RICHARD WOLF

spirit of excellence

Takes the pressure

VERTEBRIS stenosis

Full-endoscopic, interlaminar decompression in case of lumbar spinal canal stenosis

VERTEBRIS stenosis

Full-endoscopic Spine Instrumentation

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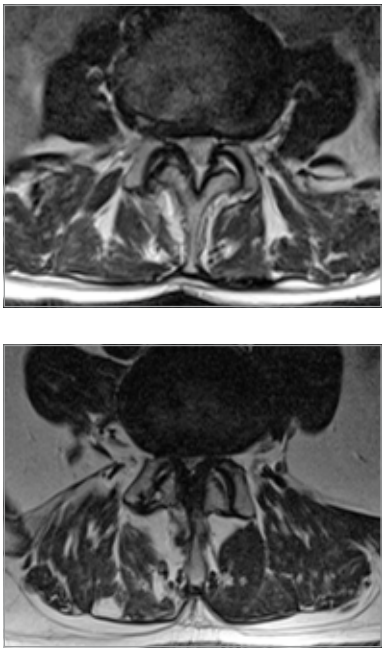
spirit of excellence

Contents

VERTEBRIS stenosis

Introduction

Degenerative stenosis of the lumbar spinal canal with compression of neural elements arise as a result of bony, disk, capsular or ligament structures. Depending on localization and spread, they can lead to classic symptoms in the lower extremities. Pain in the back tends to be attributed to secondary degenerative phenomena, e.g. segmental instability or deformity. There is no clear correlation between the extent of the stenosis shown by imaging and the clinical symptoms. Apart from spinal disk herniations, lateral and central spinal canal stenoses form the most frequent causes.



Lateral and central spinal canal stenosis of the lumbar spine.

A surgical procedure may be necessary after conservative measures have been exhausted or neurological deficits occur. When this is the case, the pathology and symptoms must be taken into account and decompression operations, fusions, or a combination of both procedures must be considered. Today, EBM criteria appear to provide certainty that decompression procedures can improve radicular symptoms and neurogenic claudication. The extent of decompression required from a technical perspective and the conditions under which an additional fusion is necessary have not been definitively described.

Conventional decompression operations on the lumbar spine demonstrate good results. However, consequences and problems associated with these operations are known. Attempts were therefore made right from the start of spine surgery to modify existing operating procedures. Up to the present day, the primary focus continues to be on reducing the invasiveness of surgery and improving the intraoperative view.

Minimally invasive techniques can reduce the trauma and consequences due to the operation. At the same time, visualization and illumination during the operation can be optimized. Appropriate instrument sets for decompression of lumbar spinal canal stenosis were developed on the basis of experiences derived from full-endoscopic operations on spinal disk herniations of the cervical and lumbar spine, offering the possibility of endoscopic bone resection. Since a more extensive bone or ligament resection is frequently necessary here, a large endoscope with a correspondingly large intraendoscopic working channel and larger instruments were necessary. Full-endoscopic, interlaminar access is used routinely, while the transforaminal/extraforaminal access is reserved for specific individual cases.

A range of endoscopes is available to match different pathologies

Spinal canal decompression with interlaminar access

Intraoperative site after decompression

Today, the instrument sets available permit a full-endoscopic approach under visualization, depending on the indication criteria, which is equivalent to conventional operations. While lateral, stenosis with symptoms on one side can be frequently operated using the basic instrument set, the larger Stenosis System can be used to operate on advanced cases or central stenosis. It is always important to consider whether a stabilizing measure is necessary in addition to decompression.

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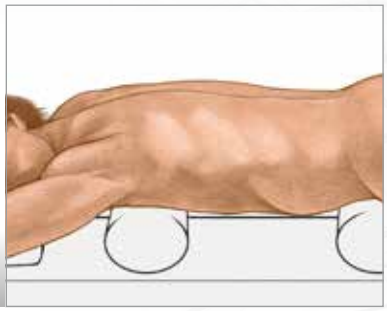
VERTEBRIS stenosis

Full-endoscopic, interlaminar decompression

Positioning

The patient is placed on an operating table with an X-ray transparent top in the prone position with pelvis and thorax support pillows. A C-arm image intensifier is required during the procedure.



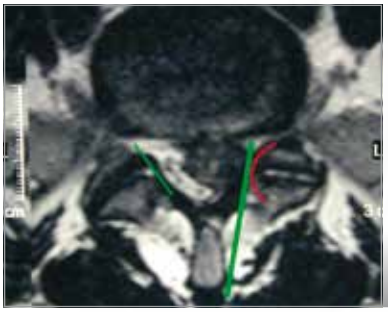
Prone position with pelvic and thorax pillows

Determination of interlaminar access

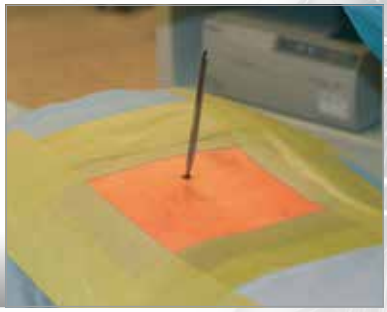
Using image intensifier control, the access is determined on the basis of anatomical landmarks in the posterior-anterior beam path and taking account of the pathology. The port must be maximally medial in the interlaminar window in order to permit easier lateral access below the obliquely positioned zygoapophyseal joints.

Marking the entry point on the skin

Entry point should be in a maximally medial position



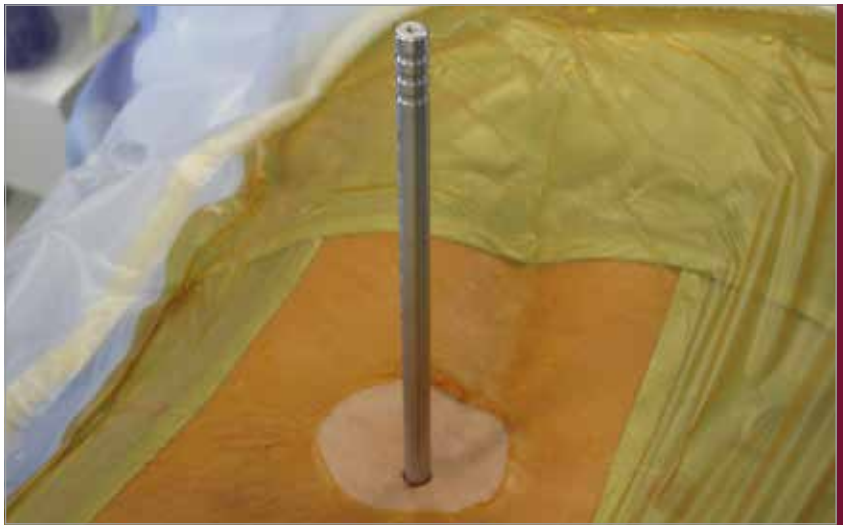
Access below the zygoapophyseal joints should be possible



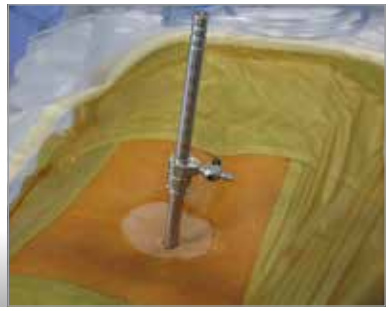
Skin incision

Performance of interlaminar access

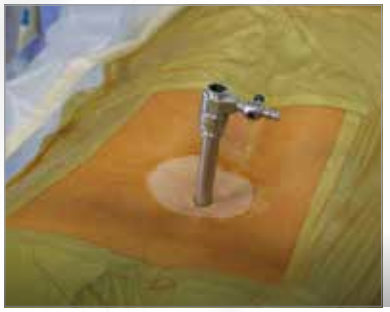
After determining the entry point on the skin and performance of the skin incision, the dilator is inserted up to the ligamentum flavum or to the zygo-apophyseal joints under posterior-anterior image intensifier control. The subsequent procedure is then performed in the lateral beam path. The working sleeve with oblique opening is pushed over the dilator toward the ligament and the dilator is removed. The endoscope is introduced and the ongoing intervention carried out under continuous visualization and irrigation.



Insertion of the dilator, ...



... operating sleeve ...



... and endoscope

VERTEBRIS stenosis

Full-endoscopic, interlaminar decompression

Ipsilateral, decompression on one side

After the access has been created, the bony structures are exposed. It may be helpful to start decompression at the caudal end of the descending facet. Depending on the pathology, decompression is then commenced with resection of parts of the medial descending facet, the cranial and caudal lamina, and the ligamentum flavum. The extent of decompression generally continues cranially at least until the tip of the ascending facet and caudally to half of the pedicle. The medial portions of the ascending facet and the ligamentum flavum are then resected until sufficient decompression of the neural structures can be clearly seen

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

The extent of bone resection must generally reach from the tip of the ascending facet to the middle of the caudal pedicle

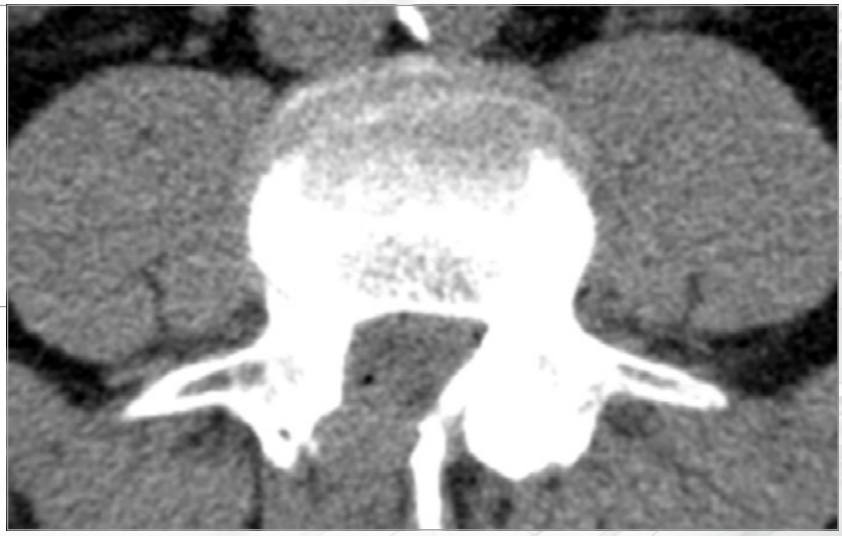
A range of burrs and bone punches is available for bone resection. They can be introduced through the intraendoscopic working channel

Resection of medial portions of the ascending facet

Removal of protruding annulus and osteophytes

cranially, caudally and laterally. In the case of a central stenosis, the ligamentum flavum generally needs to be resected medially to the midline. Finally, it may be necessary to remove protruding annulus parts and osteophytes in the ventral epidural space. If the patient experiences bilateral symptoms of a lateral stenosis, "over the top" access using the undercutting technique to the opposite side is not carried out. An independent contralateral access is used to retain the median portions of the ligamentum flavum and leave the spinal canal untouched here.

Site after ipsilateral decompression



VERTEBRIS stenosis

Full-endoscopic, interlaminar decompression

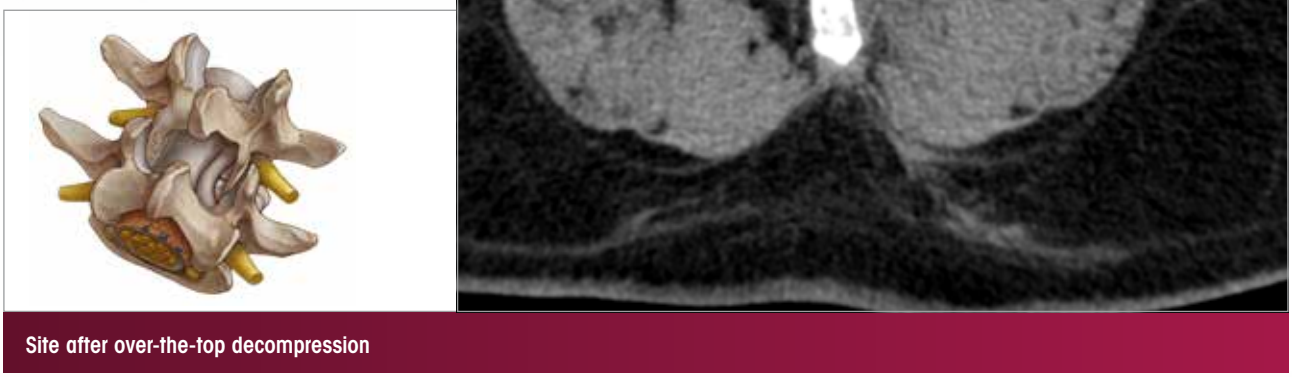
Contralateral decompression in over-the-top technique

If bilateral symptoms occur with a central stenosis, a unilateral approach is carried out with "over-the-top" access using the undercutting technique to the opposite side. For this purpose, bone in the ventral area of the spinous process is resected until the contralateral side can be accessed dorsally up to the dura of the spinal cord. If possible, the ligamentum flavum is initially left in place to protect the dura and bony decompression is again carried out by laminotomy and partial facetectomy. The ligamentum flavum is then completely resected. Finally, the contralateral recess needs to be extended. The decompression is completed when the dura and the spinal nerves have been clearly decompressed.

Entrance on the contralateral side

Decompression contralaterally including recess

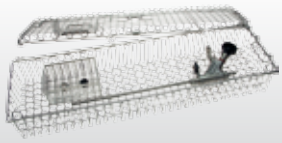
In general the sealing caps for endoscope and working sleeve should only be used briefly if bleeding obscures visibility since when operations last a long time and the drainage of fluid is prevented without being noticed, the consequences of volume overload and elevated pressure within the spinal canal and the associated and neighbouring structures should not be ignored. 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 as with all new techniques there is generally an enhanced risk of problems occurring during the learning curve.



Site after over-the-top decompression

VERTEBRIS stenosis

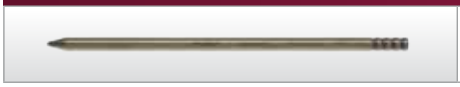
Endoscope and accessories

Endoscope	
	**Discoscope** PANOVIEW Plus Discoscope 20°, working channel ID 5.6 mm, OD 9.3 x 7.4 mm, WL 177 mm (892109205), set incl. sealing cap attachment (8792.452), sealing caps (89.02), sealing membrane (15479.006), O-ring (9500.113) and cleaning brush (6.03) 8921092051
	**Endoscope adapter** for distance control 892009000
	**Fiber light cable** D 3.5 mm, WL 1.8m, set including adapter on the projector side (8095.07) and adapter on the endoscope side (809509), color code orange 806635181
	**Reprocessing basket** for machine reprocessing and sterilization, for discoscopes 89210.xxxx, width 132 mm x length 472 mm x height 74 mm 38044.411

Retainer arm systems	
	**Retainer arm adapter** for fixing the endoscope in combination with universal retainer arm (898004717) or LEYHLA articulated arm (8766951) 892009070
	**Universal retainer arm** max. retaining force 90N, joint radius 420 mm 898004717
	**Clamp socket** electrically insulated to 4.5 KV AC, for attaching to the operating table (standard rail) 8840.9722
	**LEYHLA articulated arm** for attaching to the operating table, fixing in place using 2 articulated arms is recommended..... 8766.951

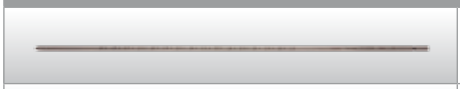
Access and working instruments

Access instruments

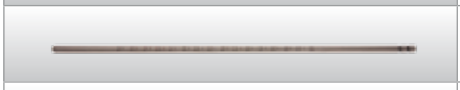


Dilator
OD 9.4 mm, cannulated, for working sleeve OD 10.5 mm 892209510

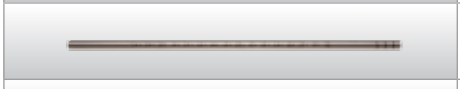
Step-dilator Set comprising: 8922095000



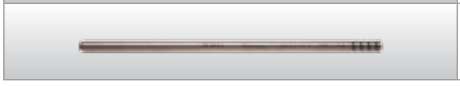
Dilator
OD 3.9 mm, cannulated, for working sleeve 892209505



Dilator
OD 5.9 mm, for working sleeve or dilator OD 7.0 mm 892209507



Dilator
OD 6.9 mm, for working sleeve or dilator OD 9.5 mm 892209508



Dilator
OD 9.4 mm, for working sleeve OD 10.5 mm 892209515

Working sleeve
OD 10.5 mm , WL 120 mm 892209010

Irrigation adapter
OD 10.5 mm 892209310

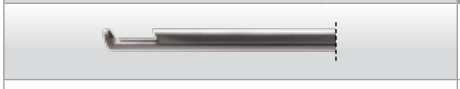
Working Instruments

Tube sheath punches

Punch, 2.0 mm cutting width, OD 5.5 mm, WL 340 mm, TL 490 mm 892409020

Punch, 3.5 mm cutting width, OD 5.5 mm, WL 340 mm, TL 490 mm 892409035

Kerrison punches



Kerrison punch 60°
4.5 mm cutting width, D 5.5 mm, WL 350 mm, TL 460 mm 892409445

Kerrison punch 90°
4.5 mm cutting width, D 5.5 mm, WL 350 mm, TL 460 mm 892409945

Micro punches and rongeurs
Color coding for easy identification of instrument diameter

Rongeur
OD 3.0 mm, WL 290 mm 89240.3003

Rongeur
OD 4.0 mm, WL 290 mm 89240.3004

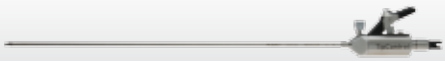
Punch
OD 3.0 mm, WL 290 mm 89240.3023

Punch
OD 4.0 mm, WL 290 mm 89240.3024

VERTEBRIS *stenosis*

PowerDrive ART1 – Universal motor system

Universal motor system	
	Burrs for Power Stick M 5
	**Oval burr,** with side guard, OD 5.5 mm, WL 290 mm 899751505
	**Oval burr, eccentric,** with side guard, OD 5.5 mm, WL 290 mm 899751555
	**Round burr,** OD 5.5 mm, WL 290 mm 899751305
	**Round burr, diamond,** OD 5.5 mm, WL 290 mm 899751405

	Articulated burr – TipControl
	**TipControl® – Articulating bone burr, complete,** OD 4.0 mm, WL 290 mm (899753754), for Power Stick M5 (15336058), set including cardan burr insert, sterile, pack of 5 (499751704), key for inserting and removing the cardan burr insert (15372005), irrigation adapter (15261106) 899753794
	Motor handles – Power Stick M5
	**Power Stick M5/0** Handle for shaver blades or burrs, operation with footswitch, sterilizable, max. speed 16,000 rpm, with fixed connection cable 8995500001
	**Power Stick M5/3** Handle for shaver blades or burrs, operation with keypad or footswitch, sterilizable, max. speed 16000 rpm, with fixed connection cable 8995500031

	PowerDrive *ART1* Universal motor system, set incl. power cable, Can Bus connection cable Technical Features: autom. handle and tool recognition, storage function, user-specific parameters, memory function for tools
	**Power supply unit 230 V,** 50/60 Hz 23040011
	Power supply unit 100 V, 50/60 Hz 23040021
	Power supply unit 110 V, 50/60 Hz 23040041
	Power supply unit 115 V, 50/60 Hz 23040061
	Power supply unit USA 120 V, 50/60 Hz 23040071
	Power supply unit 127 V, 50/60 Hz 23040121
	Power supply unit 240 V, 50/60 Hz 23040141

	**Double-pedal footswitch** for PowerDrive *ART1* (Series 2304) 2304.901

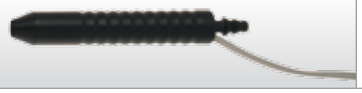
COMBIDRIVE EN – High-speed motor system

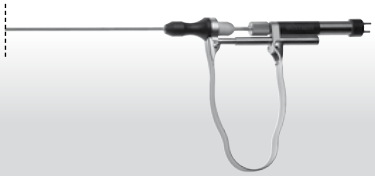
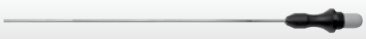
High-speed motor system

	Burrs with distal protection
	**Round burr, tungsten carbide,** burr ø 3.0 mm, WL 350 mm, pack of 3 .....82960.3730
	Support sleeve, with distal protection, OD 4.0 mm 82970.1330
	**Round burr, diamond,** burr ø 3.0 mm, WL 350 mm, pack of 3 .....82960.3930
	Support sleeve, with distal protection, AD 4,0 mm 82970.1330
	Burrs without distal protection
	**Round burr, diamond,** burr ø 3.7 mm, WL 350 mm, pack of 3 .....82960.3940
	Support sleeve, OD 4.0 mm 82970.1340
	High-speed handpiece
	**Handpiece, angled, with adapter** 40,000 rpm, INTRA-interface 82950.1301
	High-speed motor system COMBIDRIVE EN For use with high-speed accessories and accessories for Power Stick M5 (see page 14)
	**COMBIDRIVE EN Set** High-speed motor system incl. power cable, footswitch, electronic motor, medium, connection cable and a wide range of accessories 20951.0000

VERTEBRIS stenosis

Surgitron – Radio frequency unit

RF unit – Surgitron	
	Bipolar accessories – ablation electrodes
	**Bipolar hollow sphere electrode** distal head part D 2.9 mm, WL 330 mm, disposable 899364300
	**Bipolar hollow sphere electrode** distal head part D 3.4 mm, WL 330 mm, disposable 899364400
	**Electrode handle, bipolar** for mounting bipolar hollow sphere electrodes, fixed cable with US 2 PIN connector, cable length 3 m, reusable 899364100

	Bipolar accessories – Trigger-Flex
	**Trigger-Flex handle** for bipolar controllable Trigger-Flex electrode, including bipolar cable with US 2 PIN connector (2343837) 8792.691
	**Trigger-Flex bipolar electrode** articulated at the distal end, D 2.0 mm, disposable, sterile, pack of 6 .....4792.6912
	**Trigger-Flex outer sheath** WL 400 mm 8792.694
	**Bipolar connection cable** for Trigger-Flex handle, US 2 PIN connector 2343.837

	RF unit Surgitron
	**Radio frequency unit** R.Wolf/elliquence Surgitron Dual 4 MHz, radio frequency unit cpl. with footswitch (2343.901) power for monopolar max. 120 watt/4 MHz, bipolar max. 120 watt/1.7 MHz, 100/120/220/240 V, 50/60 Hz 2343.001

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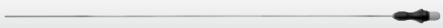
Consumables and replacement parts

	for TipControl®:
	**Cardanic burr insert, sterile** (pack of 5) 499751704
	**Wrench** 15372005
	**Irrigation adapter,** complete (M5) 15261106

	for Trigger-Flex:
	**Flexible bipolar electrode** (pack of 6) 4792.6912
	**Trigger-Flex shaft** 40 cm 8792.694
	**Trigger-Flex replacement seals** (pack of 2) 8792.695

	**Sealing cap attachment** incl. 10 sealing caps (89.00) 8792.452
	**Sealing caps** opening 0.75 mm for instruments up to D 2.4 mm, black, pack of 10 ..... 89.00
	**Sealing caps** opening 2.7 mm for instruments over 3.4 to 5.1 mm, blue, pack of 10 ..... 89.02
	Sealing membrane 15479006
	**Irrigation toggle** complete, rotatable 15461.034
	**O-rings** for irrigation toggle (15461.034) pack of 10 ..... 9500.113
	**Fog reduction agent** for endoscopes, disposable, pack of 10 ..... 102.02
	**Cleaning brush** D 5.0 mm, brush length 50 mm, TL 375 mm 6.03
	**O-rings** for irrigation adapter 892209310 15364285

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