

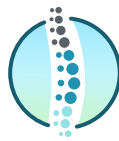
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ANTERIOR CERVICAL CORPECTOMIES
09/1992 – 12/2022

	<u>Mayr et al ¹</u> <u>(5 surgeons)</u>		<u>NeuroSpine Center</u> <u>(Dr. Wascher)</u>	
Single level (one body + 2 discs)	133		279	
Two level	96		84	
Three level	31		7	
Four level	1		2	
Hybrid (corpectomy + disc)			127	
Hybrid (2-level corpectomy + discectomy)			9	
Anterior-posterior			147	
Noncontiguous 2-level corpectomy			1	
	<hr/>		<hr/>	
	261		656	
Hematoma	0	0%	3	0.5%
Superficial infection (no drainage)	0	0%	1	0.1%
Deep infection requiring surgery	0	0%	0	0%
CSF leak	0	0%	0	0%
Incidental durotomy	0	0%	2	0.3%
Transient upper extremity weakness	2	0.8%	3	0.5%
Permanent upper extremity/lower extremity weakness	0	0%	0	0%
Transient dysphagia (> 6 weeks)	35	13.4%	6	0.9%
Respiratory failure requiring tracheostomy	?	?	1	0.1%
Permanent dysphagia (> 12 weeks)	7	2.7%	1	0.1%
Transient hoarseness	35	13.4%	8	1.2%
Permanent hoarseness	2	0.8%	0	0%
Vascular injury	0	0%	0	0%
Esophageal or tracheal injury	0	0%	0	0%
Asymptomatic pseudoarthrosis	33	12.6%	12	1.8%
Symptomatic pseudoarthrosis	?	?	2	0.3%
Asymptomatic hardware failure	14	5.4%	12	1.8%
Symptomatic hardware failure requiring revision	2	0.8%	3	0.5%
Permanent complication rate	11	4.2%	5	0.8%
Improvement	259	99.2%	654	99.7%

Number of patients with previous anterior cervical surgery: 16 (2.4%)

¹Mayr, Matthew T.; Subach, Brian R.; Corey, Christopher H.; Rodts, Gerald E.; and Hald, Regis W.; "Cervical spine stenosis: outcomes after anterior corpectomy, allograft reconstruction and instrumentation." J Neurosurg (Spine 1) 96: 10-16, 2002



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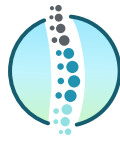
ANTERIOR CERVICAL DECOMPRESSION
+ FUSION, + - INSTRUMENTATION
09/1992 - 12/2022

1 level, no instrumentation	140
1 level, ACD anterior plate	717
2 level, ACD anterior plate	501
3 level, ACD anterior plate	213
4 level, ACD anterior plate	15
2 separate levels and anterior plate	1
Revision ACD and anterior plate	<u>123</u>
	1710

1 level corpectomy	279
2 level corpectomy	84
3 level corpectomy	7
4 level corpectomy	2
Hybrid (corpectomy + 1 or 2 level ACD)	127
Hybrid (2 level corpectomy + level ACD)	9
Anterior-Posterior (includes ACDs and corpectomies)	274
Noncontiguous 2 level	<u>1</u>
	783

Total anterior patients: 1710 + 783 = 2493

	<u>Literature Summary</u> ¹	<u>NeuroSpine Center</u> (Dr. Wascher 1710 cases)
seroma requiring drainage		0.1% 1
hematoma	0.2 - 0.9%	0.4 % 6
superficial infection, reaction to Steri-Strips	0.1 - 2%	0.1 % 2
deep infection	<1%	0.1 % 1
CSF leak		0.1 % 1
incidental durotomy		0.1 % 1
transient UE weakness		0 % 0
permanent UE/LE weakness		0.04% 1
graft extrusion	0.4 - 4.6 %	0 % 0
transient dysphagia (>6 weeks)		0.4 % 7
permanent dysphagia (>12 weeks)		0.2 % 3 (mild)
transient hoarseness	11%	2.3% 40
permanent hoarseness (>12 weeks)	4 %	0.5 % 8
vascular injury		0 % 0
esophageal or tracheal injury		0 % 0
stroke within 30 days	<1%	0.1% 1
symptomatic pseudoarthrosis (mild)		0.3 % 5
symptomatic pseudoarthrosis req. revision	2 - 20%	0.2 % 4
asymptomatic hardware failure (broken screw)		0.4% 7
improvement		99.9% 1708
permanent complication rate requiring repeat surgery	at least 7.7%	0.7% 12



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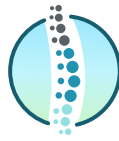
CERVICAL LAMINECTOMIES
WITH OR WITHOUT POSTERIOR FUSION/INSTRUMENTATION
09/1992 – 12/2022

TOTAL 887

Cervical Foraminotomy	27
Cervical Laminectomies + Foraminotomies	108
1 LEVEL 1	
2 LEVEL 12	
3 LEVEL 43	
4 LEVEL 35	
5 LEVEL 15	
6 LEVEL <u> 2 </u>	
108	
Cervical Laminectomies, Fusion, Instrumentation	752
1 LEVEL 77	
2 LEVEL 185	
3 LEVEL 242	
4 LEVEL 219	
5 LEVEL 22	
6-6+ LEVEL <u> 7 </u>	
752	
Total:	887

Complications (887 cases)

		<u>NeuroSpine Center</u>
1) Infection requiring revisor	6	0.7%
2) Hematoma	0	0%
3) CSF Leak/Pseudomeningocele	0	0%
4) Glacial instability	0	0%
5) Death	0	0%
6) Temporary weakness or numbness	11	1.2%
7) Permanent nerve root injury	0	0%
8) Seroma	7	0.8%
9) Wound dehiscence	4	0.5%
10) Pain > 3 months	1	0.1%
11) Perioperative ischemic stroke	1	0.1%
12) Pulmonary embolism	2	0.2%
13) Pneumonia	3	0.3%
14) Asymptomatic broken hardware	6	0.7%
Complication rate requiring repeat surgery	15	1.7%



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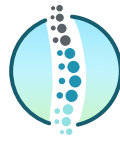
LUMBAR LAMINECTOMY & ILIAC CREST FUSION &
PEDICLE SCREW INSTRUMENTATION
01/1995 – 12/2022

1 LEVEL	411
2 LEVEL	290
3 LEVEL	34
4 LEVEL	1
	736

COMPLICATION

NEUROSPINE CENTER

Cellulitis	2	0.3%
Superficial infection	3	0.4%
Deep infectior	3	0.4%
Glacial ins tability requiring revision (20 year)	25	3.4%
Painful hardware requiring remove	1	0.1%
Misplaced screw requiring revisior	0	0%
Asymptomatic hardware falure (broken screw)	8	1.1%
Symptomatic pseudoarthros	2	0.3%
Poor outcome requiring morphine Infsaid pump for pain, etc.	3	0.4%
Incidental CSF durotomy	5	0.7%
Lumbar pseudomeningoce	0	0%
Nerve root injury	0	0%
Cauda equina syndrom	0	0%
Hematoma	0	0%
Hemorrhage requiring transfusio	4	0.5%
Wound breakdown requiring revisio	2	0.3%
Recurrent disc herniation requiring revisio	1	0.1%



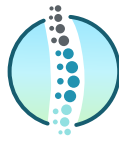
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LUMBAR LAMINECTOMY – NO INSTRUMENTATION

09/1992 – 12/2022

	TOTAL Literature (see below)	998 NeuroSpine Center (Wascher) 998	
Total Patients in cohort	452		
<u>COMPLICATIONS</u>			<u>NEUROSPINE CENTER</u>
Deep infection	2.4%	6	0.6%
Seroma/wound dehiscence	?	3	0.3%
Pseudomeningocele	0.7%	4	0.4%
Incidental durotomy	5.7%	3	0.3%
Glacial instability	4.6%	8	0.8%
Cauda equina syndrome (temporary)	0.4%	1	0.1%
Nerve root injury (temporary)	2.7%	2	0.2%
Hematoma	?	2	0.2%
Readmission for postoperative pain	?	4	0.4%
DVT	?	1	0.1%
Superficial infection (no surgery)	?	1	0.1%
Death	0.7%	0	0%
Nerve root injury (permanent)	1.8%	0	0%
Vascular Injury	0.2%	0	0%
Cauda equina injury (permanent)	0.2%	0	0%
Patients w/ reoperation	15.0%	23	2.3%

Yuan, Hansen A.; Garfin, Steven R.; Dickman, Curtis A.; and Mardjetto, Steven M., "A Historical Cohort Study of Pedicle Screw Fixation in Thoracic, Lumbar and Sacral Spinal Fusions". SPINE, Vol 19, Number 205, pp2279-2296S.

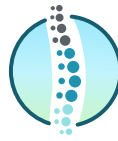


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LUMBAR LAMINECTOMY, ILIAC CREST FUSION, AND PEDICLE SCREW
INSTRUMENTATION FOR DEGENERATIVE SPONDYLOLISTHESIS + STENOSIS
1995 – 12/2022

1 LEVEL	411
2 LEVEL	290
3 LEVEL	34
4 LEVEL	_1
	736

	L iterature (see below) (%)	NeuroSpine Center (Wascher)	
Intraoperative Events (total patients in cohort)	(2177)	(736)	
Pedicle fracture	1.2%	0%	0
Screw breakou	1.0%	0.1%	1
Loss of purchase	1.7%	0.3%	2
Implant breakag	0.2%	0%	0
Nerve root injury	0.4%	0%	0
Spinal cord injury	0.1%	0%	0
Vascular injury	0.1%	0%	0
Misplaced screw requiring revisior	?	0%	0
Vertebral body penetration of screw resulting in clinically significant tissue damage	0.3%	0%	0
Dural tear from screw use (incidental	0.1%	0.0%	0
Dural tear not from screw use (incidental	7.3%	0.7%	5
Other	1.3%	0%	0
 Postoperative Events (total patients in cohort)	 (2153)	 (736)	
Rod/plate fractur	0.7%	0%	0
Screw fracture (asymptomatic	2.6%	1.17%	8
Screw loosene	2.8%	0.1%	1
Screw pulled out	1.0%	0.1%	1
Connector slippag	0.7%	N/A	N/A
Cross connector slippag	0.0%	N/A	N/A
Infection	2.6%	0.6%	4
Bone fracture	0.7%	0%	0
Symptomatic pseudoarthros	4.0%	0.1%	1
Glacial instability requiring revision	4.7%	3.4%	25
Painful hardware requiring remov	12.5%	0.3%	2
Reoperative rate	17.6%	3.9%	29
New radicular pain or deficit status unspecifie	0.9%	0%	0
New radicular pain or deficit-permanen	1.5%	0%	0
New radicular pain or deficit-transien	3.5%	0.1%	1

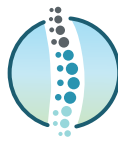


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	Literature (see below) (%)	NeuroSpine Center (Wascher) (Number %)
Dural leak	0.5%	0% 0
Vascular injury	0.3%	0% 0
New spinal cord injury	0.2%	0% 0
Other	6.6%	Other:
		a) Cellulitis
		0.3% 2
		b) Wound Breakdown
		0.3% 2
		c) Recurrent disc herniation
		0.1% 1
		d) Symptomatic Seroma
		0.1% 1

Yuan, Hansen A.; Garfin, Steven R.; Dickman, Curtis A. , and Mardjettco, Steven M., "A Historical Cohort Study of Pedicle Screw Fixation in Thoracic, Lumbar and Sacral Spinal Fusions". SPINE, Vol 19, Number 205, pp 2279-2296S.



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LUMBAR MICROSURGICAL DISKECTOMIES
09/1992 – 12/2022

Virgin	1898
Redos	<u>254</u>
Total	2152

NeuroSpine Center
(Dr. Wascher 2152 cases)

Literature Incidence

Complications:

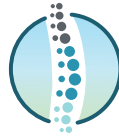
Superficial wound infection	0.9 – 5 % ¹	0.2%	4
Deep wound infection	1%	0.3 %	7
Increased motor deficit	1-8%	0.1 %	2 (transient)
Incidental durotomy	0.3-13 % ²	0.3%	7
CSF fistula requiring repair	0.1% ³	0.05 %	1
Pseudomeningocele	0.7-2% ⁴	0.4%	9
Incidental durotomy in redo MSD	18% ⁴	0 %	0
Recurrent disc herniation	6-19% ⁵ (10 yr)	3.9 % (10 yr) (6.4% over 20 yr)	85 138
Spinal epidural abscess	0.67% ⁶	0 %	0
Diskitis	0.2-4% ⁷	0.05 %	1
Cauda equina syndrome	0.21%	0 %	0
DVT/PE	0.1% ³	0 %	0
RSD	1.2% ⁸	0 %	0
Death	0.06% ³	0 %	0
Seroma	?	0.1%	2
Total permanent complication rate requiring reoperation	<u>At least 9.67% (10 yr)</u>	7.1 % (20 yr) <u>4.8% (10 year)</u>	152 <u>103</u>

¹ Shetman A. Granick M.S. et al. Management of Infected Laminectomy Wounds. Neurosurgery 35: 307-9, 1994

² Fink L.H.: Unintended “ Incidental” Durotomy. Surg Neurol 45: 590, 1996 (letter)

³ Ramirez, L. F. Thinted R: Complications and Demographic Characteristics of Patients Undergoing Lumbar Discectomy in Community Hospitals. Neurosurgery 25: 226-31, 1989

⁴ Goodkin R. Laska LL Unintended “ Incidental” Durotomy during Surgery of the Lumbar Spine: Medicolegal Implications. Surg Neurol 43: 4-14, 1995



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⁵ Davis R A: A Long Term Outcome Analysis of 984 Surgically Treated Herniated Lumbar Discs. J Neurosurgery 80: 415-21, 1994.

⁶ McLauren A.C. Bailey SI: Cauda Equina Syndrome: a Complication of Lumbar Discectomy. Clin Orthop 204: 143-9, 1986

⁷ Iversen E., Neilsen V AH, Hanes L G: Progress in Postoperative Discitis. A Retrospective Study of 111 cases. Acta Orthop Scand 63: 305-9, 1992.

⁸ Sachs B L, Zindrich M R, Beasley R D, Reflex Sympathetic Dystrophy after Operative Procedures on the Lumbar Spine. J Bone Joint Surg 75A: 721-5, 1993.

NOTE: Recurrent herniated disc after microdiscectomy, although undesired, is not considered a complication of the procedure (due to the natural history of the disease).