

The lumbar microdiscectomy

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Nowadays "Minimal Invasive Surgery" is a trend setting catchword, but in the seventies the application of microsurgical techniques derived from intracranial procedures to the lumbar spine was a breakthrough. Caspar (1) in 1976 and 1977, Yasargil (10) in 1977, and Williams (7) in 1978 independently reported microtechniques in the treatment of lumbar disc herniations. The concomitant advent of water-soluble myelography and later on of CT scanning and MRI allowed to precisely determine the location of the neural compression. This is still a mandatory prerequisite for lumbar microdiscectomy. Furthermore, the use of the microscope and intraoperative radiographic labeling of the affected disc space is imperative.

The best indications for lumbar microsurgery are: 1) the single level soft disc herniation (87% of the cases); 2) the two level or the extracanalicular fragmented disc (recommended for the practiced surgeon who is familiar with the method); 3) the recurrences following previous conventional or microdiscectomy; and 4) the lateral recess stenosis with bony root entrapment.

The following considerations have to be made before dealing with the lumbar microsurgical technique:

- If difficulties should unexpectedly occur while performing the microsurgical procedure requiring a larger approach, switching to the conventional technique is possible, without any disadvantages, at any phase of the operation.
- The microapproach should be distinguished from the microsurgical dissection technique in the target area. Whereas the former is not always possible and appropriate, there is no limitation with regard to the latter
- The extracanalicular disc fragment accounts for about 7% of all lumbar disc herniations. Several approaches are described in the literature for true far lateral expulsed herniations. We also report our experience with the microsurgical paraspinal (muscle-splitting) approach, with preservation of the functionally important portion of the facet joint.

Surgical techniques

The interlaminar microsurgical technique

The Caspar lumbar microdiscectomy will briefly be described here. For more technical details we recommend the author's original publication (2).

Positioning; the genupectoral position is used. The free-hanging abdomen reduces the epidural venous congestion which may lead to increased hemorrhage. Furthermore, this position "opens up" the interlaminar space, allowing for a better approach to the intraspinal structures.

Preoperative radiographic labeling of the affected disc space; the level to be operated on is identified by inserting a spinal needle vertically to the inferior edge of the affected disc. Note the following points:

- Avoid puncturing the dural sac by inserting the needle one finger's breadth lateral to the spinous process on the side contralateral to the intended skin incision.
- Insert the needle perpendicularly to the interspace. With an oblique puncture parallel to the spinous processes, the tip of the needle and the entry point in the skin may differ by up to one level!
- If preoperative radiographic labeling is not properly carried out or not performed at all, exploration of the wrong level will be the most common (up to 10%) and at the same time most avoidable error in lumbar microdiscectomy!

Soft tissue dissection (one level operation); a skin incision of approximately 3 cm is done just beside the lateral boundary of the adjacent spinous processes and centered over the horizontal marker line crossing the lower edge of the disc space. A slightly arcuate fascial incision of 1.5 cm from the midline follows. The musculature is then detached bluntly and pulled laterally with a fluted introducer.

Preparation of the interlaminar space; the yellow ligament is exposed. Its tendinous insertions to the upper lamina are dissected and pushed aside laterally. The appropriate speculum-like muscle retractor is inserted via the fluted introducer as vertically as possi-



Figure 1. The muscle retractor with counter-retractor from the surgeon's perspective.

ble. Once the fluted introducer is removed, the retractor is rotated by 90° clockwise, so that the handle is facing the assistant and the leaves are then opened. The counter-retractor could be employed particularly when the skin incision exceeds 4 cm. The special design ensures unobstructed view along with a lateral enough muscle retraction (Figure 1).

Microscopic decompression; at this stage the microscope should be used. A limited bony resection (lower one quarter of the upper lamina and medial portion of the medial facet joint) is performed. Medioloateral fenestration and adequate removal of the yellow ligament is carried out. The root is identified, detached from the herniation and gently pushed medially with a fluted root retractor. The longitudinal ligament is incised as usual and the disc space is cleared using curettes and special rongeurs.

Wound closure; the fascia and subcutaneous tissue is sutured to avoid muscle herniation. A drainage is usually not necessary.

The paraspinal microsurgical technique

This muscle-splitting approach described by Wiltse (8, 9) has been miniaturized. This enables a minimally invasive approach to the extracanalicular disc herniations generally preserving the facet joint. The technique described in the following refers to a series of 64 patients, 49 out of them having been operated on by one of the authors (LP).

Positioning; kneeling or the same as for microdiscectomy described by Caspar.

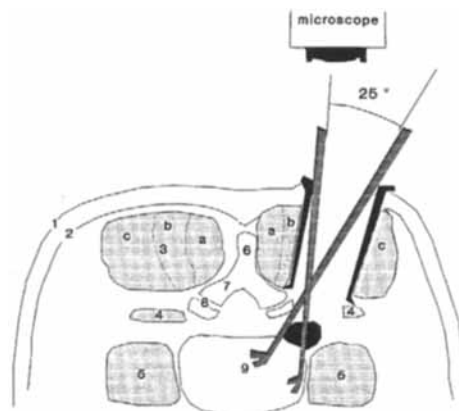


Figure 2. Tilting the table 15°–20° away from the surgeon gives a better view of the area lateral of the pedicle and clears the median portion of the disc.

1 skin; 2 lumbodorsal fascia; 3 M. sacrospinalis (a M. multifidus; b M. longissimus; c M. iliocostalis) 4 M. intertransversarius; 5 M. psoas major; 6 spinous process; 7 lamina; 8 facet joint; 9 intervertebral disc; and 10 extraforaminal lumbar disc herniation.

Preoperative radiographic labeling of the affected disc space; a spinal needle is inserted perpendicularly to the skin and to the upper edge of the affected disc 5 cm laterally from the midline.

Soft tissue dissection; a 5-cm skin incision (3 cm above and 2 cm below the horizontal disc space crossing line) is performed. This incision projects usually to the lateral third of the transverse processes. The natural cleavage plane between the multifidus and the longissimus muscle or the medial portion of the longissimus muscle itself are bluntly split longitudinally using the index fingers. The Caspar cervical retractor-counterretractor system is being inserted. The lower half of the upper transverse process and the upper half of the lower one are exposed as well as the lateral surface of the pars interarticularis medially and the edges of both transverse processes laterally. Intraoperative radiographic check is quickly done at this point of the procedure. This is of crucial importance. By introducing this step we were able to lower our wrong level exploration rate from 10% to 0%. Furthermore, at the L5/S1 level it gives a better orientation of how much bone should be removed from the cranial border of the ala in order to approach the outer foramen.

Microscopic decompression; the use of the microscope is optional to this point of the procedure but imperative when proceeding. The medial half of the intertransverse muscle and ligament are incised and pushed laterally, thereby exposing the fat surrounding the nerve. Tilting the operating table 15°–20° away from the surgeon is another key point; this gives an excellent view of the area lateral of the pedicle (Figure

Table 1. Recovery (percent) from motor deficits at hospital discharge after micro- and standard discectomy

	Micro	Standard
Complete regression	34	10
Improvement	51	62
Unchanged	15	28
Worse	0	0

Table 2. Complications (percent) after micro- (n 300) and standard (n 120) discectomy

	Micro	Standard
Wound infection	2	5 ^a
Diskitis	1	3 ^a
Dura opening	7	7
Increased neurologic deficit	1	7 ^a
Urinary infection	4	7
Postoperative bladder catheter	8	28 ^a
Thrombo-embolism	2	6 ^a

^a $P < 0.05$

Table 3. Outcome (percent) of micro- and standard discectomy rated by the Finneson Cooper score

Author	n	Satisfactory	Poor	Failure
<i>Micro</i>				
Goald	147	96	—	4
Williams	530	98	—	2
Reulen	485	92	6	2
Caspar (at follow-up)	300	93	5	2
(at discharge)		98.5	1	0.5
<i>Standard</i>				
Berlin Joint Study	3 238	68	15	17

Table 4. Facet damage (percent of patients) versus approach in microdiscectomy

Approach	None	Partial	Total
Intraspinal	15	59	26
Combined (IS + PV)	36	64	—
Paravertebral	50	50	—
Paraspinal	70	30	—

2). Drilling off the bone is usually not necessary, except for the case of extremely hypertrophied facet joints or at the L5/S1 level. Typically, we find the nerve pushed cranially and laterally by the mostly free disc fragment. We recommend not only to remove the fragment but also to clear the disc space, which can

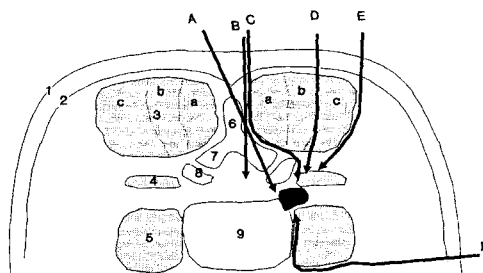


Figure 3. A Contralateral interlaminar approach; B ipsilateral interlaminar extended approach; C paravertebral approach; D paraspinal muscle-splitting approach according to Wiltse; E paraspinal approach according to Watkins; and F retroperitoneal approach. For legends see also Figure 2.

easily be done even including the median portion. Because of the complete preservation of the bony structures, surgically induced instability is most unlikely. Also, the recurrence rate is lower (3%).

Wound closure; a drainage is optional but according to our experience a valuable mean. The musculature does not need to be sutured.

Results

Interlaminar microsurgical technique

The results of 300 consecutive patients operated on microscopically by one of the authors (WC) are compared with a group of 120 patients who underwent a conventional discectomy performed by another highly experienced neurosurgeon (Tables 1–3). The first group consisted of 187 men and 113 women with a mean age of 44 (17–71) years. The smaller group comprised 76 men and 44 women with a mean age of 48 (19–68) years. The outcome was rated by the Finneson Cooper (5) score.

Paraspinal microsurgical technique

The data of 64 patients operated on consecutively were compared with those of a group of 38 patients treated with different approaches: the laterally extended interlaminar approach, the paravertebral approach according to Reulen and Ebeling (6), or a combination of both (Tables 4 and 5). The first group consisted of 42 men and 22 women and the second group of 21 men and 17 women. The mean age was 53 (29–82) for both groups.

The microsurgical paraspinal approach usually preserves the facet joint and thereby avoiding surgically

Table 5. Postoperative facet distress syndrome (percent of patients) after microdiscectomy

	Facet distress syndrome
Paraspinal	16
Intraspinal	32
Combined (IS + PV)	33
Facetectomized	33
Facet intact	10

induced instability (Table 4). The superior outcome of patients treated with the microsurgical paraspinal approach is now well documented; nevertheless 10% still complain about postoperative low back pain (Table 5).

Discussion

Evidence is now accumulating of the advantages of lumbar microdiscectomy (3, 4). Over 5000 patients have been operated on at our department since the introduction in 1975. The following points should be kept in mind in order to deal successfully with the microsurgical technique: 1) the technique of lumbar microsurgery has to be learned, carried out properly, practiced often and not just occasionally; 2) the pre/intraoperative radiographic check is a mandatory and essential guide to the target area; 3) the microtechnique cannot be used to solve all spinal problems. The best indications are listed in the introduction; 4) the results are best when surgery is performed within 3 months of the onset of symptoms; 5) lumbar microsurgery is highly effective in the decompression of the neurostructures and at the same time minimally invasive and traumatizing to the soft tissues; and 6) lumbar microsurgery preserves stability, therefore the need of subsequent fusion procedures is most unlikely.

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