INTRODUCTION

With the aging of the world’s population, particularly in Europe, the United States, and other developed and developing countries, like Brazil, the treatment of lumbar spinal stenosis (LSS) has become an important issue in the approach to degenerative diseases of the spine. This pathology is the most common motive for lumbar spine surgery in people older than 65 years of age in the United States.1 The prevalence of LSS and its associated costs should parallel the growth in the number of people 60 years old or older, which is expected to quadruple to approximately 2 billion worldwide by the year 2050.1

In the United States, the incidence of surgery for LSS increased eightfold from 1979 to 1992.2 Studies with high levels of evidence

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have proven that surgical decompression is more effective, both from the clinical perspective and in the cost-benefit analysis, when compared to conservative therapy.\(^3\)\(^4\)

The classic surgical procedures used to treat LSS result in the destruction or dysfunction of the zygapophysial joints, posterior ligamentous complex, and paravertebral muscles, leading to instability of the vertebral segment involved.\(^6\)\(^8\)

Over the last two decades, minimally invasive procedures have emerged as treatment alternatives for various spine pathologies. These procedures have the common goal of avoiding the biomechanical complications associated with some traditional surgical methods.\(^7\) The Unilateral Laminotomy for Bilateral Microcompression (ULBM) was first described in the 1980s, and was modified, reproduced, and published by Weiner et al.\(^6\) and McCulloch et al.\(^8\) and other European authors in the 1990s.\(^9\) This procedure is characterized by the fact that it maintains the integrity and stability of the spine, preserving the tissues not involved in the physiopathology of LSS, and providing adequate decompression of the neural structures located in the spinal canal.\(^7\)

METHODOLOGY

The objective of this study is to describe the details of the Unilateral Laminotomy technique for Bilateral Microcompression of Lumbar Spinal Stenosis and the current clinical results, including its advantages, disadvantages, and common complications, based on the available literature.

To this end, a search of articles in the CAPES portal was conducted using the terms “Microcompression + spinal + stenosis”, “Microsurgical + spinal + stenosis”, and “unilateral laminotomy for bilateral decompression”, without any date restrictions, resulting in 55 articles for the first search (23 after eliminating duplicates), 164 for the second (83 after eliminating duplicates), and 135 for the third (55 after eliminating duplicates). Of these, only those that presented the clinical results of the procedure in question, with detailed descriptions or reviews of the topic, were selected.

RESULTS

The patient is positioned in ventral decubitus, the standard position for spinal procedures. Decompression is achieved by partial resection of the upper and lower parts of the laminar arch of the affected level for one or more levels or by hemilaminectomy by decompression of the two consecutive levels, partial medial resection of the ipsilateral facet joints and of the central part of the base of the spinous process, and complete removal of the ligamentum flavum. The contralateral ligamentum flavum and the medial portion of the contralateral facet joint are also removed for contralateral decompression.\(^6\)\(^8\)\(^9\) This process allows visualization of the entire posterior surface of the dural sac, the contralateral nerve root, and the foramens. If necessary, discectomy and foraminotomy can be performed. (Figures 1, 2, 3 and 4)

In a biomechanical study using swine models, published in BMC Musculoskeletal Disorders in 2008, the authors demonstrated that during movements of flexion, displacement of the intervertebral segments submitted to total laminectomy in segments L4-L5 was significantly greater than in those that were intact or had undergone bilateral laminectomy ($P=0.0000963$ and $P=0.0000963$, respectively). Moreover, no differences were found between the intact and bilateral laminotomy groups ($P>0.05$). In movements of extension, there was no significant difference in displacement among the three groups.\(^10\)

In 1999, Weiner et al.\(^6\) after describing the ULBM technique in detail, presented the results of their case series. Thirty patients underwent surgery and prospective follow-up. Of these, 16 were women and 14 were men, with an average age of 68. Following surgery, the average neurogenic claudication score rose from 32 to 67 on a scale with a maximum score of 100 (with 100 representing the asymptomatic patient). Twenty-six (26) patients thought that their outcomes were good to excellent. No intraoperative complications were observed. Four (4) patients required drainage of abundant wound secretions, one of which, when cultured, tested positive for $S. aureus$.\(^6\)

In a prospective analysis, Kato et al.\(^11\) identified facet joint synovial cysts in 38 (16.5%) out of 230 patients who had undergone ULBM during one year of follow-up. Twenty-four (24) of them had...
ninety-four (92.2%) of the 102 patients available for follow-up exams that 130 (97.7%) showed immediate improvement following surgery.

The average Japaneese Orthopedic Association Score (JOA) of patients with cysts at one year following surgery was significantly less than that of patients without cysts. This result was generated by the presence of lower back pain that did not improve, despite conservative treatment. Most patients with spontaneous disappearance of cysts still had no symptoms a year later. The preoperative risk factors for cyst formation were instability, anterior-posterior translation greater than 3 mm in flexion-extension (OR 2.47, P = 0.26), scoliotic disc with wedge > 5° in AP radiograph (OR 2.23, P = 0.048), and change in sagittal balance, and distance > 50 mm from the promontory to the C7 plumb line (OR 2.22, P = 0.045).

In a 5-year follow-up published in 2011, Toyoda H et al. presented the following findings from a series of 57 patients (27 with LSS without instability, 20 with degenerative spondylolisthesis (DS), and 10 with degenerative lumbar scoliosis (DLS)) with neurogenic claudication who underwent ULMB. The average JOA score was 13.8 ± 3.6 points prior to surgery, improving to 24.9 ± 3.1 points after one year following surgery. The average JOA score improved significantly in a comparison of preoperative and last follow-up evaluation values, with the exception of already existing lower back pain. There were no significant differences between preoperative and postoperative radiological findings. Thirteen patients (61.9%) had good to excellent results. Two patients underwent subsequent lumbar surgery consisting of arthrodesis to treat foraminal stenosis and lumbar instability with persistent lower back pain. Two (10.5%) surgery-related complications were observed: dehiscence of a surgical wound, and a deep infection of the surgical wound. Both patients recovered without sequela.

DISCUSSION

Most studies of surgical treatment of LSS demonstrate that both ULBM and laminectomy can significantly improve the Oswesty Disability Index (ODI) and the Visual Analog Scale for Pain (VAS) for both interventions (p < 0.001 for both groups). Furthermore, the patients treated with ULBM had a significantly better improvement in the VAS scale (p = 0.013), but not in the ODI (p = 0.055) when compared with the patients who underwent laminectomies. The group treated with ULBM had shorter postoperative hospitalizations (55.1 vs. 100.8 hours, p = 0.0041) and shorter mobilization times (15.6 vs. 33.3 hours, p < 0.001) and used fewer opioids for postoperative pain (51.9% vs. 15.4%, p = 0.046).

The only randomized clinical trial found comparing ULBM with Laminectomy showed significant improvements in the Oswestyi Disability Index (ODI) and the Visual Analog Scale for Pain (VAS) for both interventions (p < 0.001 for both groups). Furthermore, the patients treated with ULBM had a significantly better improvement in the VAS scale (p = 0.013), but not in the ODI (p = 0.055) when compared with the patients who underwent laminectomies. The group treated with ULBM had shorter postoperative hospitalizations (55.1 vs. 100.8 hours, p = 0.0041) and shorter mobilization times (15.6 vs. 33.3 hours, p < 0.001) and used fewer opioids for postoperative pain (51.9% vs. 15.4%, p = 0.046).
among others, which also impact treatment costs.

The possible disadvantages of ULBM include difficulty in manipulating the instruments through a small portal, which can increase the risk of dural sac lesions and liquoric fistulae, higher rates of recurrence and of reoperation because of inadequate decompensation, and an increase in surgical time due to a steep learning curve.\(^\text{17}\)

However, this review reveals a lack of studies with the adequate control groups and methodological designs to compare effectiveness between ULBM and laminectomy. Additionally, the disparity between the variables measured, follow-up time, size and heterogeneity of the samples published to date makes a comparison of study results unfeasible.

REFERENCES


