59 Microsurgical Decompression

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59.1 Introduction and Core Messages

Degenerative lumbar spinal canal stenosis is a frequent disease of the "aging spine," leading to mono- or bilateral leg symptoms that are often described as spinal claudication [1–3]. The primary goal in treatment is to relieve the patients' leg symptoms. Surgery for lumbar spinal stenosis is generally accepted when conservative treatment has failed or if progressive neurological deficits occur [4]. In the past, laminectomies are considered to be the treatment of choice in lumbar spinal stenosis without instability [3, 5, 6]. Due to the risk of destabilization after laminectomy, limited approaches and less invasive techniques for decompression have been proposed by several authors [7–10]. Today, laminotomy under microscopic guidance is the preferred surgical technique in lumbar spinal stenosis presenting without additional deformity or segmental instability. During the past decade, approaches and techniques for laminotomy have been modified in different manners. In this chapter, the ipsilateral interlaminar approach for microsurgical decompression of the ipsilateral and contralateral spinal canal in the so-called over-the-top technique is described.

59.2 Indications

- Acquired degenerative central and lateral spinal canal stenosis with clinical symptoms (e.g., spinal claudication), verified by MRI or CT scan
- Failed conservative treatment
- No symptoms/signs for segmental instability

59.3 Contraindications

- Unstable lumbar degenerative scoliosis
- Spondylolisthesis grade I or higher with dominant low-back pain
- Severe and/or dominant low-back pain
- Absolute contraindications for general anesthesia

59.4 Technical Prerequisites

- Microscope
- Microsurgical instruments (e.g., Bayonet-shaped instruments)
- Tubular retractor system (e.g., Caspar retractor)
- High-speed drill
- Fluoroscopy

59.5 Planning, Preparation, and Positioning

The patient is placed prone for this procedure on a Wilson frame or alternatively placed on a special operating table in the knee-chest position (mecca position) (see Fig. 59.1). In this positioning, the abdomen is free, thus relieving pressure on the abdominal venous system and decreasing venous backflow into the spinal canal through Batson plexus. Furthermore, the amount of lumbar lordosis is decreased, and the interlaminar spaces are widened. Thus, it is easier to enter the spinal canal for decompression.

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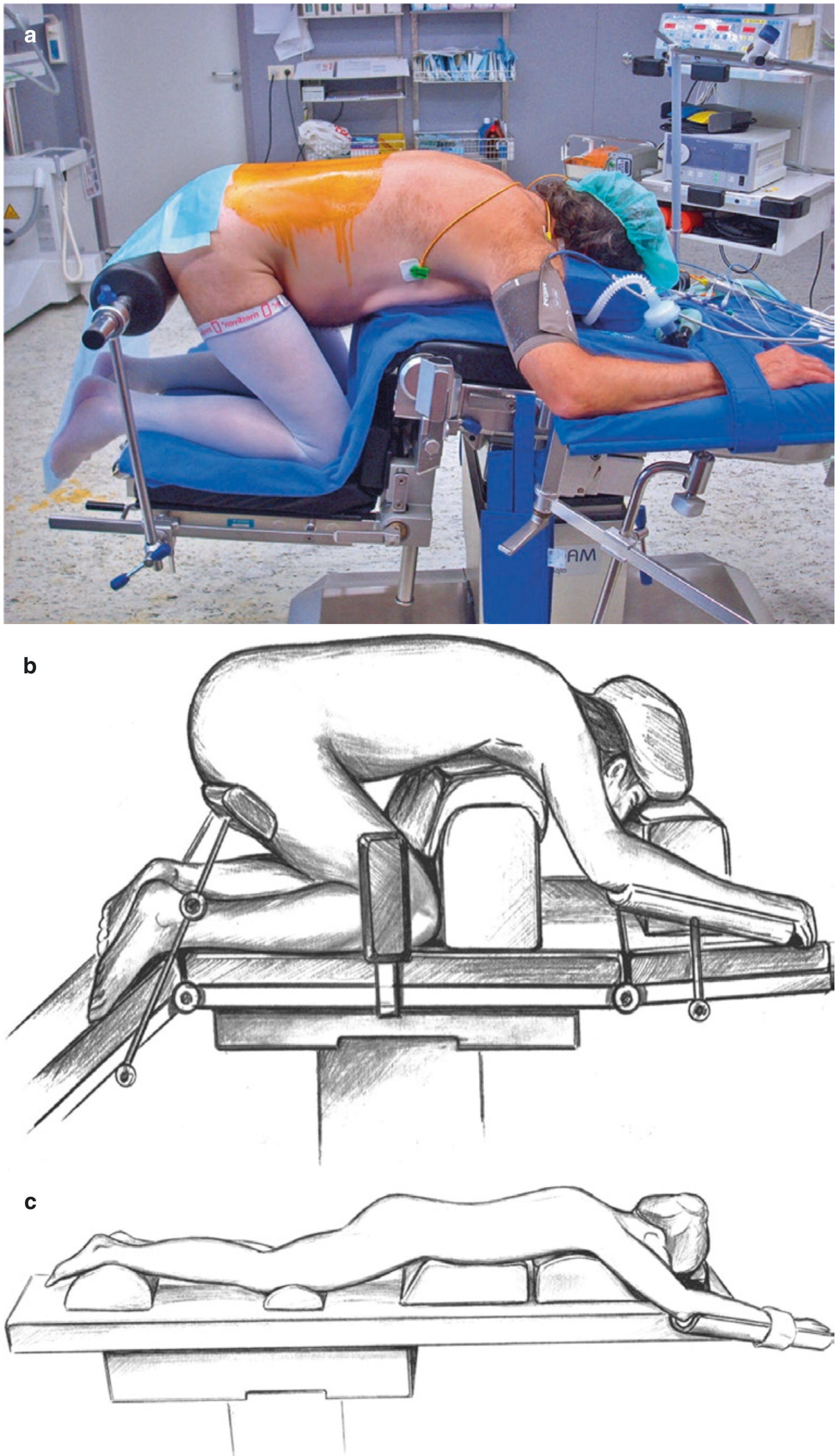

Fig. 59.1 (**a**) Knee-chest (mecca) position, situation in the OR and illustration (**b**), and as an alternative prone positioning (**c**)

Fig. 59.2 The target level is localized with an inserted needle under lateral fluoroscopy control

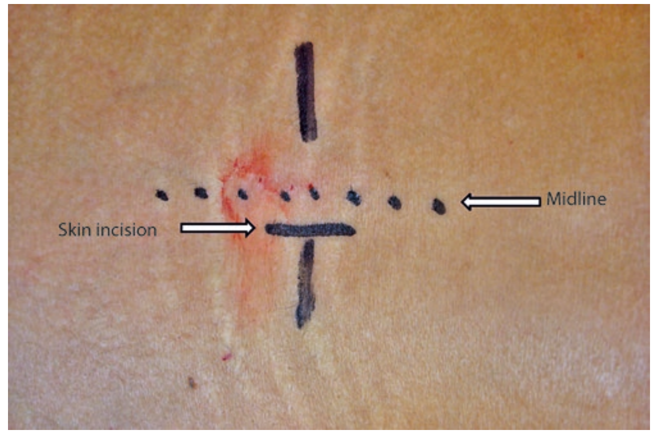

Fig. 59.3 Skin incision 5–10 mm lateral to the spinous process on the affected side and typically 2–3 cm in length for one level

For positioning, some special aspects have to be considered in (mostly elderly) patients with acquired spinal canal stenosis: patients can have limited mobility of the joints (shoulder, hip, knee) and of the cervical spine (avoid head rotation!).

Localization: The target level(s) is localized with an inserted needle under lateral fluoroscopy control, and the approach is planned and marked (see Fig. 59.2). It is important to place the superficial approach exactly over the lumbar segment of interest because of the limited extent of the microsurgical approach.

59.6 Surgical Techniques

- The author recommends the application of the surgical microscope from the beginning of the surgical procedure.
- The skin incision is up to 5–10 mm lateral to the spinous process on the affected side and typically 2–3 cm in length for one level. In the presence of bilateral symptoms, a left-sided approach is preferred for right-handed surgeons.
- A semicircular paramedian incision is made in the thoracolumbar fascia. The length of this incision can be longer than the skin incision (see Fig. 59.3).
- Subperiosteal dissection of the paravertebral muscles is carried out, and a self-retraining speculum retractor (Caspar, Aesculap,- or metrx retractor, Medtronic) is inserted (see Fig. 59.4). It is necessary to control the force of the retractor during surgery to avoid pressure necrosis of the surrounding cutaneous and musculature tissue.
- The laminae of the adjacent vertebrae and the interlaminar space are exposed.

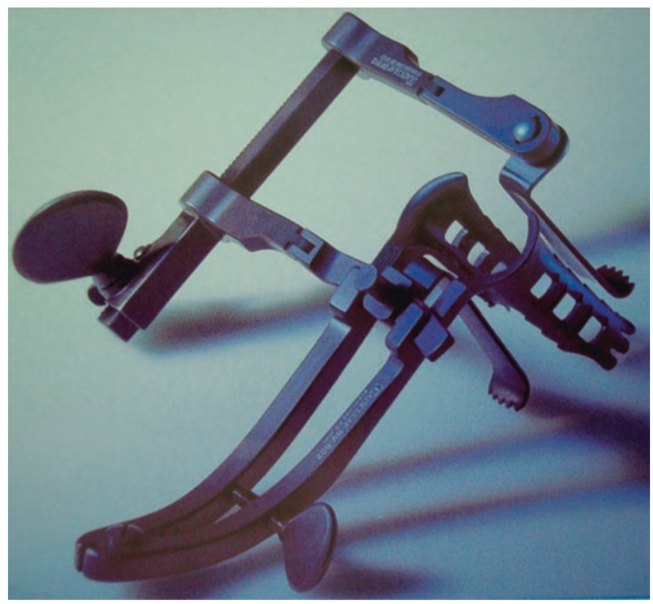

Fig. 59.4 Caspar tubular retractor system

- With a high-speed burr (see Fig. 59.5a, b), the decompression of the ipsilateral spinal canal is started with the removal of lower half of the cephalad lamina until the origin of the ligamentum flavum is exposed (see Fig. 59.6). The ligamentum flavum will be seen to thin out at the cephalad lamina and is detached from the lamina with a dissector. At this point, epidural fat and the dura can be identified (see Fig. 59.7). The extension of the interlaminar space is completed by resection of the cephalad part of the caudal lamina and by resection of a portion of the medial part of the facet joint (medial facetectomy).
- After complete exposure of the ipsilateral ligamentum flavum, it can be removed with rongeurs. Adhesions of the dura to the ligamentum flavum are dissected carefully in order to avoid dural laceration.

Fig. 59.5 Angular handpiece for high-speed drill

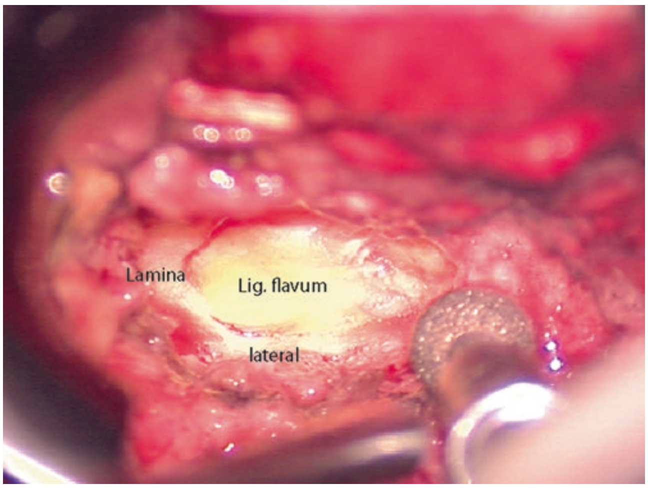

Fig. 59.6 Partial removal of the lamina and exposure of the ligamentum flavum

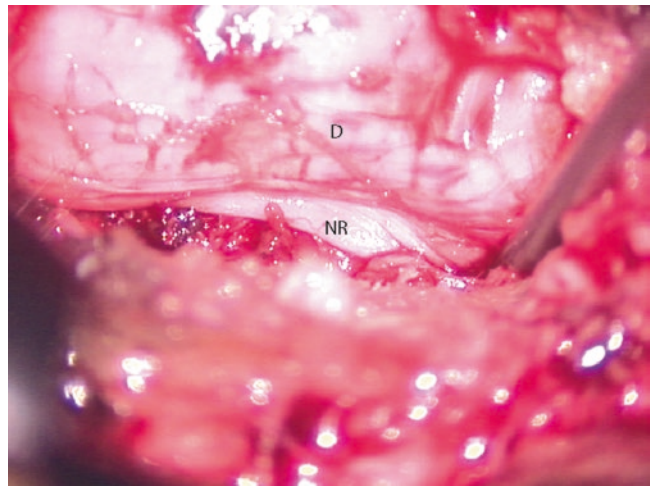

Fig. 59.8 Exposure of dura and nerve root after ipsilateral decompression. *D* dura, *NR* nerve root

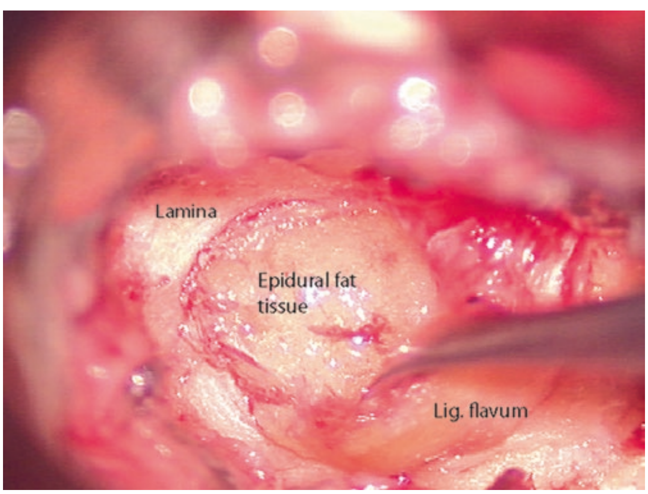

Fig. 59.7 The ligamentum flavum is detached from the lamina with a dissector. Epidural fat and the dura can be identified

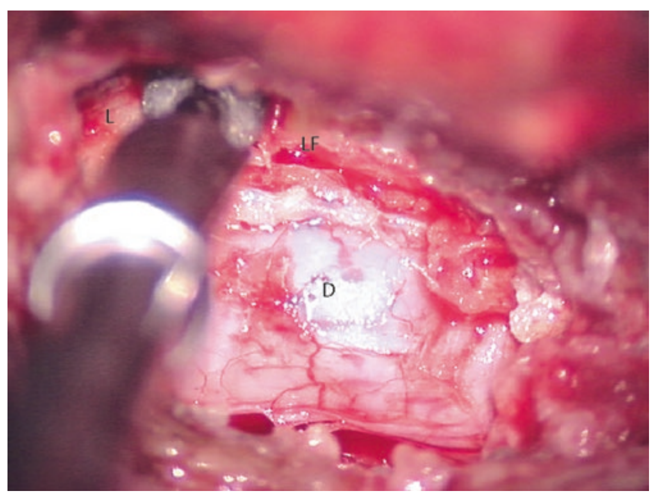

Fig. 59.9 Undercutting of the lamina with a high-speed burr. *L* lamina, *LF* ligamentum flavum, *D* dura

- An adequate ipsilateral subarticular decompression has been accomplished when the medial part of the pedicle and the lateral border of the nerve root are identified—and when the traversing nerve root can be easily mobilized (Fig. 59.8).
- The contralateral decompression is initiated by a tilting of the table away from the surgeon, and the microscope is adjusted to obtain a clear field of vision across the midline. Utilizing a high-speed burr, the undercutting of the

adjacent laminae and the part of the base of the spinous process is performed (Fig. 59.9).

- The next step is the resection of the contralateral ligamentum flavum and the subarticular decompression until the lateral border of the dura and the medial border of the contralateral inferior pedicle are identified. In cases with severe stenosis, the dura should be separated from the ligamentum flavum with blunt dissection before resection to avoid cerebrospinal fluid leak.
- The adequate decompression should be checked with a blunt probe.
- Check the bone margins with a blunt dissector to be certain that no sharp bony spicules remain (which can penetrate the dura postoperatively).
- Meticulous hemostasis and wound closure.

59.7 Postoperative Care

- Bed rest for 6 h in supine position with elevated chest (30°) to elevate lumbar CSF pressure for compression of epidural veins.
- We recommend bracing only in cases with more than two-level decompression.

References

1. Berney J. Epidemiology of narrow spinal canal. Neurochirurgie. 1994;40:174–8.
2. Verbiest H. A radicular syndrome from developmental narrowing of the lumbar vertebral canal. J Bone Joint Surg Br. 1954;36-B:230–7.
3. Verbiest H. Pathomorphologic aspects of developmental lumbar stenosis. Orthop Clin North Am. 1975;5:177–96.
4. Amundsen T, Weber H, Nordal HJ, et al. Lumbar spinal stenosis: conservative or surgical management? A prospective 10-year study. Spine. 2000;25:1425–35.
5. Herkowitz HN, Kurz LT. Degenerative lumbar spondylolisthesis with spinal stenosis. A prospective study comparing decompression with decompression and intertransverse process arthrodesis. J Bone Joint Surg Am. 1991;73:802–8.
6. Silvers HR, Lewis PJ, Ash HL. Decompressive lumbar laminectomy for spinal stenosis. J Neurosurg. 1993;78:695–701.
7. Hopp E, Tsou PM. Postdecompression lumbar instability. Clin Orthop Relat Res. 1988;227:143–51.
8. McCulloch JA. Microsurgery for lumbar spinal canal stenosis. In: McCulloch JA, Young PH, editors. Essentials of spinal microsurgery. Philadelphia: Lippincott-Raven; 1998. p. 453–86.
9. Poletti CE. Central lumbar stenosis caused by ligamentum flavum: unilateral laminotomy for bilateral ligamentectomy. Preliminary report of two cases. Neurosurgery. 1995;37:343–7.
10. Senegas J, Etchevers JP, Vital JM, et al. Recalibration of the lumbar canal, an alternative to laminectomy in the treatment of lumbar canal stenosis. Rev Chir Orthop Reparatrice Appar Mot. 1988;74:15–22.