Lumbar microendoscopic spinal decompression surgery

The indications for microendoscopic spinal decompression surgery for lumbar lesions, which was first reported in 1997 by Foley and Smith [1] as discectomy for lumbar disk herniation, has been used to treat lumbar spinal stenosis.

In microendoscopic decompression surgery using the unilateral approach, the integrity of the facet joint on the side of the surgical approach often needs to be sacrificed to reach the spinal canal, because the lamina is short, especially at the higher lumbar levels. This may lead to fracture of the inferior articular process [2] which can result in iatrogenic low back pain. It is imperative to preserve the facet joint while decompressing the spinal canal to prevent this complication. Some procedures, such as lumbar spinous process-splitting laminectomy [3], muscle-preserving interlaminar decompression (MILD) [4], and microendoscopic MILD [5] have been developed to preserve the facet joint and the paraspinal muscles. The demerits of these procedures, however, is that the integrity of the facet joint can only be preserved at the expense of the spinous process (which is injured) while decompressing the spinal canal from the midline. It has been reported that the facet joints and the spinous processes play important roles in stabilizing the lumbar spine in some cases [6]). It has also been reported that breakdown of the bony contact between spinous processes, the so-called “kissing spines,” often results in subsequent foraminal stenosis [7].

There are earlier reports of bilateral decompression being conducted via the unilateral approach by gouging a part of the spinous process [8] [9] [10].

Bilateral decompression is possible via a unilateral approach, by slanting the microendoscope diagonally and angling the microendoscope to see over to the other side. The nerve roots on the contralateral side can be decompressed through the enlarged laminotomy from the side of the surgical approach. The technique has increased in popularity as a minimally invasive option for LSCS in Japan.

However, there is still room for improving this technique. First, resection of the facet joint on the side of the surgical approach is needed to reach the spinal canal when the distance between the spinous process and facet joint is small, especially at the upper lumbar levels. Second, flavectomy in the region of severe stenosis can be associated with a high risk of a dural tear [11].

Case series

Four hundred eighty LSCS cases involving 753 stenotic lesions limited to the intraspinal canal were treated with microendoscopic decompression by a single surgeon at an institution between November 2006 and January 2015. They were numbered chronologically, and the operating time, intraoperative blood loss, and perioperative complications were investigated. Surgical outcomes were evaluated using the Japanese Orthopedic Association (JOA) score for low back pain before and 1 year after the operation.

The mean operating time per level was 66.1 minutes. There was a progressive reduction in the operating time through the case series, and the approximate curve seemed to be $y = -9.4Ln(x) + 115.0$. The blood loss per level, which showed a mean value of 15.0 mL, was more than 50 mL in only 2.7% of the cases after case no. 30 and in 20% of the cases before it. There were 10 (2.1%) cases of perioperative complications, which occurred even after the surgeon had gained mastery of the procedure. The median JOA score improved significantly from 17 points preoperatively to 26 points postoperatively.

The learning curve of microendoscopic decompression surgery for LSCS has been defined with data for a single surgeon in an institution. The operating time seems to decrease along a natural logarithmic function. The intraoperative blood loss stabilizes after the first 30 cases, whereas perioperative complications can occur at any time even after mastery of the technique [12].

1)
Foley K T, Smith M M. Microendoscopic discectomy. Tech Neurosurg. 1997;2:301–307.
2)
Yoshida M. Kyoto: Kimpodo; 2005. Microendoscopic Discectomy; pp. 63–83.
3)
Watanabe K, Hosoya T, Shiraishi T, Matsumoto M, Chiba K, Toyama Y. Lumbar spinous process-splitting laminectomy for lumbar canal stenosis. Technical note. J Neurosurg Spine. 2005;2(2):405–408.
4)
Hatta Y, Shiraishi T, Sakamoto A. et al. Muscle-preserving interlaminar decompression for the lumbar spine: a minimally invasive new procedure for lumbar spinal canal stenosis. Spine. 2009;2(2):E276–E280.
5)
Yanagisawa K, Mikami Y, Hatta Y, Hase H, Koyama K, Kubo T. New microendoscopic decompression method via midline interlaminar approach for lumbar canal stenosis: microendoscopic muscle preserving interlaminar decompression; ME-MILD. Surgical Technique for Spine and Spinal Nerves. 2006;2:105–108.
6)
Murata H Hachiya Y Muramatsu K Onitake H Unilateral microscopic decompression for spinal canal stenosis in upper lumbar lesions Surgical Technique for Spine and Spinal Nerves 2008. 2133–137.137(Jpn
7)
Itoi A, Shimamura Y, Muta T, Kaneko K. Problems of the posterior lumbar approach technique that does not keep kissing spines. J Spine Res. 2010;2:1449–1456.
8)
Nishijima Y. Unilateral microdecompression for lumbar spinal canal stenosis. Surgical Technique for Spine and Spinal Nerves. 2007;2:40–44.
9)
Palmer S, Turner R, Palmer R. Bilateral decompression of lumbar spinal stenosis involving a unilateral approach with microscope and tubular retractor system. J Neurosurg. 2002;2(2):213–217.
10)
Poletti C E. Central lumbar stenosis caused by ligamentum flavum: unilateral laminotomy for bilateral ligamentectomy: preliminary report of two cases. Neurosurgery. 1995;2(2):343–347.
11)
Nomura K, Yoshida M. Microendoscopic Decompression Surgery for Lumbar Spinal Canal Stenosis via the Paramedian Approach: Preliminary Results. Global Spine J. 2012 Jun;2(2):87-94. doi: 10.1055/s-0032-1319774. PubMed PMID: 24353952; PubMed Central PMCID: PMC3864472.
12)
Nomura K, Yoshida M. Assessment of the Learning Curve for Microendoscopic Decompression Surgery for Lumbar Spinal Canal Stenosis through an Analysis of 480 Cases Involving a Single Surgeon. Global Spine J. 2017 Feb;7(1):54-58. doi: 10.1055/s-0036-1583943. Epub 2017 Feb 1. PubMed PMID: 28451510; PubMed Central PMCID: PMC5400167.