization of lumbar disk herniations relates to the lower levels. The diameter of the intervertebral foramen decreases from the cranial to caudal position. An additional constriction can be caused by degenerative changes. These anatomical conditions frequently prevent extradiskal access to the anterior epidural space with full visualization when using the posterolateral access passage particularly at the lower levels. There are also technical limits

The established posterolateral access is measured in centimeters from the midline



The working area is primarily intradiskal in the posterolateral access

to a lateral alignment of the endoscope in order to reach the spinal canal tangentially after implementing the access as a result of the approach access passage within the soft tissue and the zygoapophyseal joint. The predictable adequate decompression by means of the posterolateral access may therefore be significantly restricted.

The new transforaminal passage has therefore been developed in the past several years. *

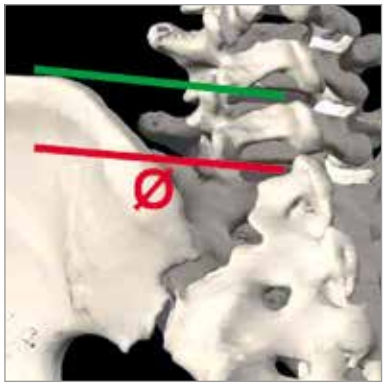
This approach does not entail measurement in centimeters being carried out to define the entry point in the skin, but involves an individual anatomical determination under radiographic control. The access permits the spinal canal to be reached tangentially and hence affords direct visualization of the epidural space with a continuous flow of fluid for purposes of adequate decompression. A broad but clearly defined indication spectrum is provided in conjunction with the newly developed endoscopes designed with a large working channel and the corresponding new instruments, shavers and burrs.

Mobility in a caudal direction to the middle of the pedicle and in a cranial direction to the commencement of the pedicle serves as a guide for decompression within the spinal canal. Constricted foramina no longer constitute restrictions but can be expanded. The pelvis can prevent the necessary lateral access so that the center of the cranially positioned pedicle should be reached maximally in the orthograde lateral beam path. At the upper levels, there are limits to the laterality of the access due to the organs of the thorax and abdomen. The increase in size of the foramen in a cranial direction and the possibility of bone resection achieves a larger radius of action so that the access can be selected less laterally. There are no restrictions for intraforaminal and extraforaminal decompression. Selection of a lateral access is also attempted here in order to be able to pass under the exiting spinal nerves atraumatically. The surgical access method for intraforaminal or extraforaminal spinal disk herniations and in foraminal stenoses may vary from the conventional approach in order to avoid damaging the dislocated nerves or exiting nerves which cannot be localized with certainty. This relates to the extraforaminal access.

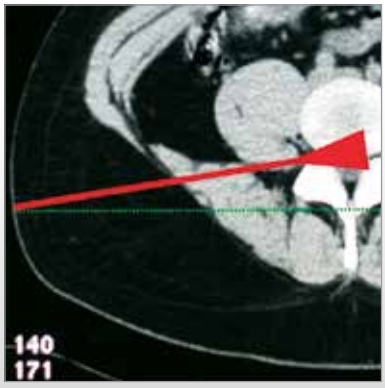
In the case of the intradiskal approach, e.g. in the case of fusions or infections, the posteriolateral access is frequently necessary. The access always depends on the target point and takes into account individual pathology and anatomy. Outside the indication criteria, there are well-defined limits to the transforaminal procedure.

* see literature

The lateral transforaminal access allows the spinal canal to be reached in the caudal levels



The pelvis can prevent the necessary lateral transforaminal access at the lower levelsn



The lateral transforaminal access shifts the working area into the spinal canal working area

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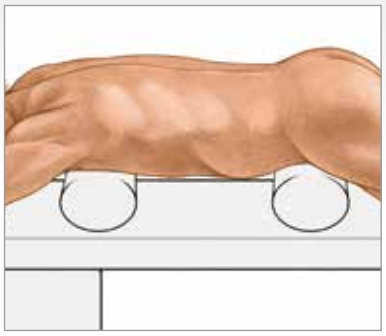
The full-endoscopic **transforaminal** technique

Patient positioning

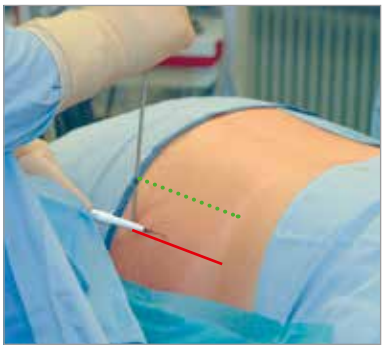
The patient is in the prone position lying on a hip and thorax roll on an X-ray permeable table. Application of a C-arm is required during the operation.

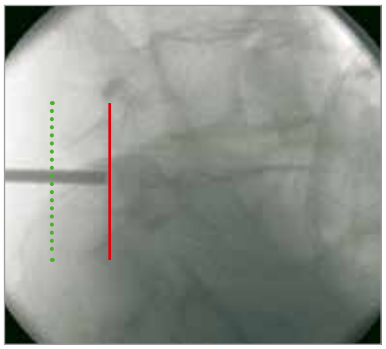


Prone position with pelvic and thorax rolls

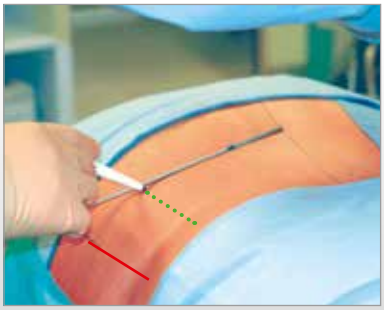
Determination of the lateral access

The access is determined under C-arm control on the basis of anatomical landmarks in the orthograde lateral and posterior-anterior view and taking account of the pathology. The posterior edge of the facet joints (red line) is marked. It is recommended to mark the posterior edge of the spinous process (green line) as entry point of the puncture cannula. Depending on the level, injury to the abdominal organs must be excluded.





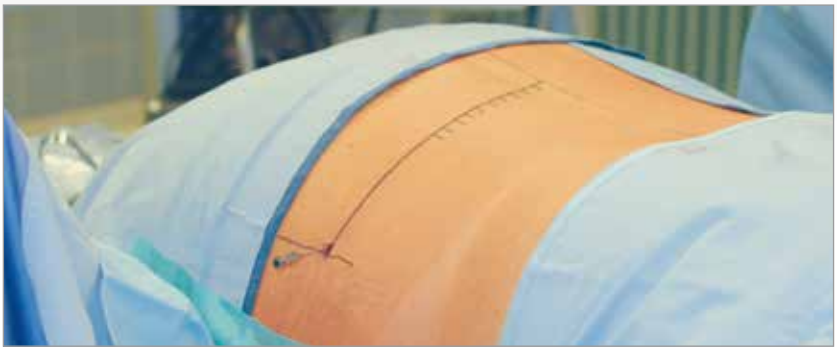
Determination of the maximum anteriority on the basis of individual anatomical landmarks and drawing the entry line in the skin – posterior limitation of the facet joints (red line)



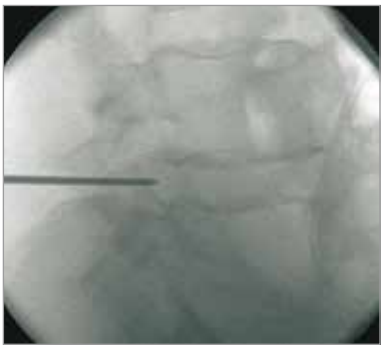
Establishment of the spinal disk level in the orthograde posterior-anterior beam path and definition of the entry point

Implementation of the lateral access

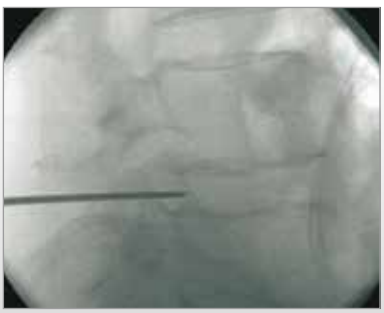
After determining the entry point in the skin and carrying out a stab incision, a spinal cannula is inserted under AP C-arm control and with conservation of the neural structures. The positioning in relation to the spinal canal is carried out individually in relation to the spinal canal. The guide wire is then inserted and the spinal cannula is removed.



Inserted spinal cannula



At the beginning of the spinal canal, the spinal cannula contacts the posterior annulus in the medial pedicle line



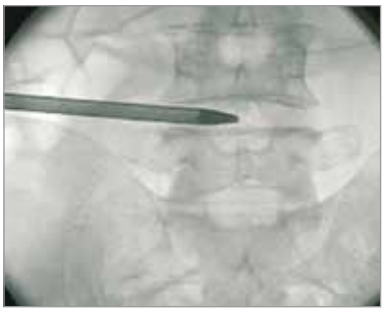
The spinal cannula is pushed in the posterior annulus in the direction of the spinal canal

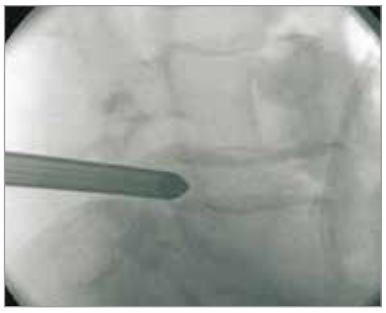
VERTEBRIS lumbar

The full-endoscopic **transforaminal** technique

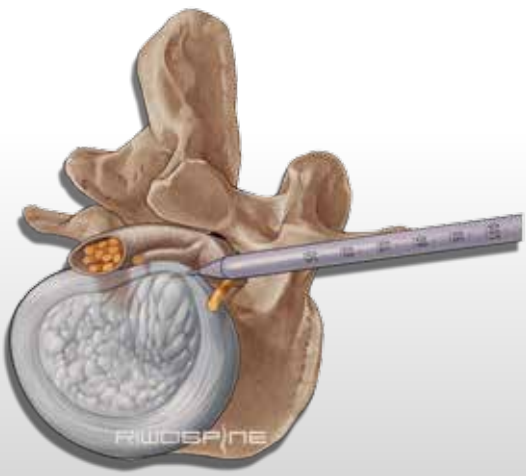
The dilator is initially inserted along the guide wire by means of rotating movements initially as far as the foramen and after removal of the guide wire it is inserted in the spinal canal depending on the pathology.
The beveled working sleeve is then pushed along the dilator and the dilator is removed. All the work stages must be carried with protection of the neural structures.

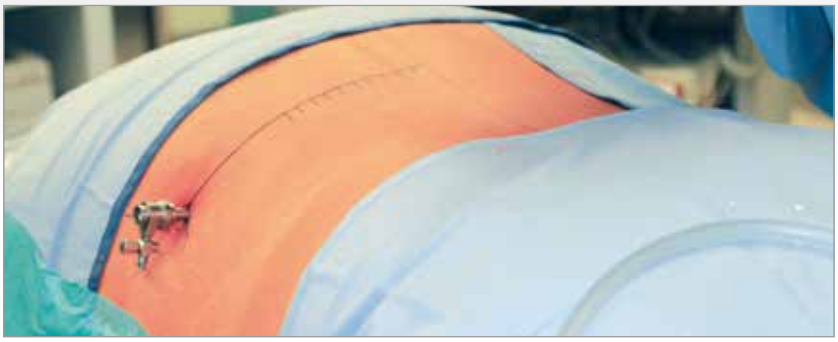
The guide wire is positioned and the spinal cannula is removed



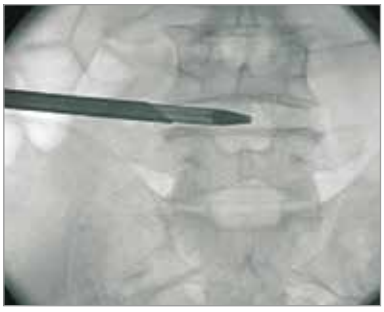


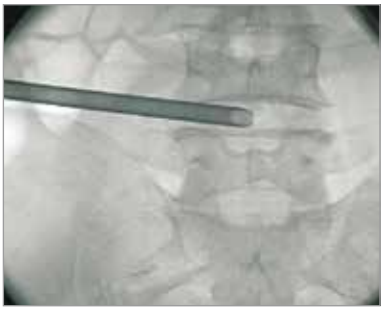
The dilator is inserted along the guide wire and in the final position is located in the spinal canal or posterior annulus defect

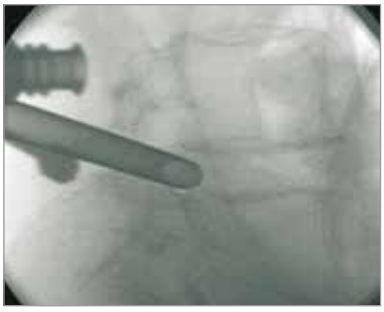




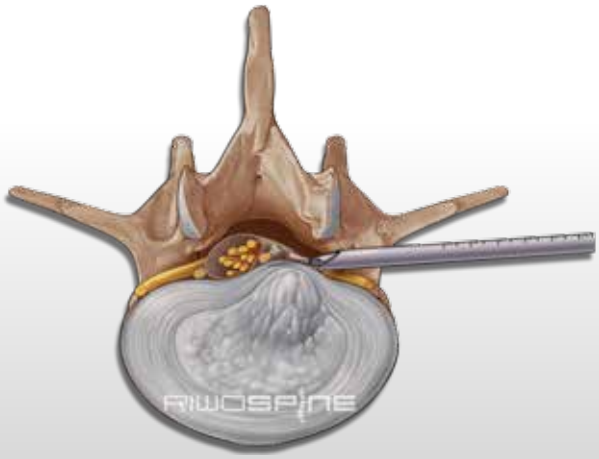
Lateral transforaminal access







The working sleeve is positioned along the dilator and the dilator is removed; the beveled opening is located within the spinal canal posterior to the annulus



VERTEBRIS lumbar

The full-endoscopic **transforaminal** technique

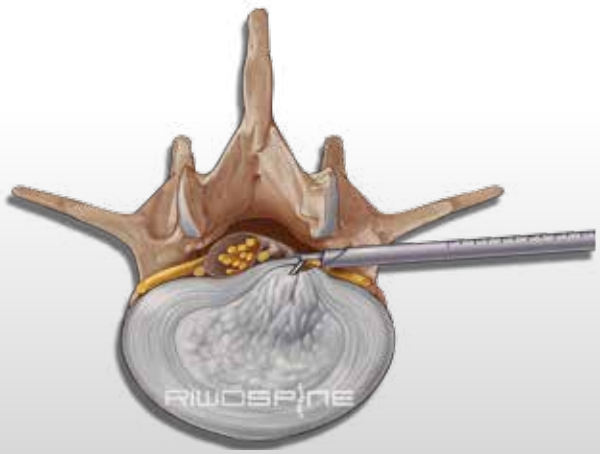
Surgical procedure

The endoscope is inserted through the working sleeve. The operation is carried out under endoscopic control using different instruments positioned through the intraendoscopic working channel and with a continuous flow of liquid.

The locking caps for the telescope and working sleeve should only be used briefly if bleeding obscures visibility 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.

Experience indicates that generally speaking there is an increased risk of complications occurring when all new procedures are carried out, in particular during the learning curve.

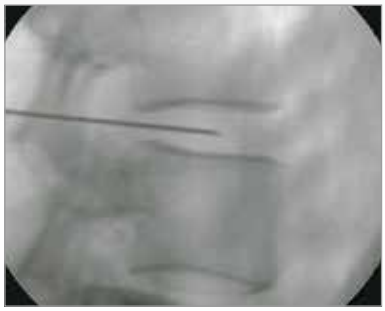
The lateral access permits working the spinal canal under endoscopic control



Implementation of the posterolateral access

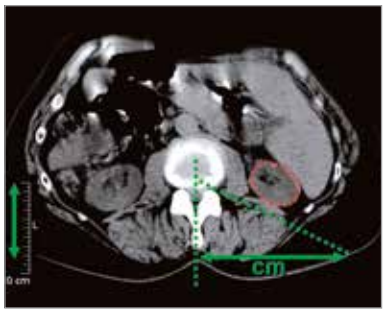
In intradiskal operations, prevention of a lateral access through the pelvis or for avoidance of injuries to the abdominal or thoracic organs at the cranial levels, a more posterior to postero-lateral access may be necessary. The entry point in the skin is determined by the pathology and anatomy, and can be measured in centimeters from the midline. Alternatively it is localized by adequate positioning of the inserted spinal cannula. The subsequent stages with insertion of the guide wire, the dilator, the operating sleeve and then the telescope are not different from the procedure already described.

Measurement of the entry point in centimeters laterally from the midline



The inserted spinal cannula in the desired target point can determine the localization of the stab incision

Operation with posterolateral transforaminal access

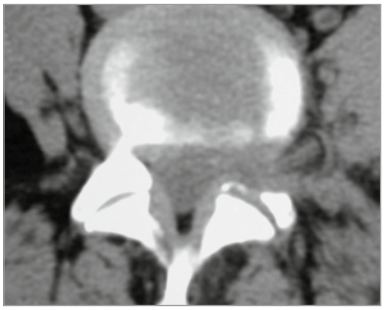


The maximum laterality of the access can be measured on the basis of a preoperative CT scan in order to avoid injury to organs

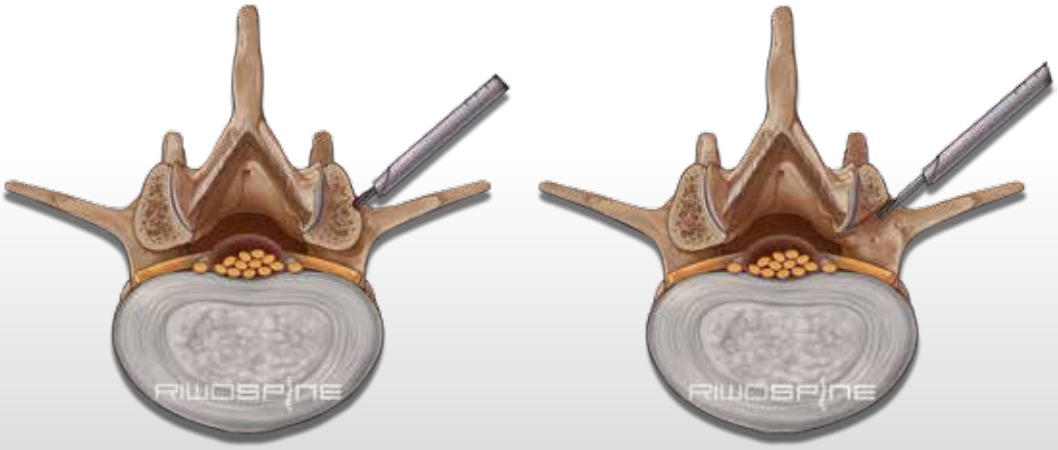
Implementation of bony resection

Bone resection may be necessary in order to expand mobility within the spinal canal or if there are problems during access. This may be the case e.g. in degenerative and position-related foramen stenosis or during an operation on recess stenosis. The entry point into the skin is possible from posterolateral to lateral. After the transforaminal or extraforaminal access has been implemented, the bony structures have to be dissected for this. This generally involves resection of the anterior structures of the ascending facets. If a resection of the structures of the caudal pedicle is carried out, it is important to take account of the fact that this is a support structure. Extensive resections can lead to biomechanical weaknesses and to pedicle breaks.

A range of burrs or bone punches is available for bone resection



An opening of the joint cannot always be avoided in order to reach medial edge of the ascending facet



Bone resection generally relates to the anterior structures of the ascending facets

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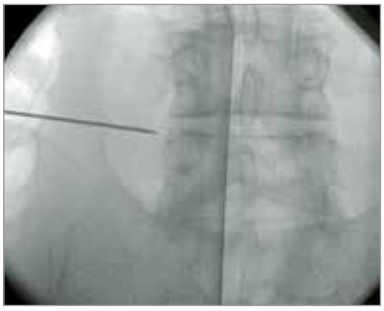
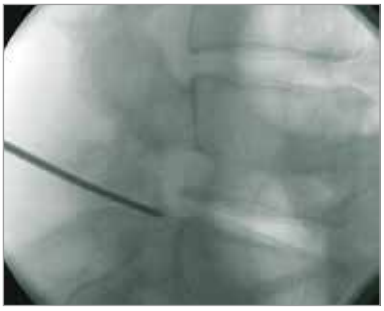
The full-endoscopic **extraforaminal** technique

Implementation of the extraforaminal access

In the case of intraforaminal and extraforaminal spinal disk herniations and foraminal stenoses, there may be an increased risk of injury to the exiting nerves during the passage through the foramen with the access instrument set. The extraforaminal access may be necessary here. The entry point into the skin is possible from posterolateral to lateral. The spinal cannula is not guided through the foramen into the spinal canal but on the caudal pedicle of the level to be operated. This is the safest zone in relation to the exiting nerves and an access-related risk is avoided. The guide wire, dilator and operating sleeve are then also inserted on to the pedicle up to the bony contact. The anatomical structures of the caudal foramen and the exiting nerve can then be dissected in vision and the surgical intervention can be carried out with conservation of the nerves.

The caudal pedicle is a safe zone in relation to the exiting nerve





Insertion of the spinal cannula on to the caudal pedicle

Dissection of the anatomical structures of the caudal foramen and the exiting spinal nerve

VERTEBRIS lumbar

The full-endoscopic interlaminar technique

Direct access to the epidural space with continuous visualization is hence necessary for adequate operations within the spinal canal. A lateral access is necessary for this when using the full-endoscopic transforaminal technique. The bony and neural boundaries of the neuroforamen define limits for mobility and hence also in relation to the indication criteria. Furthermore, the necessary lateral access in the lower levels may be prevented by the pelvis. On the basis of our experience, these restrictions encompass a spectrum of pathologies which are not operable using the full-endoscopic transforaminal approach due to technical limitations.

Making use of anatomically preformed access areas is effective for reducing surgically related traumatization to the structures of the spinal canal. Alongside the intervertebral foramen, the sacral hiatus and the interlaminar window are located here. Resection of large pathologies is not possible in technical terms using epiduroscopy through the sacral hiatus. The surgical access through the interlaminar window is therefore used. This has been familiar in lumbar spine surgery for the longest and is frequently used. It has been described since the beginning of the 1920s. Alternative methods were subsequently developed, such as the posterolateral approach for taking biopsies from vertebras at the end of the 1940s or intradiskal decompression using chemonucleolysis in the early 1970s. Endoscopic inspections of the intervertebral space after open decompression were described during the early 1980s. The implementation of full-endoscopic operations concentrated on the transforaminal technique with posterolateral access.

Since the end of the 1970s, the microsurgical procedure using the microscope has also been developed and today this has achieved the status of "Gold Standard" for interlaminar decompression in the area of the spinal canal. Details of an endoscopically assisted technique known as a microendoscopic operation were published in the late 1990s. This relates to visualization of the opened operation site using an endoscope and a monitor.

Opening the spinal canal is necessary in the conventional method for reaching the epidural space. This generally involves incision of the ligamentum flavum and resection of bone. Adequate access must be created which ensures vision into the spinal canal and permits working with instruments. Problems may arise as a result of traumatization of the access passage, as a result of resection of stabilizing structures and in particular in relation to potential revisions resulting from scar formation. The microscope principally reduces the size of the access passage and creates very good light and envisioning conditions. Resection of structures of the spinal canal can generally not be avoided. Access using the microendoscopic method may be structured to be more gentle on tissue than the microscopic procedure. The advantage is in the smaller distance between the working area and the visualizing system. Visibility conditions and illumination are generally poor. This is not an endoscopic procedure in the true sense. Today, the microendoscopic access method and the microendoscopic operating procedure are partly combined. Overall, a larger access generally has to be selected with all procedures than would actually be necessary for actually working in the spinal canal.

In order to make use of the known advantages from the transforaminal operation and arthroscopy, the new full-endoscopic interlaminar access was developed over recent years.*

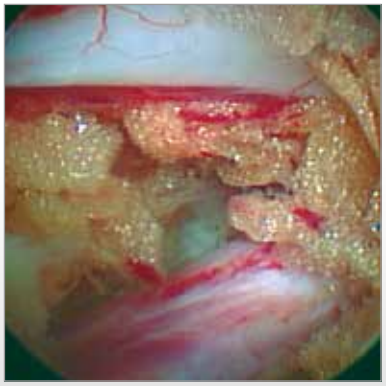
* see literature

VERTEBRIS lumbar

The full-endoscopic **interlaminar** technique

Full-endoscopic interlaminar access

Handling the telescope using the joystick principle permits mobility



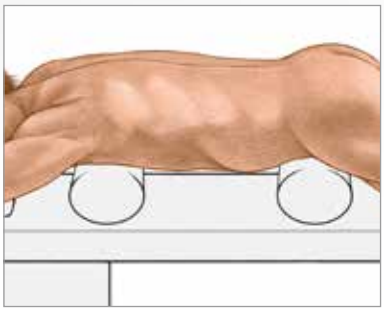
The interlaminar access guarantees outstanding visibility for the structures of the spinal canal

The endoscopic system with 25° direction of view is located directly in the relevant working area so that traumatization can be minimized in the access passage and also in connection with the structures of the spinal canal. Working in a continuous flow of liquid provides excellent visibility conditions. Mobility for the new endoscope is achieved by handling with joystick technology. Protection of the neural structures is provided by manipulating the beveled operating sleeve like a nerve hook. In combination with the newly developed instrument sets, this represents a genuine minimally invasive procedure.

Indications primarily relate to pathologies within the spinal column. It is important to note that the size of the interlaminar window can prevent free passage of the endoscope. In this case, the bone can be cut until the target point is reached without opening the ligamentum flavum or damaging the zygoapophyseal joints. In most cases, bony resection should be avoided, although the pathology precludes this in the case of spinal canal stenoses. The incision in the ligamentum flavum can be reduced to a few millimeters because the elasticity of the intervertebral disc facilitates entry into the spinal canal. On the other hand, mobility to the other side is equivalent to conventional operations. In a craniocaudal direction, access along adjacent levels can be considered in order to minimize the resection of structures of the spinal canal. The full endoscopic interlaminar technique permits selective operation of pathologies within the spinal canal with minimized access-related traumatization. The transforaminal access is generally the most appropriate for intradiskal, intraforaminal or extraforaminal working. The transforaminal procedure has more restrictions compared with the interlaminar approach, although it provides the best tissue conservation. The anatomical and pathological conditions mean that the percentage of transforaminal to interlaminar procedures is approximately 40 to 60 in practice.

Patient positioning

The patient is in the prone position lying on a pelvic and thorax roll on an X-ray permeable table.
Application of a C-arm is required during the operation.



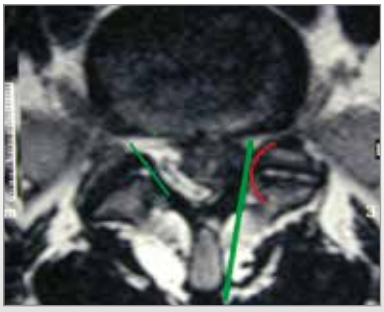
Prone position with pelvic and thorax rolls

Determination of the access

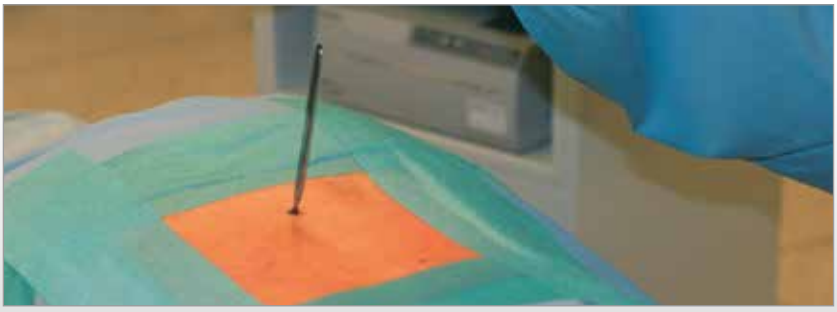
The access is determined under C-arm control on the basis of the anatomical landmarks in the postero-anterior view and taking account of the pathology. It must be positioned maximally medially in the interlaminar window in order to permit entry under the obliquely positioned zygoapophyseal joints laterally.

Marking the entry point on the skin

Entry point should be in a maximally medial position



Entry under the zygoapophyseal joints should be facilitated



Stab incision

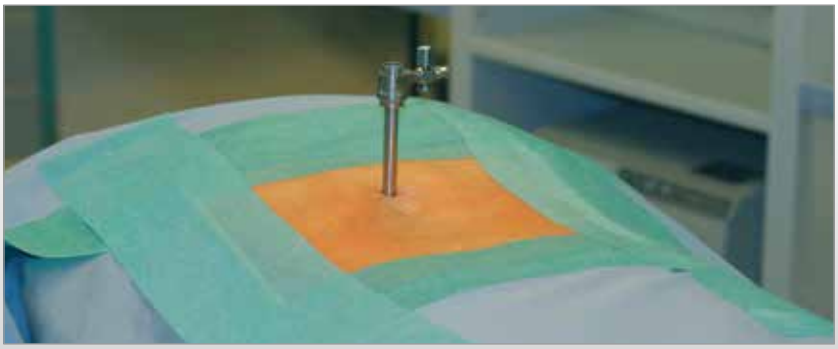
VERTEBRIS lumbar

The full-endoscopic **interlaminar** technique

Implementation of the access

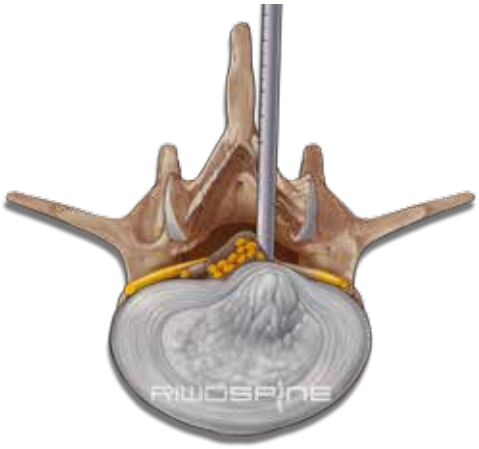
After determining the entry point in the skin and carrying out the stab incision, the dilator is inserted under posterior-anterior C-arm control until the ligamentum flavum. The subsequent procedure is then performed in the lateral view. The working sleeve with oblique opening is pushed through the dilator toward the ligament and the dilator is removed.

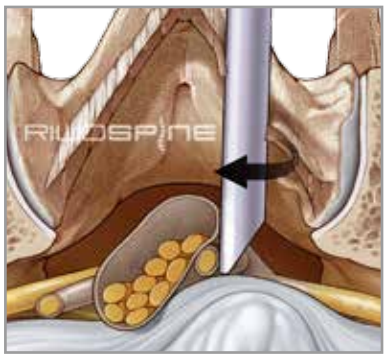
Insertion of the dilator and then the sleeve under image intensifier control to the ligamentum flavum

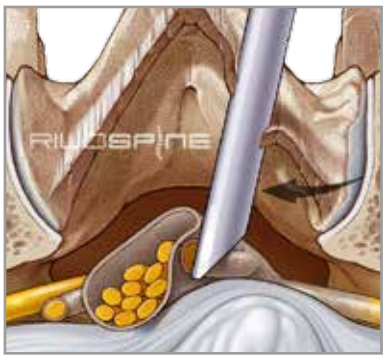


Surgical procedure

The endoscope is inserted through the working sleeve. The operation is carried out under endoscopic control using different instrument sets positioned through the intra-endoscopic working channel and with a continuous flow of liquid. After opening the ligamentum flavum, it is possible to enter the spinal canal. Mobility for the telescope is achieved by handling the visual using the joystick principle. Protection of the neural structures is provided by the beveled working sleeve serving as a second instrument and through rotation.







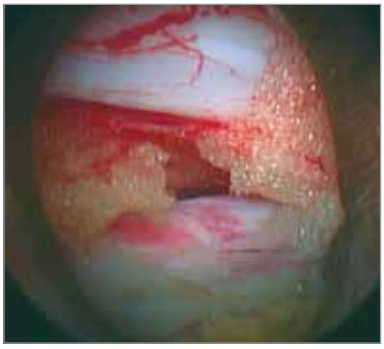
The beveled working sleeve can be used as a second instrument by rotation

VERTEBRIS lumbar

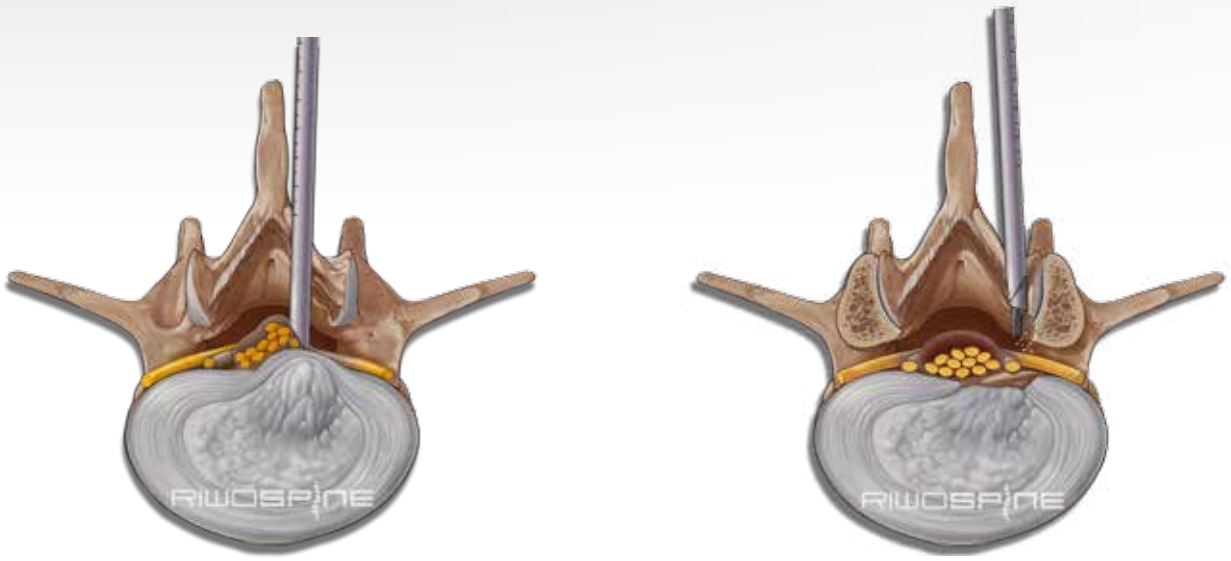
The full-endoscopic **interlaminar** technique

The locking caps for the telescope and working sleeve should only be used briefly if bleeding obscures visibility 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. An extended and uninterrupted excessive retraction of the neural structures with the working sleeve in a medial direction must be avoided particularly in cranial areas, or only carried out intermittently, in order to avoid the risk of neurological damage. Experience indicates that generally speaking there is an increased risk of complications occurring when all new procedures are carried out, in particularly during the learning curve.

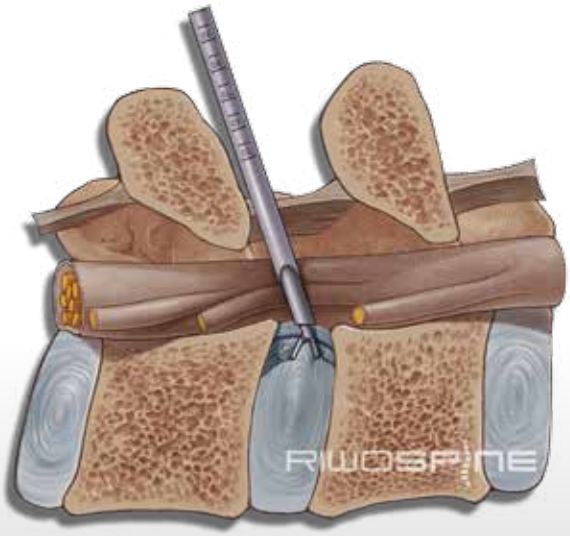
Opening of the ligamentum flavum



View of the axilla at L5/S1



A necessary bone resection is possible with the instruments and burrs available



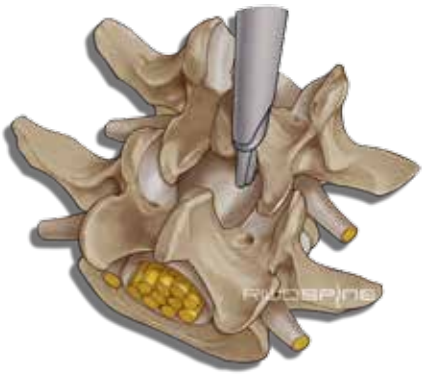
The interlaminar access permits working in the spinal canal in vision

VERTEBRIS lumbar

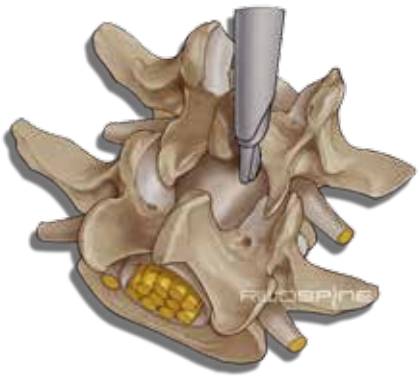
The full-endoscopic **interlaminar** technique

Implementation of bony resection

Bone resection may be necessary in order to expand mobility within the spinal canal or if there are problems during access. The may be the case e.g. in sequestered spinal disk herniations, small interlaminar windows or during an operation on recess stenosis. After the access has been implemented, the bony structures are dissected. It may be helpful to start decompression at the caudal end of the descending facets. Medial structures of the descending and ascending facets or the caudal and cranial laminas may be resected depending on the pathology.

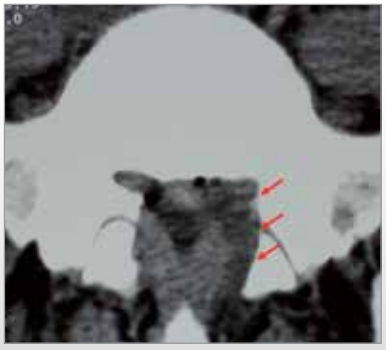


It may be helpful to start decompression at the caudal end of the descending facets



The extent of bony resection depends on the pathology

A range of burrs and bone punches are available for bone resection which can be inserted through the intraendoscopic working channel



Lateral bone resection is carried out on the floor of the spinal canal directly in the working area

VERTEBRIS lumbar

Overview of trans-/ extraforaminal and interlaminar techniques

Trans- / extraforaminal technique – Access lateral

Indication criteria:

- Pathologies at level segment L4 / L5 and higher with localization intraspinal / intraforaminal / extraforaminal and intradiskal, at level L5 / S1 extraforaminal

Technical specification VERTEBRIS lumbar 8 mm:

- Access sheath OD 8.0 mm, working length 185 mm
- Working channel for instruments with outer diameter max. 4.0 mm
- Instruments with working length 360 mm

Access lateral

Trans- / extraforminal technique – Access posterolateral

Indication criteria:

- Pathologies at level segment L4 / L5 and higher with localization intraspinal / intraforaminal / extraforaminal and intradiskal, at level L5 / S1 extraforaminal
- Specially developed **for tight anatomical conditions**

Technical specification VERTEBRIS lumbar 7 mm:

- Access sheath OD 7.0 mm, working length 185 mm
- Working channel for instruments with outer diameter max. 3.0 mm
- Instruments with working length 360 mm

Access posterolateral

Interlaminar technique – Access posterior

Indication criteria:

- Pathologies at level segment L1 - S1, L4 / L5

Technical specification VERTEBRIS lumbar 8 mm:

- Access sheath OD 8.0 mm, working length 120 mm
- Working channel for instruments with outer diameter max. 4.0 mm
- Instruments with working length 290 mm
- Maximum mobility

Access posterior

VERTEBRIS lumbar

Instrument Set for full-endoscopic **transforaminal and extraforaminal** techniques

Endoscope and accessories

	**PANOVIEW PLUS DISCOSCOPE** 25° Ø 6.9 mm, SL 207 mm, rigid, with lateral ocular lens working channel Ø 4.1 mm, irrigation channel Ø 1.3 mm, TL 321 mm, rod lens system 89210.1254
	**CONE ADAPTER** 8791.751
	**MEMBRANE ATTACHMENT** 8792.451
	**FIBER LIGHT CABLE BNDL** consisting of: 80663530 fiber Light Cable, Ø 3.5 mm, TL 2.3 m, 8095.09 adapter endoscope side, 8095.07 adapter projector side 806635301

Access instruments reusable

	**DILATOR** ID 1.3 mm, OD 6.9 mm, for single-stage dilatation, TL 235 mm 89220.1508
	**WORKING SLEEVE** ID 7 mm, OD Ø 8 mm, TL 186 mm, distal end beveled, graduated 89220.1078
	**FLUSHING ADAPTER** For working sleeve OD 8 mm 89220.1308
	**EXTENSION SLEEVE** ID 7 mm, OD 8 mm, TL 155 mm 89220.1408
	**HAMMER** 8866.956

Access instruments for single use

	**PUNCTURE NEEDLE SET** 18G (OD 1.25 mm), WL 150 mm, Pack = 10 PCS, sterile ..... 4792.803 18G (OD 1.25 mm), WL 250 mm, Pack = 10 PCS, sterile ..... 4792.802 17G (OD 1.5 mm), WL 250 mm, Pack = 10 PCS, sterile 492201215

Reprocessing tray

	**LUMBAR SPINE SURGERY TRAY** Metal, reusable 21.5" L x 10.7" W x 5.0" H 88090001

Instrument Set for full-endoscopic **transforaminal and extraforaminal** techniques

Working instruments
for application with endoscopes with working channel ID 4.1 mm (color coding ● ● ●)
and endoscopes with working channel ID 3.1 mm (color coding ● ●)

Rongeurs, grasping forceps and punches with color coding for simple identification of the instrument diameter

	**RONGEUR**, WL 360 mm, reusable ● Ø 2.6 mm, TL 460 mm, with irrigation connection ..... 8792.632 ● Ø 3 mm, TL 457 mm, with irrigation connection ..... 89240.1003 ● Ø 4 mm, TL 470 mm, with irrigation connection 89240.1004
	**RONGEUR**, curved upward, WL 360 mm, reusable ● Ø 2.5 mm, fits through ID 4 mm working channel, TL 457 mm, with irrigation connection 89240.1044
	**RONGEUR**, articulating, WL 340 mm, reusable ● Ø 4 mm, articulating, TL 500 mm, with irrigation connection 89240.1624
	**NUCLEUS GRASPING FORCEPS**, WL 360 mm, reusable ● Ø 2.6 mm, TL 457 mm, with irrigation connection ..... 89230.1125 ● Ø 3 mm, TL 457 mm, with irrigation connection ..... 89230.1003 ● Ø 4 mm, TL 470 mm, with irrigation connection 89230.1004
	**PUNCH**, WL 360 mm, reusable ● Ø 2.6 mm, TL 460 mm, with irrigation connection ..... 8792.671 ● Ø 3 mm, TL 457 mm, with irrigation connection ..... 89240.1023 ● Ø 4 mm, TL 470 mm, with irrigation connection 89240.1024
	**PUNCH**, curved upward, WL 360 mm, reusable ● Ø 2.5 mm, TL 457 mm, fits through ID 4 mm working channel, with irrigation connection 89240.1034
	**SHEATH TUBE PUNCH**, dismantling sheath, reusable ● Ø 3 mm, WL 360 mm, TL 450 mm, with irrigation connection ..... 89240.1903 ● Ø 4 mm, WL 357 mm, TL 500 mm, with irrigation connection 89240.1904
	**SCISSORS**, WL 360 mm, reusable ● Ø 3 mm, TL 457 mm, with irrigation connection 89240.1703
	**DISSECTOR** Ø 2.5 mm, WL 350 mm, atraumatic, reusable 8792.591
	**PROBE WITH FLEXIBLE TIP BNDL**, consisting of: 15570643 sheath tube Ø 2.5 mm, SL 350 mm, 892501625 probe insert Ø 2 mm, 892500600 spring handle 892501925

VERTEBRIS lumbar

Instrument Set for the full-endoscopic **interlaminar** technique

Endoscopes and accessories	
	**PANOVIEW PLUS DISCOSCOPE** 25° Ø 6.9 mm, SL 165 mm, rigid, with lateral ocular lens, working channel Ø 4.1 mm, irrigation channel Ø 1,3 mm, TL 279 mm, rod lens system 89210.3254
	**ENDOSCOPE ADAPTER** 892009000
	**CONE ADAPTER** 8791.751
	**MEMBRANE ATTACHMENT** 8792.451
	**FIBER LIGHT CABLE BNDL** consisting of: 80663530 fiber Light Cable, Ø 3.5 mm, TL 2.3 m, 8095.09 adapter endoscope side, 8095.07 adapter projector side 806635301

Access instruments for discoscopes with 4.1 mm working channel	
	**DILATOR** ID 1.3 mm, OD 6.9 mm, TL 235 mm, for single-stage dilatation, reusable 89220.1508
	**WORKING SLEEVE** ID 7 mm, OD 8 mm, TL 120 mm, distal end beveled, graduated, reusable 89220.3008
	**FLUSHING ADAPTER** for working sleeve, OD Ø 8 mm, reusable 89220.1308

Reprocessing tray	
	**LUMBAR SPINE SURGERY TRAY** Metal, reusable 21.5" L x 10.7" W x 5.0" H 88090001

Instrument Set for the full-endoscopic **interlaminar** technique

Working instruments – interlaminar
for application with endoscopes with working channel ID 4.1 mm (color coding 🟢🟡🟠🔴)
and endoscopes with working channel ID 3.1 mm (color coding 🟢🟠🔴)

Rongeurs, grasping forceps and punches with color coding for simple identification of the instrument diameter

	**RONGEUR**, WL 290 mm, reusable 🟠 Ø 2.6 mm, TL 388 mm, with irrigation connection ..... 89240.2025 🔴 Ø 3 mm, TL 388 mm, with irrigation connection ..... 89240.3003 🟡 Ø 4 mm, TL 400 mm, with irrigation connection 89240.3004
	**PUNCH**, WL 290 mm, reusable 🟠 Ø 2.6 mm, TL 388 mm, with irrigation connection ..... 89240.2225 🔴 Ø 3 mm, TL 388 mm, with irrigation connection ..... 89240.3023 🟡 Ø 4 mm, TL 400 mm, with irrigation connection 89240.3024
	**PUNCH**, curved upward, WL 360 mm, reusable 🟡 Ø 2.5 mm, TL 457 mm, fits through ID 4 mm working channel, with irrigation connection 89240.1034
	**SHEATH TUBE PUNCH**, dismantling tube sheath, WL 290, reusable 🔴 Ø 3 mm, TL 380 mm, with irrigation connection ..... 89240.3903 🟡 Ø 4 mm, TL 441 mm, with irrigation connection 89240.3904
	**RONGEUR**, curved upward, WL 360 mm, reusable 🟡 Ø 2.5 mm, fits through ID 4 mm working channel, TL 457 mm, with irrigation connection 89240.1044
	**DISSECTOR** Ø 2.5 mm, WL 350 mm, atraumatic, reusable 8792.591
	**DISSECTOR** Ø 3 mm, WL 350 mm, atraumatic, reusable 89250.1003
	**DISSECTOR** Ø 4 mm, WL 350 mm, atraumatic, reusable 892501004

Accessories

	**POSITIONING ROD** Ø 5.0 mm, WL 400 mm, graduated, pointed, reusable 8791.701
	**SUCTION TUBE** Ø 2.5 mm, SL 290 mm, reusable 89270.2025

VERTEBRIS lumbar

Instrument Set for the full-endoscopic **transforaminal posterolateral** technique

Endoscopes and accessories

	**PANOVIEW PLUS DISCOSCOPE** 25° Ø 5.9 mm, SL 207 mm, rigid, with lateral ocular lens working channel Ø 3.1 mm, irrigation channel Ø 1.2 mm, TL 321 mm, rod lens system 89210.1253
	**CONE ADAPTER** 8791.751
	**MEMBRANE ATTACHEMENT** 8792.451
	**FIBER LIGHT CABLE BNDL** consisting of: 80663530 fiber Light Cable, Ø 3.5 mm, TL 2.3 m, 8095.09 adapter endoscope side, 8095.07 adapter projector side 806635301

Access instruments reusable

	**DILATOR** ID 1.3 mm, OD 5.9 mm, for single-stage dilatation, TL 225 mm 8792.764
	**WORKING SLEEVE** ID 6 mm, OD 7 mm, TL 186 mm, distal end beveled, graduated 89220.1047
	**FLUSHING ADAPTER** for working sleeve Ø 7 mm 89220.1307
	**EXTENSION SLEEVE** ID 6 mm, OD 7 mm, TL 155 mm, distal end straight 89220.1407
	**HAMMER** 8866.956

Access instruments for single use

	**PUNCTURE NEEDLE SET** 18G (OD 1.25 mm), WL 150 mm, Pack = 10 PCS, sterile ..... 4792.803 18G (OD 1.25 mm), WL 250 mm, Pack = 10 PCS, sterile ..... 4792.802 17G (OD 1.5 mm), WL 250 mm, Pack = 10 PCS, sterile 492201215

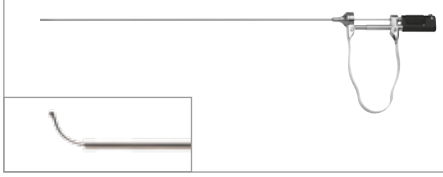
Reprocessing tray

	**LUMBAR SPINE SURGERY TRAY** Metal, reusable 21.5" L x 10.7" W x 5.0" H 88090001

Instrument Set for the full-endoscopic **transforaminal posterolateral** technique

Working instruments
for application with endoscopes with working channel ID 4.1 mm (color coding ● ● ●)
and endoscopes with working channel ID 3.1 mm (color coding ● ●)

Rongeurs, grasping forceps and punches with color coding for simple identification of the instrument diameter

	**RONGEUR**, WL 360 mm, reusable ● Ø 2.6 mm, TL 460 mm, with irrigation connection ..... 8792.632 ● Ø 3 mm, TL 457 mm, with irrigation connection 89240.1003
	**NUCLEUS GRASPING FORCEPS**, WL 360 mm, reusable ● Ø 2.6 mm, TL 457 mm, with irrigation connection ..... 89230.1125 ● Ø 3 mm, TL 457 mm, with irrigation connection 89230.1003
	**PUNCH**, WL 360 mm, reusable ● Ø 2.6 mm, TL 460 mm, with irrigation connection ..... 8792.671 ● Ø 3 mm, TL 457 mm, with irrigation connection 89240.1023
	**SHEATH TUBE PUNCH**, dismantling tube sheath, reusable ● Ø 3 mm, WL 360 mm, TL 450 mm 89240.1903
	**SCISSORS**, WL 360 mm, reusable ● Ø 3 mm, TL 457 mm, with irrigation connection 89240.1703
	**DISSECTOR** Ø 2.5 mm, WL 350 mm, atraumatic, reusable 8792.591
	**PROBE WITH FLEXIBLE TIP BNDL**, consisting of: 15570643 sheath tube Ø 2.5 mm, SL 350 mm, 892501625 probe insert Ø 2 mm, 892500600 spring handle 892501925

VERTEBRIS lumbar

Instrument Set optional

Instrument Set optional – for application through the endoscope	
Auxuliary instruments sharply abrading	
	**ANNULOTOME** Ø 2.5 mm, WL 350 mm, one ended, reusable.....8792.581
	**FACE MILLER** Ø 3 mm, WL 350 mm, sharp, reusable.....89260.1113
	FACE MILLER Ø 4 mm, WL 350 mm, sharp, reusable.....89260.1114
Dissecting claws	
	**RONGEUR**, double-action jaw insert, WL 360 mm, reusable ● Ø 2.6 mm, TL 460 mm, with irrigation connection .....8792.636 ● Ø 3 mm, TL 457 mm, with irrigation connection .....89240.1013 ● Ø 4 mm, TL 470 mm, with irrigation connection 89240.1014
	**SPREAD DISSECTOR**, WL 360 mm, reusable ● Ø 3 mm, TL 457 mm, with irrigation connections.....89230.1803
Kerrison punches for application with discoscopes 89210.1254 and 89210.3254	
	**KERRISON PUNCH HANDLE** reusable.....881001234
	**KERRISON PUNCH SHAFT** Ø 4 mm, WL 360 mm, 40° tip, reusable.....881001404
	KERRISON PUNCH SHAFT Ø 4 mm, WL 290 mm, 40° tip, reusable.....881003404
	**KERRISON PUNCH SHAFT** Ø 4 mm, WL 360 mm, 90° tip, reusable.....881001904
	KERRISON PUNCH SHAFT Ø 4 mm, WL 290 mm, 90° tip, reusable.....881003904

Instrument Set optional

Instrument Set optional – for application through the working sleeve

Trephines

	**TREPHINE** Ø 3 mm, WL 200 mm, sharp, reusable.....8792.503
	**TREPHINE** Ø 5.3 mm, WL 200 mm, sharp, reusable.....8792.504
	**TREPHINE** Ø 6.9 mm, WL 210 mm, sharp, reusable.....89260.1108

Forceps and punches, articulated

	**INTRADISC FORCEPS** Ø 5.2 mm, WL 244 mm, color code white, TL 393 mm, with irrigation connection, reusable.....8792.623
	**INTRADISC FORCEPS** Ø 5.2 mm, WL 240 mm, color code white, articulated, TL 389 mm, with irrigation connection, reusable.....89240.1052

Rongeurs, punches and scissors

	**RONGEUR** 4.3 X 5 mm, WL 247 mm, jaw section 6 mm long, TL 320 mm, reusable.....8791.691
	**RONGEUR** 4.3 X 4.5 mm, WL 247 mm, jaw section 12 mm long, TL 320 mm, reusable.....8791.601

VERTEBRIS lumbar

Instrument Set optional

Endoscopes	
	**PANOVIEW PLUS DISCOSCOPE** 25° Ø 5.9 mm, SL 165 mm rigid, with lateral ocular lens, working channel Ø 3.1 mm, irrigation channel Ø 1.2 mm, TL 279 mm, rod lens system 89210.3253
Access instruments	
Working sleeves for application with discoscope 89210.3253	
	**WORKING SLEEVE** ID 6 mm, OD 7 mm, TL 120 mm, distal end beveled, graduated, reusable 89220.3007
Working sleeves for application with discoscope 89210.1253	
	**WORKING SLEEVE** ID 6 mm, OD 7 mm, TL 166 mm, distal end with elevator tip, graduated, reusable 15208.257
	**WORKING SLEEVE** ID 6 mm, OD 7 mm, TL 166 mm, fenestrated distal end for foraminoplasty, graduated, reusable 89220.1007
	**WORKING SLEEVE** ID 6 mm, OD 7 mm, TL 166 mm, distal end with elevator tip, graduated, reusable 15208.258
	WORKING SLEEVE ID 6 mm, OD 7 mm, TL 186 mm, distal end with elevator tip, graduated, reusable 89220.1157
	**WORKING SLEEVE** ID 6 mm, OD 7 mm, TL 166 mm, distal end with long elevator tip, graduated, reusable 89220.1117
	WORKING SLEEVE ID 6 mm, OD 7 mm, TL 186 mm, distal end with long elevator tip, graduated, reusable 89220.1167
	**WORKING SLEEVE** ID 6 mm, OD 7 mm, TL 166 mm, with distal viewing window, graduated, reusable 15208.255
	WORKING SLEEVE ID 6 mm, OD 7 mm, TL 186 mm, fenestrated distal end, graduated, reusable 89220.1147
	**WORKING SLEEVE** ID 6 mm, OD 7 mm, TL 166 mm, distal end with long fenestration, graduated, reusable 89220.1087
	**WORKING SLEEVE** ID 6 mm, OD 7 mm, TL 186 mm, double fenestrated distal end, graduated, reusable 15208.260
	**WORKING SLEEVE** ID 6 mm, OD 7 mm, TL 166 mm, distal end straight, graduated, reusable 15208.261
Attachments for working sleeves OD 7.0 mm	
	**HANDLE ATTACHMENT** for working sleeve, OD Ø 7 mm, reusable 89200.1007

Instrument Set optional

Working sleeves for application with discoscope 89210.1254	
	**WORKING SLEEVE** ID 7 mm, OD 8 mm, TL 166 mm, distal end beveled, graduated, reusable 15208.262
	**WORKING SLEEVE** ID 7 mm, OD 8 mm, TL 166 mm, fenestrated distal end for foraminoplasty, graduated, reusable 15208.266
	**WORKING SLEEVE** ID 7 mm, OD 8 mm, TL 166 mm, distal end with elevator tip, graduated, reusable 15208.265
	WORKING SLEEVE ID 7 mm, OD 8 mm, TL 186 mm, distal end with elevator tip, graduated, reusable 89220.1088
	**WORKING SLEEVE** ID 7 mm, OD 8 mm, TL 166 mm, distal end with long elevator tip, graduated, reusable 89220.1068
	WORKING SLEEVE ID 7 mm, OD 8 mm, TL 186 mm, distal end with long elevator tip, graduated, reusable 89220.1098
	**WORKING SLEEVE** ID 7 mm, OD 8 mm, TL 166 mm, distal end straight, graduated, reusable 15208.264
Attachments for working sleeves OD 8 mm	
	**HANDLE ATTACHMENT** for working sleeve, OD Ø 8 mm, reusable 892001008

VERTEBRIS lumbar

CURIS® RF 4 MHz – Multidisciplinary Radiofrequency Surgical System

Radiofrequency Surgical System	
TipControl RF Instrument, bipolar, sterile for CURIS	
	**TIPCONTROL RF INSTRUMENT BIPO** Ø 2.5 mm, WL 280 mm for endoscopic spine surgery, flexible insert, integrated connection cable WL 3 m with device plug to CURIS RF 4 MHz, sterile, for single use 4993691
	TIPCONTROL RF INSTRUMENT BIPO Ø 2.5 mm, WL 350 mm for endoscopic spine surgery, flexible insert, integrated connection cable WL 3 m with device plug to CURIS RF 4 MHz, sterile, for single use 4993692
CURIS RF generator, 4 MHz System	
	**CURIS® RF BUNDLE,** includes: 360100-03 CURIS Generator, power cord, manual 360110 footswitch 870001W
Accesories not for use with CURIS	
TipControl RF Instrument, bipolar, sterile for US 2-PIN	
	**TIPCONTROL RF INSTRUMENT BIPO** Ø 2.5 mm, WL 280 mm for endoscopic spine surgery, flexible insert, integrated connection cable WL 3 m with device plug to US 2-PIN, sterile, for single use..... 49936911
	TIPCONTROL RF INSTRUMENT BIPO Ø 2.5 mm, WL 350 mm for endoscopic spine surgery, flexible insert, integrated connection cable WL 3 m with device plug to US 2-PIN, sterile, for single use..... 49936921

Universal Motor System

Accessories for Universal Motor System – Power Drive ART1 & Combidrive

Burrs for Power Stick M5

BURR OVAL,
with lateral protection, color code violet, PACK = 1 PC, WL 350 mm, reusable
Ø 2.5 mm 899751502
Ø 3.0 mm 899751503
Ø 4.0 mm 899751504

BURR OVAL,
with front guard, color code violet, PACK = 1 PC, WL 350 mm, reusable
Ø 2.5 mm 899751512
Ø 3.0 mm 899751513
Ø 4.0 mm 899751514

BURR ROUND,
without protection, color code royal blue, PACK = 1 PC, WL 350 mm, reusable
Ø 2.5 mm 899751302
Ø 3.0 mm 899751303
Ø 4.0 mm 899751304

DIAMOND BURR ROUND,
without protection, color code light turquoise, PACK = 1 PC, WL 350 mm, reusable
Ø 2.5 mm 899751402
Ø 3.0 mm 899751403
Ø 4.0 mm 899751404

Nucleus resectors for Power Stick M5

NUCLEUS RESECTOR SMOOTH,
color code canary yellow, PACK = 1 PC, WL 350 mm, reusable,
Ø 3.0 mm 899751003
Ø 4.0 mm 899751004

Nucleus resectors for Power Stick M5, sterile, for single use

NUCLEUS RESECTOR,
color code red, Ø 4.5 mm, PACK = 5 PCS, WL 240 mm 499751045

NUCLEUS RESECTOR CURVED,
color code red, Ø 4.5 mm, PACK = 5 PCS, WL 240 mm 499751245

VERTEBRIS lumbar

Universal Motor System

Accessories for Universal Motor System Power Drive ART1 & Combidrive	
Articulated burr for Power Stick M5	
	**TIPControl – ARTICULATING BONE BURR BNDL**, consisting of: 899753754 articulating burr Ø 4 mm, 499751704 burr insert round Ø 3.5 mm, sterile, Pack = 5 PCS 15261106 irrigation adapter M5, 15372005 wrench, 15336058 drive shaft M5 899753794
	TIPControl – ARTICULATING BONE BURR BNDL, consisting of: 899751754 articulating burr Ø 4 mm, 499751704 burr insert round Ø 3.5 mm, sterile, Pack = 5 PCS 15261106 irrigation adapter M5, 15372005 wrench, 15336056 drive shaft M5 899751794
	**TIPCONTROL – BURR INSERT** round, Ø 3.5 mm, Pack = 5 PCS, sterile, for application with TipControl articulated burr, for extraction of bony structures, sterile, for single use 499751704
Tip Control Nucleus Resector	
	**TIPCONTROL NUCLEUS RESECTOR ARTICULATING** articulated, Ø 5.5 mm, Pack = 3 PCS, WL 350 mm, for application with the motor handles M5/0 and M5/3, for resection of soft tissue, sterile, for single use..... 499751005
Motor Handles – Power Stick M5	
	**POWER STICK M5/0** Motor handle max. 16000 RPM, for use with rotation tools, control by footswitch, reusable 899550000
	POWER STICK M5/3 Motor handle max. 16000 RPM, for use with rotation tools, with three function buttons, control optional by footswitch, reusable..... 899550003
	CONNECTION CABLE WL 3 m, reusable. 8564.851
Accessories for High-Speed Motor System – for use with angled handpiece for endoscopic high-speed tools	
Burr with distal protection	
	**BURR ROUND, CARBIDE** Ø 3.0 mm, Pack = 5 PCS, WL 353.5 mm, sterile, single use. 409903730
	SHEATH TUBE WITH DISTAL GUARD Ø 4.0 mm, for endoscopic high-speed tools, WL 350 mm, reusable 82970.1330
	**DIAMOND BURR ROUND, DIAMOND** Ø 3.0 mm, Pack = 5 PCS, WL 353.5 mm, sterile, single use. 409903930
	SHEATH TUBE WITH DISTAL GUARD Ø 4.0 mm, for endoscopic high-speed tools, WL 350 mm, reusable. 82970.1330
Burr without distal protection	
	**DIAMOND BURR ROUND** Ø 3.7 mm, Pack = 5 PCS, WL 355 mm, sterile, single use. 409903940
	SHEATH TUBE Ø 4.0 mm, for endoscopic high-speed tools, WL 350 mm, reusable. 82970.1340

Universal Motor System

Accessories for Universal Motor System Power Drive ART1 & Combidrive

High-Speed Handle

ANGLED HANDPIECE MAX. 20,000 RPM
with INTRA-interface, for endoscopic tools with length 350 mm
and sheath Ø 2.35 mm, reusable. 82950.1301

Univeral Motor System

PowerDrive ART1
Universal Motor System: autom. handle and tool recognition, storage function with user-specific parameters and memory function for tools

POWERDRIVE ART1 MOTOR SYSTEM 2304 BNDL, consisting of:
2304.007 MOTOR CONTROL UNIT for Orthopedics, Spine surgery and Bronchoscopy, for connection of handpieces M4, M5/0, M5/3, S1 and M1, connection for two handpieces and a footswitch, 5.7" monochrome display, compatible with core, US: 120 VAC, 50/60 Hz, Dim. (w x h x d): 330x155x365 mm; N7101718 FOOT POWER CORD STRAIGHT; and 103.701 CAN-BUS CONNECTION CABLE – for ultrasound generator length 40 cm..... 23040071

FOOTSWITCH 2 PEDALS
for Power Drive ART1 Motor Control Unit (2304) 2304.901

Combidrive EN

COMBIDRIVE EN MOTOR CONTROL UNIT BNDL
20951.0201 control unit; 20951.0401 foot pedal; 80951.0002 electronic motor medium; 82950.1301 endoscopic angled handpiece; 40900.1201 spray attachment for handpieces; 40900.1202 spray attachment for motors; 40900.1000 cleaning spray, reprocessing reference card..... 20951.011

COMBIDRIVE EN MOTOR CONTROL UNIT
for orthopedics, spine surgery and micro surgery, for connection of motor handle M4, M5/0, M5/3, S1, M1 and High-Speed Motor X1, connection for two handpieces and a footswitch, touchscreen color display, U: 100-115/230 VAC, 50/60 Hz, Dim. (w x h x d): 295x155x270 mm 20951.0201

FOOTSWITCH
1 pedal + 3 buttons 20951.0401

VERTEBRIS lumbar

Consumables and Accessories

Consumables and Accessories	
	MEMBRANE 15479.006
	**IRRIGATION LEVER, CPL** 15461.034
	**REPLACEMENT O-RING** 15461,034, PACK = 10 PCS 9500.113
	**O-RING** 15364285

For your notes

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