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THE MICROSCOPIC AND ENDOSCOPIC TECHNIQUES IN LUMBAR DISCECTOMY: A SYSTEMATIC REVIEW

A TÉCNICA MICROSCÓPICA E ENDOSCÓPICA NA DISCECTOMIA LOMBAR: UMA REVISÃO SISTEMÁTICA

LA TÉCNICA MICROSCÓPICA Y ENDOSCÓPICA EN LA DISCECTOMÍA LUMBAR: UNA REVISIÓN SISTEMÁTICA

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ABSTRACT

Objectives: To compare microdiscectomy (MD) and endoscopic interlaminar discectomy (EID) as methods for the surgical treatment of lumbar disc herniation, describing their efficiency in reducing hospitalization time, pain, and neurological deficit, and comparing the findings and the quality of studies that used the microscopic and endoscopic techniques. Methods: A systematic literature review that used the PRISMA protocol as a methodology. The search was conducted in the PUBMED/MEDLINE and The Cochrane Library databases, using publications from the last 5 years in Portuguese and English. After applying the inclusion and exclusion criteria and validating the qualified studies via STROBE and CONSORT, there were a total of 16 studies for data compilation. Results: A sample of 1004 patients who underwent lumbar discectomy was obtained, 62% of whom were male, and 493 of whom underwent EID (49%) and 511 MD (51%). The mean patient age was 38.7 years and the predominant vertebral level operated was L5-S1 (64.8%). The EID had shorter surgical time (66.38 min) and hospitalization time (3.3 days), in addition to greater variation in the VAS LLLL score (5.38), while the MD presented greater variation in the VAS LUMBAR score (3.14). Conclusion: EID demonstrated efficacy like that of MD, given the similarity in the results obtained, in addition to non-inferiority in the reduction of pain and neurological deficit, and superiority in surgical and hospitalization times. ***Level of Evidence I; Systematic review.***

Keywords: Diskectomy; Microsurgery; Endoscopy.

RESUMO

Objetivo: Comparar a microdiscectomia (MD) e a discectomia endoscópica interlaminar (DEI) como métodos de tratamento cirúrgico da hérnia de disco lombar, descrevendo a sua eficiência quanto à redução do tempo de hospitalização, da dor e do déficit neurológico e comparando os achados e a qualidade de estudos que utilizaram as técnicas microscópica e endoscópica. Métodos: Revisão sistemática da literatura que utilizou o protocolo PRISMA como metodologia. A busca foi realizada nas bases de dados: PUBMED/MEDLINE e The Cochrane Library, utilizando publicações dos últimos 5 anos, em português e inglês. Aplicados os critérios de inclusão e exclusão, bem como a validade dos estudos qualificados via STROBE e CONSORT, totalizaram 16 estudos para compilação de dados. Resultados: Foram obtidas amostras de 1.004 pacientes submetidos à discectomia lombar, sendo 493 com DEI (49%) e 511 com MD (51%), do sexo masculino (62%), média de idade de 38,7 anos e o nível vertebral L5-S1 (64,8%) como mais prevalente. A DEI mostrou menor tempo cirúrgico (66,38 min.) e de hospitalização (3,3 dias), além de maior variação no escore EVA MMII (5,38), enquanto a MD apresentou maior variação na EVA Lombar (3,14). Conclusões: A DEI demonstrou eficácia similar à MD diante dos resultados obtidos, além da não inferioridade na redução da dor e do déficit neurológico e da superioridade no tempo de cirurgia e de hospitalização. ***Nível de Evidência I; Revisão sistemática.***

Descritores: *Discotomia; Microcirurgia; Endoscopia.*

RESUMEN

Objetivos: Comparar la microdiscectomía (MD) y la discectomía endoscópica interlaminar (DEI) como métodos de tratamiento quirúrgico de la hernia de disco lumbar, describiendo su eficiencia para reducir el tiempo de hospitalización, el dolor y el déficit neurológico y comparando los hallazgos y la calidad de los estudios que utilizaron la técnicas microscópicas y endoscópicas. Métodos: Revisión sistemática de la literatura que utilizó el protocolo PRISMA como metodología. La búsqueda se realizó en las bases de datos: PUBMED / MEDLINE y The Cochrane Library, utilizando publicaciones de los últimos 5 años, en portugués e inglés. Tras aplicar los criterios de inclusión y exclusión, así como la validez de estudios calificados a través de STROBE y CONSORT, se recopilaron un total de 16 estudios para la compilación de datos. Resultados: Se obtuvieron muestras de 1004 pacientes sometidos a discectomía lumbar, 493 con DEI (49%) y 511 con MD (51%), hombres (62%), edad promedio de 38,7 años y el nivel vertebral L5-S1 (64,8%) como más prevalente. La DEI mostró un menor tiempo quirúrgico (66,38 min) y de hospitalización (3,3 días), además

Study conducted at the Escola Bahiana de Medicina e Saúde Pública (EBMSP) – Salvador (BA), Brazil.
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de una mayor variación en el puntaje EVA MMII (5,38), mientras que el MD presentó una mayor variación en el EVA Lumbar (3,14). Conclusiones: DEI demostró una eficacia similar a la MD mediante los resultados obtenidos, además de la no inferioridad en la reducción del dolor y del déficit *neurológico, y de la superioridad en el tiempo de cirugía y hospitalización.* ***Nivel de Evidencia I; Revisión Sistemática.***

Descriptores: *Discectomía; Microcirurgia; Endoscopía.*

INTRODUCTION

Disc herniation, defined as the process of posterior herniation of the disc content beyond its anatomical space, due to the appearance of radial fissures in the fibrous ring of the intervertebral disc and leading to the extravasion of the nucleus pulposus,[1] is one of the main causes of lumbosciatic pain. Such fissures result from a process of disc degeneration, caused by a prolonged period of mechanical stress that the spine of the individual suffers during their life.[2,3]

The phenomenon of spontaneous reabsorption of the herniated content by the body has been reported in the literature, based on computed tomography and magnetic resonance findings, with an overall incidence of approximately 66.66%.[4,5] However, in some cases this herniated fragment tends to compress adjacent nerve structures, such as the nerves that emerge and converge through the intervertebral foramen, or even the cauda equina itself, causing greater morbidity.[1] This compressive radiculopathy caused by the disc content varies according to the degree of compression of the nerve structures, and can generate a process of radicular pain, or even sensory/motor dysfunction of the lower limbs, such as paresis and paresthesia.[2,6]

An indication of elective surgery is based on the convergence between the patient's history and their physical examination, imaging tests that confirm intervertebral disc herniation, and the presence of pain refractory to at least six weeks of conservative treatment. The surgical approach is superior to conservative treatment in relieving symptoms and in functional improvement when clinical conditions persist, with an absolute indication for the cauda equina syndrome or severe paresis, which require immediate surgical treatment.[7,8] Related indications include sciatica that does not respond to a minimum of six weeks of conservative treatment, motor deficit higher than grade 3 associated with sciatica for more than six weeks or radicular pain associated with foraminal stenosis.[8] In addition, other factors like the patient`s lifestyle, pain tolerance, understanding of the procedure, and knowledge of the postoperative process must be considered when the surgeon and the patient opt for surgery.[2,6,9]

Surgical treatment for a herniated disc consists of total removal of the herniated content outside of its anatomical limit, decompressing the adjacent nerve roots. Given this objective, surgical techniques have been developed over decades, with the goal of reducing the area of surgical manipulation, providing better recovery and better aesthetic results.[5,9]

Currently, the most used procedure for surgical treatment of lumbar disc herniation is microdiscectomy, which is an open procedure performed using a surgical microscope, reducing the size of the skin and muscle tissue incision. Recently and analogously, the endoscopic technique emerged with the aim of minimizing even further the tissue trauma caused by the surgical procedure, reducing the area of surgical manipulation, and providing considerable postoperative benefits for the patient.[2,6,10,11]

Although the literature describes significant results from the endoscopic technique, more studies comparing it with already established techniques, such as microdiscectomy must be conducted. Therefore, the objective of this systematic review is to compare the open microscopic technique and the endoscopic technique as tools for the surgical treatment of lumbar disc herniation, describing the efficiency of the techniques based on the length of hospitalization, the pain, and the neurological deficit present, as well as the findings and the quality of the studies that use the microscopic and endoscopic techniques.

METHODS

Study design and search strategy

This is a systematic literature review that used a systematized methodology based on the PRISMA protocol.[12] The search was performed in the MEDLINE/PubMed (U.S. National Library of Medicine/ Public Medicine Library) and The Cochrane Library electronic data sources using a combination of descriptors, including the Medical Subject Headings (MeSH) terms. The descriptors used together were: ((((“microdiscectomies”[All Fields] OR “microdiscectomy”[All Fields]) OR (“full-endoscopic”[All Fields] AND “interlaminar”[All Fields] AND (((“diskectomy”[MeSH Terms] OR “diskectomy”[All Fields]) OR “discectomies”[All Fields]) OR “discectomy”[All Fields])))) AND ((((((((“lumbarised”[All Fields] OR “lumbarization”[All Fields]) OR “lumbarized”[All Fields]) OR “lumbars”[All Fields]) OR “lumbosacral region”[MeSH Terms]) OR (“lumbosacral”[All Fields] AND “region”[All Fields])) OR “lumbosacral region”[All Fields]) OR “lumbar”[All Fields]) AND ((((“intervertebral disc displacement”[MeSH Terms] OR ((“intervertebral”[All Fields] AND “disc”[All Fields]) AND “displacement”[All Fields])) OR “intervertebral disc displacement”[All Fields]) OR (“disc”[All Fields] AND “herniated”[All Fields])) OR “disc herniated”[All Fields])))) OR (“lumbosacral”[All Fields] AND ((((“intervertebral disc displacement”[MeSH Terms] OR ((“intervertebral”[All Fields] AND “disc”[All Fields]) AND “displacement”[All Fields])) OR “intervertebral disc displacement”[All Fields]) OR (“disc”[All Fields] AND “herniated”[All Fields])) OR “disc herniated”[All Fields])))) OR ((((((((“lumbarised”[All Fields] OR “lumbarization”[All Fields]) OR “lumbarized”[All Fields]) OR “lumbars”[All Fields]) OR “lumbosacral region”[MeSH Terms]) OR (“lumbosacral”[All Fields] AND “region”[All Fields])) OR “lumbosacral region”[All Fields]) OR “lumbar”[All Fields]) AND (((((((“decompress”[All Fields] OR “decompressed”[All Fields]) OR “decompresses”[All Fields]) OR “decompressing”[All Fields]) OR “decompression”[MeSH Terms]) OR “decompression”[All Fields]) OR “decompressions”[All Fields]) OR “decompressive”[All Fields])))) AND ((((“clinical trial”[Publication Type] OR “observational study”[Publication Type]) OR “randomized controlled trial”[Publication Type]) AND 2015/6/3:3000/1/1[Date - Publication]) AND “humans”[MeSH Terms]).

Inclusion and exclusion criteria of the sample

The population studied in this review comprised patients of both sexes, above 18 years of age, who underwent surgical treatment for lumbar disc herniation, via open microdiscectomy or endoscopic discectomy. The pre- and postoperative visual analog scale (VAS) values obtained for the lumbar region and lower limbs, the demographic data, and the duration of each surgical procedure were compared.

Retrospective and prospective observational studies, cohort studies, and randomized trials found in the previously mentioned databases were selected. Only articles written in English or Portuguese and studies involving human beings were included. Works that diverged from the proposed topic, studies published more than five years before, and systematic reviews were excluded.

Data identification and selection

Studies published between October 2019 and June 2020 were selected. The authors responsible for the study performed a reading of the title and abstract of each preselected paper, separately identifying articles that correctly met the inclusion and exclusion criteria. After this stage, a full reading of the articles respecting the criteria set out in the abstract was conducted, and in cases of doubt, both researchers met to make a consensual decision.

Data extraction

After selection of the articles for data analysis, the following characteristics were extracted from the studies: author, year of publication, scientific journal where published, type of study, sample size, methods and criteria analyzed, surgical time, and pre- and postoperative surgical results of the technique performed in the study (lower limb and lumbar VAS and hospitalization time). The data analyzed were classified by visual analog score (VAS) to compare the degrees of pre- and postoperative neurological deficit and hospitalization time, as well as the intra-hospital recovery time necessary after each surgical procedure.

Assessment of the methodological quality of the selected articles

To evaluate the methodological quality of the selected articles, both authors separately filled out a checklist based on the Consolidated Standards of Reporting Trials (CONSORT) for the analysis of clinical trials, and the studies that met at least 14 of the 25 CONSORT criteria were included. The other checklist was based on Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) for the analysis of observational studies, and the studies that met a minimum of 18 of the 22 STROBE criteria were included.

Statistical analysis

After the collection period, the data selected were recorded in a Microsoft Excel spreadsheet created for the current study. Then, the recorded data were submitted for statistical analysis using the same program.

RESULTS

The search process to identify the articles to be analyzed yielded 184 articles from the previously mentioned platforms and 11 articles found through other sources, which appeared to be compatible with the topic. There were no duplicates among these 195 works, but 160 studies were excluded because they did not relate to the topic of this review, leaving 35 original articles for full text analysis. Thirteen of these studies were excluded because the text was not consistent with the review, because they did not address the criteria to be analyzed, or because only a draft of the paper was presented with no explanation of the results. The remaining 22 articles underwent both qualitative and quantitative analysis, and 6 articles which did not meet the predetermined minimum scores of 14 and 18 points for the CONSORT and STROBE instruments, respectively, were excluded, concluding the selection process with a final sample of 16 articles, as shown in Figure 1.

From the 16 selected articles, shown in Table 1, we obtained a total sample of 1004 patients who underwent surgical treatment for lumbar disc herniation. Of these, 493 were operated using the endoscopic interlaminar technique and 511 using the open microscopic technique. There was a predominance of males (62%), a mean age of 38.7 years, and the most prevalent location (64.8% of cases) was vertebral level L5-S1, as shown in Table 2.

The mean follow-up times of the articles that analyzed the open microscopic and endoscopic discectomy techniques were 34 and 24.5 months, respectively. Regarding the surgical time, there was a reduction in the average time in the endoscopic technique (66.38 min), compared to the microscopic technique (78.3 min), represented in Table 3. The analysis of surgical procedure efficiency according to the lumbar VAS and lower limb VAS (LLLL VAS) showed that the endoscopic technique provided patient improvement of 51.97% (lumbar VAS) and 76.74% (LLLL VAS), while the open microscopic technique percentages were 54.7% (lumbar VAS) and 69.1% (LLLL VAS), with a mean follow-up time of 21.6 months for endoscopic discectomy and 34 months for microdiscectomy, as shown in Tables 4 and 5.

A difference between the initial mean lumbar VAS scores for the endoscopic and microscopic techniques can be observed in Figure 2, suggesting a distinction between the patients submitted to each of the techniques. However, we can identify a greater variation for microdiscectomy, even though this technique did not score the lowest final follow-up values. In Figure 3, the mean initial lower limb VAS (LLLL VAS) values of both techniques are similar, suggesting greater commonality between the clinical statuses of the two patient groups. The endoscopic technique had a greater variation between the initial and final LLLL VAS values, in addition to scoring a lower mean value, indicating a better clinical outcome than microdiscectomy.

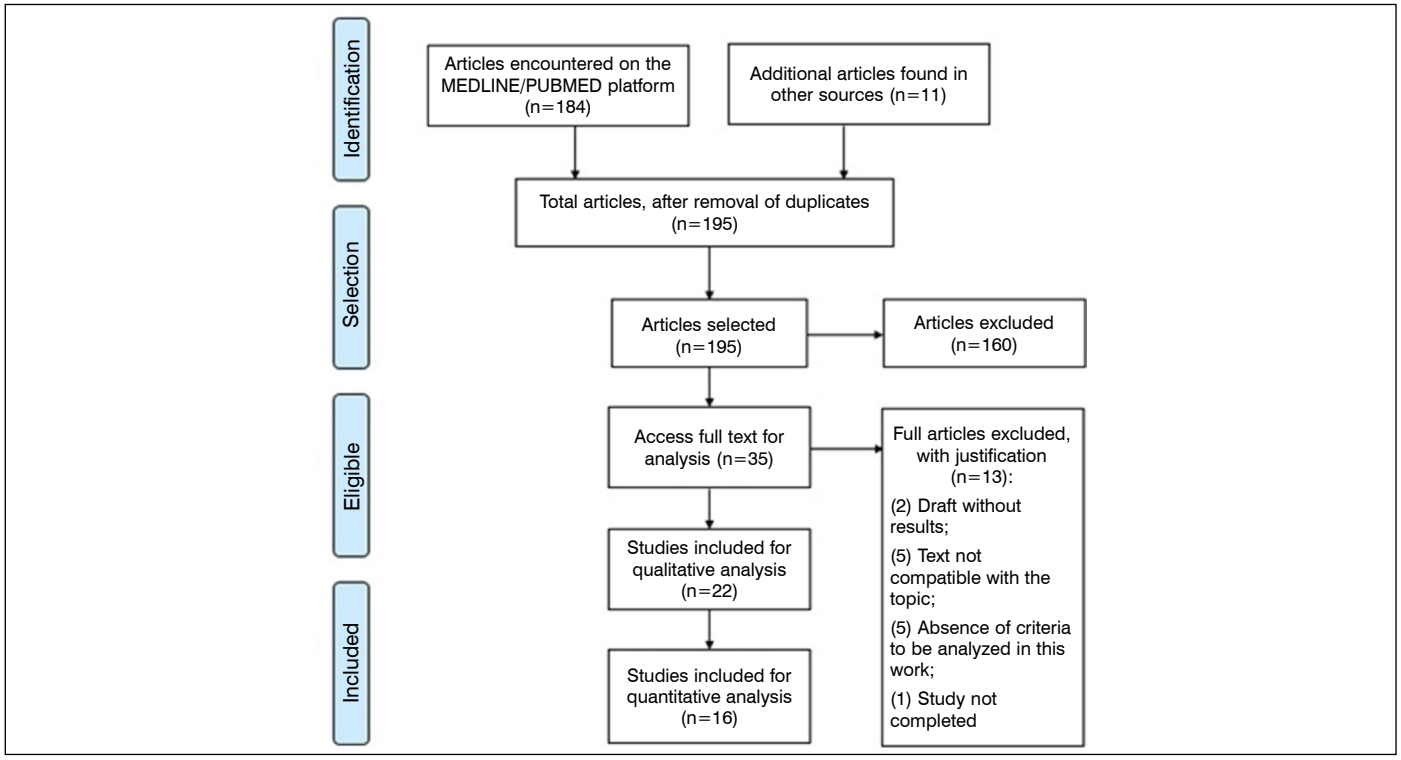

Figure 1. Study selection flowchart.

Table 1. Characteristics of the studies selected for review (n=16).

Author	Year	Publication journal	Keywords	Study design	Sample	Characteristics evaluated	Approaches analyzed
Ahn et al.[13]	2019	Pain Physician	Endoscopic; discectomy; hospital stay; lumbar disc; microscopic; operative time; return to work; transforaminal	Cohort	298	Age, sex, BMI, level of herniation, preoperative lumbar VAS, preoperative leg VAS, preoperative ODI, postoperative lumbar VAS, postoperative leg VAS, postoperative ODI, modified MacNab criterion, postoperative complications, reoperation, surgical time, hospitalization time, time to return to work, time to herniation recurrence.	Microdiscectomy/ endoscopic transforaminal discectomy
Kong et al.[14]	2019	Orthopade	Intervertebral disc diseases; Lumbar vertebrae; Postoperative blood loss; Root canal; Visual analog scale	Randomized clinical trial	40	Age, sex, duration of symptoms, motor or sensory deficit, location of herniation, surgical time, blood loss, preoperative leg VAS, postoperative leg VAS, preoperative lumbar VAS, postoperative lumbar VAS, preoperative ODI, postoperative ODI, hospitalization costs, hospitalization time, postoperative complications	Endoscopic interlaminar discectomy/ microsurgical laminectomy
Segura-Trepichio et al.[15]	2018	Journal of Clinical Neuroscience	Lumbar disc herniation; Discectomy; Microdiscectomy; Patient related outcomes; Length of stay; In-hospital costs; Surgical safety; Readmission; Re-operation	Observational retrospective	30	Age, sex, BMI, tobacco use, vertebral levels treated, Charlson comorbidity index, preoperative ODI, preoperative axial VAS, preoperative lumbar VAS, postoperative ODI, postoperative axial VAS, postoperative lumbar VAS	Microdiscectomy
Tu et al.[16]	2018	Pain Physician	Adolescent lumbar disc herniation; full-endoscopic interlaminar discectomy; sciatic scoliosis; recurrence	Observational retrospective	74	Age, sex, duration of symptoms, trauma, BMI, level of herniation, type of herniation, surgical time, hospitalization time, complications, recurrence, preoperative leg VAS, preoperative lumbar VAS, preoperative ODI, postoperative leg VAS, postoperative lumbar VAS, postoperative ODI, modified MacNab criterion, radiological results of the group with scoliosis	Endoscopic interlaminar discectomy
Hua et al.[17]	2018	Medicine	Discectomy; Foraminoplasty; Full-endoscopic visualization technique; General anesthesia; Interlaminar approach; Laminectomy; Transforaminal approach	Observational retrospective	60	Age, sex, type of hernia, symptoms, neurological changes, preoperative leg VAS, preoperative lumbar VAS, preoperative ODI, postoperative leg VAS, postoperative lumbar VAS, postoperative ODI, MacNab criterion, surgical time, surgical complications, reoperation.	Endoscopic interlaminar discectomy
Shi et al.[18]	2018	BioMed Research International	-	Randomized clinical trial	22	Age, sex, duration of symptoms, type of hernia, presence of disc calcification, preoperative VAS, preoperative ODI, postoperative VAS, postoperative ODI, MacNab criterion, surgical time, volume of disc tissue removed, postoperative complications	Endoscopic interlaminar discectomy
Hua et al.[19]	2018	Medicine	Discectomy; full-endoscopic; interlaminar approach; laminectomy	Observational retrospective	84	Age, sex, location of herniation, type of herniation, pain, neurological changes, preoperative leg VAS, postoperative leg VAS, surgical complications, surgical time, hospitalization time, recovery time, reoperation, MacNab criterion	Endoscopic interlaminar discectomy
Brouwer et al.[20]	2017	Interventional Neuroradiology	Minimally invasive; spine intervention; disk herniation; laser; percutaneous laser disc decompression	Randomized clinical trial	115	Age, sex, BMI, tobacco use, time of sciatica, neurological changes in LLLL, pain, level of herniation, Roland disability questionnaire, lumbar VAS, leg VAS, preferred method, surgical time	Microdiscectomy/ Percutaneous laser discectomy

Song et al.[21]	2017	Journal of Orthopaedic surgery and research	Clinical outcome; Full endoscopy; Herniated nucleus pulposus; Interlaminar approach; Intermittent endoscopy; Intracanalicular disc herniation; MacNab criteria; Percutaneous endoscopic lumbar discectomy	Observational retrospective	126	Age, sex, type of herniation, leg pain, low back pain, neurological symptoms, duration of pain, surgical time, recovery time, hospitalization time, hospital costs, preoperative VAS, preoperative ODI, MacNab evaluation, additional conditions, postoperative complications	Total endoscopic interlaminar discectomy/intermittent endoscopic interlaminar discectomy
Overdevest et al.[22]	2017	Journal of Neurology, Neurosurgery and Psychiatry	Herniation; lumbar disc; minimal invasive; surgery; tubular discectomy.	Randomized clinical trial	325	Age, sex, BMI, time of sciatica, neurological changes, level of herniation, physical functionality, Roland-Morris questionnaire for sciatica (RDQ), preoperative leg VAS, preoperative lumbar VAS, postoperative leg VAS, postoperative lumbar VAS, self-perception of improvement, surgery wait time, need for reoperation	Microdiscectomy/ Tubular discectomy
Gibson et al.[23]	2017	European Spine Journal	Lumbar discectomy; Microdiscectomy; Transforaminal endoscopic surgery; Randomized controlled trial	Randomized clinical trial	143	Age, sex, weight, tobacco use, duration of symptoms, work, level of herniation, type of hernia, preoperative lumbar VAS, preoperative leg VAS, preoperative ODI, postoperative lumbar VAS, postoperative leg VAS, postoperative ODI, SF-36 index, hospitalization time, reoperation	Microdiscectomy/ endoscopic transforaminal discectomy
Nakamura et al.[24]	2017	Pain Physician	Clinical outcome; Herniated nucleus pulposus; Interlaminar approach; Intracanalicular disc herniation; Learning curve; MacNab criteria; Percutaneous full-endoscopic lumbar discectomy	Observational retrospective	50	Age, sex, location of herniation, type of herniation, preoperative leg VAS, postoperative leg VAS, surgical complications, surgical time, hospitalization time, reoperation, blood loss, MacNab criterion	Endoscopic interlaminar discectomy
Cristante et al.[25]	2016	Clinics	Discectomy, percutaneous discectomy, low back pain, spine	Randomized clinical trial	40	Age, sex, race, education level, marital status, manual labor, opioid use, current work, government assistance, time on leave, duration of pain, preoperative lumbar VAS, preoperative leg VAS, preoperative ODI, postoperative lumbar VAS, postoperative leg VAS, postoperative ODI	Microdiscectomy/ hydrodiscectomy
Choi et al.[26]	2016	Pain Physician	Large lumbar disc herniation, percutaneous endoscopic lumbar discectomy, microdiscectomy, back pain, disc height	Observational retrospective	43	Age, sex, level of herniation, duration of symptoms, occupation, disc location, preoperative lumbar VAS, preoperative leg VAS, preoperative ODI, improvement in lumbar VAS, improvement in leg VAS, ODI improvement, rate of satisfaction with the surgery, preoperative disc weight, postoperative disc weight, preoperative segmental angle, postoperative segmental angle, surgical time, hospitalization time, time to return to work	Microdiscectomy/ endoscopic discectomy
Joswig et al.[27]	2016	Journal of Neurological Surgery, Part A: Central European Neurosurgery	Full-endoscopic lumbar diskectomy; learning curve; minimally invasive; percutaneous endoscopic lumbar diskectomy; recurrence rate	Observational retrospective	68	Age, sex, level of herniation, side of herniation, duration of pain, preoperative leg VAS, postoperative leg VAS, preoperative lumbar VAS, postoperative lumbar VAS, intensity of preoperative pain, intensity of postoperative pain, opioid use, quality of life scales, surgical time, recurrence, postoperative complications, blood loss, hospitalization time, spine surgeon learning curve, difficulties in each procedure	Endoscopic interlaminar discectomy
Dabo et al.[28]	2016	Pain Physician	Lumbar disc herniation; percutaneous endoscopic lumbar discectomy; interlaminar approach; calcification	Observational retrospective	30	Age, sex, BMI, level of herniation, type of herniation, hospitalization time, surgical time, MacNab criteria, CT diagnostic value, preoperative leg VAS, postoperative leg VAS, preoperative ODI, postoperative ODI	Endoscopic interlaminar discectomy

Table 2. Summary demographic data for the patients in each study (n = 16).

	Endoscopic interlaminar technique		Microscopic technique	
Sample	493 (49%)		511 (51%)	
Sex (M / F)	336 (68%)	157 (32%)	296 (58%)	215 (42%)
AGE	36.77		40.7	
*Location of the herniation (L4-L5 / L5-S1)	162 (32%)	419 (85%)	194 (38%)	238 (46%)

*Among the selected articles, Crisante et al. (26), Shi et al. (19), and Hua et al. (18) did not describe the level where the herniation was found, and other studies included patients with herniations at more than one level, generated percentage values that do not total, or exceed, 100%.

Table 3. Temporal data values for each technique, showing sample size, surgical time, hospitalization, and study follow-up (n = 16).

	Sample (N)	Surgical time (MIN)	Hospitalization (Days)	Follow-up (Months)
Endoscopic technique	493	66.38	3.3	24.5
Microscopic technique	511	78.3	3.6	34

Table 4. Clinical results by technique, according to lumbar VAS in each follow-up period (n=13).

	Preoperative lumbar VAS	Lumbar VAS 6 months	Lumbar VAS 12 months	Final lumbar VAS
Endoscopic technique	4.31	2.05	1.58	2.07
Microscopic technique	5.74	2.74	2.49	2.60

Table 5. Clinical results by technique, according to lower limb VAS in each follow-up period (n=14).

	Preoperative LLLL VAS	LLLL VAS 6 Months	LLLL VAS 12 Months	Final LLLL VAS
Endoscopic technique	7.01	1.29	0.92	1.63
Microscopic technique	7.03	2.11	1.99	2.17

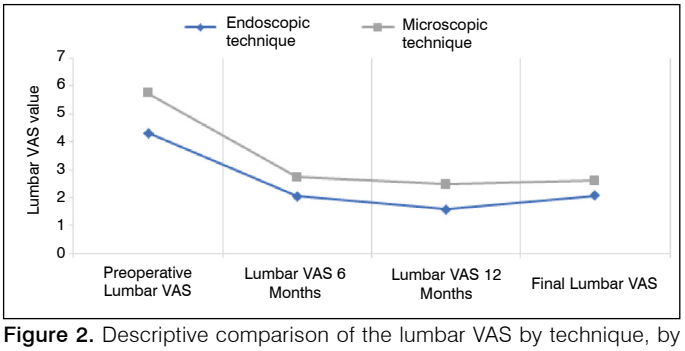

Figure 2. Descriptive comparison of the lumbar VAS by technique, by follow-up period.

DISCUSSION

This systematic review compared the clinical results obtained within the last 5 years in each study, following correction of lumbar disc herniation by the open microscopic or the endoscopic technique. In view of the results obtained in this study, we observed a similarity between the techniques when we analyze efficiency, represented by the reduction in the lumbar VAS and LLLL VAS.

The main objective of using new minimally invasive techniques is to minimize the trauma and long-term harm caused by surgery.[3,29] Surgical correction of lumbar disc herniation using the endoscopic technique has produced satisfactory results in reducing the pain reported by the patient, as well as a reduction in neurological deficits and tissue damage inherent to the procedure.

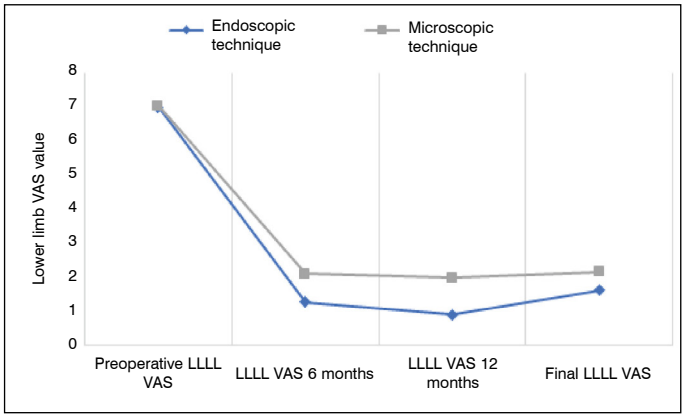

Figure 3. Descriptive comparison of LLLL VAS by technique and by follow-up period.

Ruetten et al.[11] conducted a randomized clinical trial with 200 patients with a 2-year follow-up, comparing the clinical results of the endoscopic (interlaminar and transforaminal) and conventional microsurgical techniques. This study showed similar reductions in lower limb pain in both groups, demonstrating that there was no significant clinical difference and both groups had the same herniated disc recurrence rate (6.2%). However, the endoscopic technique had the advantage of reduced medication use and recovery time, while the conventional technique provided a greater reduction in lumbar pain.

In 2014, Rasouli et al.[6] also conducted a systematic review comparing the above-mentioned techniques by means of the variables lumbar VAS and sciatica measurements, neurological deficits of the extremities or urinary incontinence, specific sciatica symptoms, using the Sciatica Bothersomeness Index (SBI) and Sciatica Frequency Index (SFI), and the direct impact on daily activities and return to work, using the Oswestry Disability Index (ODI) and Roland-Morris Disability score. The study concluded that open microdiscectomy is superior in reducing low back and lower limb pain, as well as reducing the risk of a new hospitalization, although the reduction did not prove to be clinically significant (< 0.5 points on the VAS scale). On the other hand, the study highlighted the low risk of surgical site infection and the shorter, though inconsistently, hospitalization as potential advantages.

Analyzing the mean procedure times for the techniques described in Table 3, one can see that the endoscopic surgical time is shorter than the open microscopic technique, however, the following aspects should be taken into account: the learning curve for the procedure, the hospital structure, the preference of the surgeon who will perform the procedure, and the patient's potential comorbidities. The mean hospitalization was 3.3 days in patients submitted to the endoscopic technique and 3.6 days for the microscopic technique, representing a slight reduction that would be reflected in the patient hospitalization costs.

Thus, the endoscopic procedure was superior to the microscopic technique in terms of reduced patient surgical and hospitalization times, representing a significant positive factor. However, in clinical practice, a divergence in the length of hospitalization may be observed when there are no complications, in which patients who undergo microdiscectomy are discharged the day after surgery and patients who undergo endoscopic discectomy are discharged on the same day. This divergence may reflect the evolution of the techniques over the last few years, as well as the greater confidence that the surgeons acquire with each procedure, reducing the in-hospital observation time necessary in cases without perioperative complications or previous comorbidities.

When analyzing the most prevalent lumbar disc herniation location (Table 2), we can see that the L5-S1 vertebral level is the most affected, suggesting that the lumbosacral transition zone may be a determinant of greater anatomical fragility leading to a higher occurrence of this pathology.[30]

In his review study, Ahn[31] discusses indications and outcomes of the different types of endoscopic access. Interlaminar access proved to be the most indicated for discal protrusions without calcification and for inaccessible transforaminal access, in addition to the following conditions: (1) L5-S1 intervertebral space with the iliac crest level elevated above the L5 pedicle in a lateral radiograph, (2) high-grade migraine disc herniation, (3) sufficient interlaminar window between the cranial and caudal laminae, and between the midline and the dorso-medial edge of the inferior articular process measuring at least 6 mm, and (4) no limitation as to the dorsal or lateral extension of the disc herniation.

A recent meta-analysis conducted by Muthu, Ramakrishnan, and Chellamuthu[32] analyzed 27 articles, of which 11 were randomized clinical trials, 7 were non-randomized prospective studies, and 9 were retrospective studies, involving a total of 4018 patients. When analyzing the randomized clinical trials, they observed equivalence in the comparison of the endoscopic discectomy and the conventional microdiscectomy in relation to the lumbar VAS ($P = 0.860$) and LLLL VAS ($P = 0.495$) values obtained. On the other hand, the superiority of the endoscopic technique over the microscopic technique ($P = 0.05$) in terms of the Oswestry Disability Index (ODI) functional results score ($P = 0.008$), the duration of the procedure ($P = 0.023$), and the length of the hospital stay ($P < 0.001$), even though significant heterogeneity was observed.

Park et al.[33] conducted a randomized clinical trial with 64 patients, comparing decompressive lumbar laminectomy using the biportal endoscopic technique and conventional microdiscectomy in patients with spinal stenosis. In their analysis of the results obtained, they concluded that there was no significant difference between the groups, considering the 12-month postoperative ODI score ($P = 0.635$). Furthermore, there were no significant differences between lumbar and LLLL VAS scores, in EQ-5D and painDETECT at the 3rd, 6th, or 12th months of follow-up, or in the clinical outcomes of each patient (surgical duration, hospitalization time, serum CPK, or perioperative complications). And only one patient from the microdiscectomy required a surgical revision 9 months following the initial procedure.

When we compared the above studies with the present systematic review, we observed a concordance between them in that the heterogeneity of the results found in each study analyzed indicates a difficulty in determining which technique is really superior. However, the similarity in the results proves that, even though the endoscopic procedure was developed more recently and, therefore, has been applied in treatment of lumbar disc herniation for a shorter time, it is a viable method for the treatment of lumbar disc herniation, when compared to microdiscectomy.

Among the articles included for the review, Choi et al.,[26] Gibson et al.,[23] and Ahn et al.,[13] performed direct comparisons between microdiscectomy and endoscopic discectomy in the same study. However, only Choi et al.,[26] specifically addressed the endoscopic interlaminar technique in their comparative study. This observation reinforces the need for more studies that compare the techniques concurrently in a similar population sample, regardless of the study design, to produce more scientific evidence.

CONCLUSION

Based on the evidence presented by this study, we can conclude that the endoscopic interlaminar technique proved to be as efficient as conventional microdiscectomy, given the similarity of the results obtained. In addition, according to the lumbar and LLLL VAS values of the patients evaluated in each study, this technique demonstrates equivalence in pain and neurological deficit reduction and superiority in terms of surgical and hospitalization times. In view of this, we can affirm that endoscopic discectomy is a viable therapeutic option for the correction of lumbar disc herniation, and it is up to the surgeon to make the decision in accordance with their experience in performing the technique.

However, we also recommend conducting further studies that can complement and deepen knowledge about the clinical results and benefits of the endoscopic technique, given the evolution and innovation of the instruments used in the surgical procedure. From this perspective, the clinical outcomes obtained in these studies will ensure more safety in the choice of treatment, as well as greater benefits for the patient.

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