French door laminoplasty for cervical spondylotic myelopathy

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Learning targets

- To identify a strategy of cervical stenosis treatment at multiple levels,
- To learn the steps of a midsagittal laminotomy and lateral lamina thinning,
- To show the enlargement of the spinal canal by bending the hemilaminae laterally according to the French door technique,
- To demonstrate a lamina stabilization technique by suturing iliac crest spacers.

Introduction

Cervical laminoplasty represents a current technique in the treatment of spondylotic myelopathy, if the stenosis is located at multiple levels [1]. Laminoplasty was originally

developed in Japan because of the high prevalence of ossification of the posterior longitudinal ligament (OPLL). The principle of this technique is based on an enlargement of the canal, which decompresses the spinal cord indirectly by allowing the dural sac to drift away from the spondylotic bars. Several technical variations exist such as the Z-plasty [2] or the open door technique [3]. The technique of Kurokawa et al. [4], also named French door laminoplasty, consists of a median lamina split followed by a lateral thinning and opening of both hemilaminae. This technique seems to provide satisfying and reliable results at long-term in patients with OPLL, but also in myelopathy due to cervical spondylosis and posterior thickening of the ligamentum flavum [5]. The sagittal cervical profile has to be considered preoperatively. The role of deep extensor muscles seems crucial for the sagittal alignment, and open posterior techniques might harm the muscular balance [6]. Therefore, loss of lordosis represents a contraindication for laminoplasty because it might result in further kyphotic deformity without removing pressure on the anterior spinal cord. Furthermore, segmental instability must be diagnosed preoperatively, and supplemented with a fusion to prevent further progression.

Case description

A 72-year-old female presented a loss of strength in her upper limbs, a feeling of clumsy hands and decreased grip strength. Additionally, a progressive gait disturbance

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became invalidating over the last 5 months. Neurologic examination evidenced a bilateral hyperreflexia of the patellar reflex, a positive Babinski test and a positive Lhermitte's sign. Preoperative neuromonitoring was performed: motor evoked potentials (MEP) confirmed the compression of the pyramidal tract and somatosensory evoked potentials (SSEP) evidence a disturbance of the posterior column-medial lemniscus pathway. Lateral and antero-posterior radiographs of the cervical spine showed spondylotic degenerative changes from C3–C4 to C6–C7. Computed tomography demonstrated a cervical stenosis at C3–C4 and C4–C5 due to osteophytes, which were narrowing the canal centrally and at the recessus on both sides. Magnetic resonance imaging showed a slight hypersignal of the spinal cord at the most severe stenosis level C3–C4.

Surgical procedure

The patient was placed on a Jackson table in supine position and Mayfield thongs stabilized the head. A slight reverse Trendelenburg position may be helpful to decrease venous bleeding. The bony landmarks were palpated, thus determining the level of the C6 and C7 spinous processes. A midline posterior approach focused on C2–C6 was performed and the laminae were exposed to the level of the lateral masses. The supra- and interspinous ligaments were removed between the spinous processes, and the ligamentum flavum was resected between C2–C3 and C5–C6 using a Kerrison rongeur. This would further allow lateral bending of the hemilaminae by detaching C3 and C5 from C2 and C6 respectively. A high-speed burr was then used for the laminotomy, which was conducted through the midsagittal plane of the spinous processes C5–C3. The lateral parts of the hemilaminae were thinned at the junction between the lamina and the lateral mass, using a high-speed drill. A palpator, introduced in the median laminotomy, could check the adequate weakening of each hemilamina. Each side was then bent laterally while resecting residual parts of the ligamentum flavum with a Kerrison rongeur. The dura was exposed and its posterior migration observed. Hemostasis was performed using bipolar electrocautery and a gelatin foam sponge that was applied to the dura without compression. Iliac crest was harvested to manufacture small bone cubes, used as spacers between the spinous processes, which would maintain the canal enlargement. A hole was drilled through each spinous process and bone graft, thus allowing a fixation using a non-absorbable suture. A deep and a subcutaneous drain were placed and wound closure was performed.

Postoperative information

The patient started ambulation with a walking frame on the first day after surgery. The total hospital stay in a conventional spine surgery department was 5 days, and the patient was then transferred to a rehabilitation center to increase her walking capacity. A soft collar was worn during 4 weeks during ambulation. After 6 weeks, physical therapy was continued on an ambulatory basis. The patient was pain free at this time. The weakness of her arms had significantly recovered, but she was still using crutches when walking.

Discussion and conclusion

Cervical laminoplasty represents a valuable technique for the treatment of multilevel spondylotic myelopathy [1]. The French door technique allows a clear exposure of the dural sac, and bony spacers manufactured from the iliac crest, maintain the enlargement of the spinal canal. It is mandatory to rule out a kyphotic deformity or instability preoperatively, since this would require additional fusion in a lordotic position. Anterior cervical corpectomy represents an alternative technique for the treatment of cervical stenosis [7]. However, multiple level corpectomies are associated with a higher complication rate such as non-union or cage subsidence [8]. We therefore restrict the indication for a corpectomy to one vertebra. More than two levels of stenosis may be treated by laminoplasty, or eventually by a combined anterior and posterior approach if fusion is required.

Conflict of interest None.

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