

EVALUATION OF LUMBAR ENDOSCOPIC DISCECTOMY IN OBESE PATIENTS

AVALIAÇÃO DA DISCECTOMIA LOMBAR ENDOSCÓPICA EM PACIENTES OBESOS

EVALUACIÓN DE LA DISCECTOMÍA LUMBAR ENDOSCÓPICA EN PACIENTES OBESOS

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ABSTRACT

Objectives: Obesity is a public health problem with high morbidity and mortality rates and perioperative complications in the general population. Minimally invasive procedures are promising alternatives to perioperative complications in individuals with a high body mass index (BMI). Endoscopic lumbar discectomy has been gaining popularity in this regard. However, there are few descriptions in the literature about the endoscopic approach to improve pain and quality of life in obese individuals. Likewise, it is not determined whether individuals with a high BMI have more complications in this type of surgical approach. **Methods:** A longitudinal retrospective case-control study was performed with 63 subjects submitted to endoscopic discectomy, divided into 2 groups according to BMI (Group A, BMI $\geq 30\text{kg/m}^2$ and Group B, BMI $<30\text{kg/m}^2$), in order to compare improvement in quality of life through the Oswestry Disability Index (ODI) and pain improvement by the Visual Analogue Scale (VAS), as well as to observe the incidence of postoperative complications in both groups. **Results:** There was no difference in postoperative ODI ($p=0.36$) and VAS ($p=0.54$) between groups, nor was there a statistical difference in the incidence of complications between groups ($p=0.56$). **Conclusions:** Endoscopic discectomy brings similar results in pain and quality of life in obese and non-obese patients without causing higher rates of complications. **Level of Evidence III; Case-Control Study.**

Keywords: Endoscopy; Spine; Intervertebral Disc Displacement; Obesity.

RESUMO

Objetivos: A obesidade é um problema de saúde pública com taxas elevadas de morbimortalidade e complicações perioperatórias em relação à população em geral. Procedimentos minimamente invasivos são alternativas promissoras em relação às complicações perioperatórias nos indivíduos com Índice de Massa Corporal (IMC) elevado. A discectomia lombar endoscópica vem ganhando popularidade neste sentido. Todavia, há poucas descrições na literatura acerca da abordagem endoscópica na melhora da dor e qualidade de vida em indivíduos obesos. Da mesma forma, não está estabelecido se os indivíduos com IMC elevado apresentam mais complicações neste tipo de abordagem cirúrgica. **Métodos:** Estudo longitudinal retrospectivo tipo caso-controle com 63 indivíduos submetidos à discectomia endoscópica subdivididos em dois grupos de acordo com o IMC (Grupo A, $\text{IMC} \geq 30\text{Kg/m}^2$ e Grupo B $<30\text{Kg/m}^2$), afim de comparar a melhora na qualidade de vida pelo score Oswestry Disability Index (ODI) e a melhora da dor pela Escala Visual Analógica (EVA), assim como observar a incidência de complicações pós-operatórias em ambos os grupos. **Resultados:** Não houve diferença nos escores ODI ($p=0.36$) e EVA ($p=0.54$) pós-operatórios entre os grupos, assim como não houve diferença estatística na incidência de complicações entre os grupos ($p=0.56$). **Conclusões:** A discectomia via endoscópica traz resultados semelhantes na dor e qualidade de vida em pacientes obesos e não obesos sem apresentar maiores taxas de complicações. **Nível de Evidência III; Estudo de Caso-Control.**

Descritores: Endoscopia; Coluna Vertebral; Deslocamento do Disco Intervertebral; Obesidade.

RESUMEN

Objetivos: La obesidad es un problema de salud pública con tasas elevadas de morbimortalidad y complicaciones perioperatorias en la población en general. Los procedimientos mínimamente invasivos son alternativas prometedoras en relación a las complicaciones perioperatorias en los individuos con índice de masa corporal (IMC) elevado. La discectomía lumbar endoscópica viene ganando popularidad en este sentido. Sin embargo, hay pocas descripciones en la literatura acerca del acceso endoscópico en la mejora del dolor y calidad de vida en individuos obesos. Del mismo modo, no está establecido si los individuos con IMC elevado tienen más complicaciones en este tipo de abordaje quirúrgico. **Métodos:** Estudio longitudinal retrospectivo tipo caso-control con 63 individuos sometidos a discectomía endoscópica, subdivididos en 2 grupos de acuerdo con el IMC (Grupo A, $\text{IMC} \geq 30\text{ kg/m}^2$ y Grupo B, $\text{IMC} < 30\text{ kg/m}^2$), a fin de comparar la mejora en la calidad de vida por el score Oswestry Disability Index (ODI) y la mejora del dolor por la Escala Visual Analógica (EVA), así como observar la incidencia de complicaciones postoperatorias en ambos grupos. **Resultados:** No hubo diferencia en las puntuaciones ODI ($p = 0,36$) y EVA ($p = 0,54$) postoperatorios entre los grupos, así como no hubo diferencia estadística en la incidencia de complicaciones entre los grupos ($p = 0,56$). **Conclusiones:** La discectomía por vía endoscópica brinda resultados similares en el dolor y calidad de vida de pacientes obesos y no obesos sin causar tasas de complicaciones más altas. **Nivel de Evidencia III; Estudio de Caso-Control.**

Descriptores: Endoscopia; Columna Vertebral; Desplazamiento del Disco Intervertebral; Obesidad.

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INTRODUCTION

Obesity, defined by the World Health Organization (WHO) as a body mass index (BMI) $\geq 30\text{kg/m}^2$, is considered a public health issue due to its numerous adverse effects on quality of life and increased morbidity and mortality.^{1,2}

The correlation between obesity and lumbalgia is not clear. However, the prevalence of obese individuals submitted to lumbar arthrodesis is 71.4% in the US. A high BMI has been associated with a greater incidence of postoperative complications in spinal surgeries.³⁻⁷ Diabetes mellitus and insulin resistance are frequently associated with obesity and are correlated with delayed healing and an increased rate of infection of the surgical wound. Similarly, increased surgical time and bleeding are more often described in these individuals.^{8,9} Hudak et al.¹⁰ reported an increase in the rate of perioperative complications in obese patients, but without statistical significance in the clinical outcomes. Telfeian et al.¹¹ observed that long arthrodesis did not correlate with an increase in the incidence of complications in the overweight population when compared to isolated decompression or short arthrodesis. On the other hand, authors such as Cao et al.¹² highlight the growing obese population in doctors' offices and indicate minimally invasive procedures as a promising alternative for these patients.

The endoscopic approach to the lumbar spine has been gaining ground as a minimally invasive method in the treatment of lumbar disc herniation. There are numerous advantages as compared to traditional methods, such as less tissue trauma to the spine and adjacent tissues, fewer complaints of postoperative pain, shorter hospitalization, less extensive surgical scarring, early rehabilitation and return to work, in addition to a lower rate of perioperative complications.¹³

Given the frequency of the obese population in the universe of individuals with surgical spinal pathologies and the popularization of the endoscopic approach among spine surgeons, the objective of this study was to evaluate the results of endoscopic lumbar discectomy in obese patients, analyzing the postoperative improvement in pain and the quality of life, as well as the incidence of complications.

METHODS

This was a longitudinal, retrospective, case-control study in which the electronic data from the medical records of patients who had undergone endoscopic lumbar discectomy between January 2015 and December 2016 at the Hospital do Trabalhador (Curitiba/Brazil) were analyzed. The study was approved by the Institutional Review Board as number 57908816.9.0000.5225 and all participants signed the Informed Consent Form. The sample subjects were divided into two homogeneous groups according to BMI: Group A, BMI $\geq 30\text{kg/m}^2$ and Group B, $<30\text{kg/m}^2$. The Visual Analog Scale (VAS) and the Oswestry Disability Index (ODI) were evaluated in both groups at three different times: preoperatively, on the first day following surgery, and after six months of outpatient follow-up. The presence of immediate or late postoperative complications was also evaluated. Individuals with previous surgeries, incomplete medical record data, and those who were lost to follow-up after the surgical procedure were excluded from the sample.

The individuals who were submitted to endoscopic lumbar discectomy had surgical indications of disabling unilateral sciatic pain for more than 90 days, refractory to conservative treatment, or unilateral sciatic pain associated with progressive neurological deficit. All patients had magnetic resonance imaging (MRI) examinations revealing a single foraminal or centrolateral lumbar disc herniation involving a single level (L3-L4, L4-L5, or L5-S1), with clinical-radiological correlation, without stenosis and without any other defects associated with the posterior arch. All these individuals had anterior-posterior lumbar spine radiographs including the iliac crests and lateral orthostatic dynamic (neutral, flexion, extension) radiographs without signs of instability or interspinous impact.

The approach chosen by the surgeon was dependent on the level involved and the location of the disc herniation in the MRI. In patients with a foraminally located disc herniation in L3-L4 or

L4-L5, an endoscopic transforaminal approach was chosen, except in cases with a high iliac crest (above the level of the L4-L5 disc) in the anteroposterior spinal radiograph. Level L5-S1 was not included in the sample, because the iliac crest also causes technical difficulties in this case. Individuals with centrolateral disc herniations (level L3-L4, L4-L5, or L5-S1) were operated via endoscopic interlaminar approach. The endoscopies were performed by four experienced spinal surgeons with a lumbar endoscopy learning curve of at least four years prior to the current study. A comparison of surgical outcomes by level approached was not one of the study objectives.

In the transforaminal technique, the patient is placed in a prone position and the midline, the lower and upper vertebral plates of the desired level, and lateral marks 8, 10 and 12 cm from the midline, which will be the possible entry points, are marked under visualization of the image intensifier. The patient is mildly sedated and an infiltration with local anesthetic without vasoconstrictor is applied at the point of entry. The sedation should be mild, because the patient must be conscious in order to alert the surgeon should any nerve root be stimulated during the procedure. Following this step, puncture of the intervertebral disc and discography with methylene blue, associated with non-ionic contrast, are performed. Using wire-guides, the endoscope is inserted into the intervertebral disc and indirect decompression of the intervertebral disc ("inside-out" technique) is performed, followed by a thermal nucleoplasty. The whole procedure takes place within Kambin's safety triangle.¹⁴ (Figure 1)

In the interlaminar endoscopic technique, the patient is placed the prone position on a radiotransparent table under general anesthesia. (Figure 2) In this technique, general anesthesia is necessary, since it requires retraction of the nerve root, which creates patient discomfort. The interlaminar window of the desired level is marked on the skin with the assistance of the image intensifier and a longitudinal access of 1 cm is made close to the midline. An initial dilator is positioned in the interlaminar space and the endoscope is introduced. The multifidus muscle is dissected up to the ligamentum flavum, which is opened to expose the descending root and the perineural fat. The nerve root is retracted and protected with the aid of a beveled cannula. (Figure 3) The herniated disc fragment is removed and the intervertebral disc is perforated and decompressed. At the end of the procedure, a thermal nucleoplasty is performed.¹⁴

When possible, operated individuals routinely received gait training with the help of a physical therapist on the first postoperative day and were discharged after answering the ODI and VAS questionnaires, with guidelines for restricting flexion and rotation

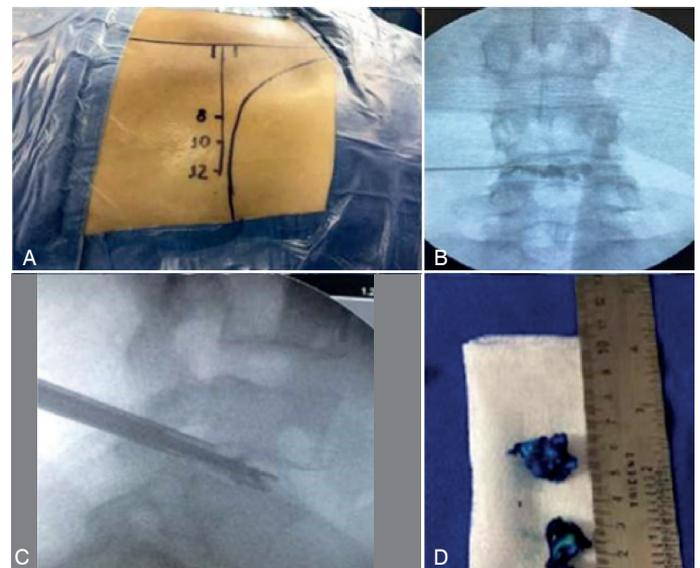


Figure 1. Percutaneous endoscopic transforaminal discectomy. A) Skin markings, B) Discography in the anteroposterior view of the radioscope, C) Lateral radioscope view showing the "inside-out" discectomy technique, D) Removed disc material.



Figure 2. Intraoperative photograph showing the positioning and the dimensions of the incision in the back of an obese patient submitted to endoscopic interlaminar lumbar discectomy.

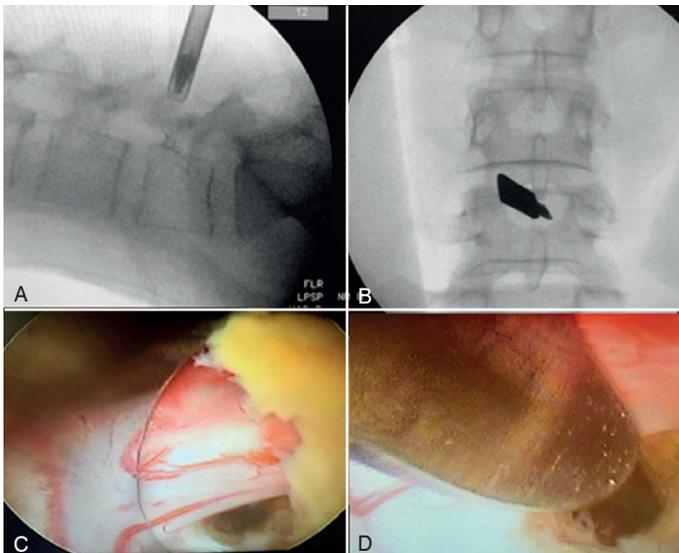


Figure 3. Percutaneous endoscopic interlaminar discectomy. A) Lateral radioscopic view of the point of entry, B) Point of entry in the anteroposterior view, C) Opening of the ligamentum flavum and the nerve root being exposed, D) Probe retracting the root after performing the discectomy.

movements of the trunk, without the need for use of a lumbar orthosis. The patients returned in seven days or removal of the sutures and monthly for follow-up for a period of six months, at the end of which the ODI and VAS questionnaires were once again applied. With regard to postoperative imaging examinations, dynamic lumbar spine radiographs and MRIs were only performed in the permanence or worsening of radiculopathy and in the suspicion of infection involving the surgical site (intense lumbalgia, local or systemic phlogistic signs, elevation of blood-work counts, ESR, and CRP), but these parameters were not included in the study objectives.

The system used for the procedures was the Vertebri Richard Wolf Endoscope®.

The data obtained were statistically analyzed by means of multivariate logistic regression, with homogeneous samples in terms of age range, sex, and endoscopic approach used (interlaminar or transforaminal) between the two study groups (obese and not obese), considering the final value of $p < 0,05$ as statistically significant.

RESULTS

Sixty-three patients were included in the study. Of these, twenty-one (33.4%) were obese and 42 (66.6%) were not. Thirty-four patients (53.9%) were female and 29 (46.1%) were male. The mean age was 40 years (21-79 years). Twenty-four (38%) were operated by the transforaminal endoscopic technique and 39 (63%) by the interlaminar technique. (Table 1)

The preoperative ODI scores ranged from 14 to 45 (mean 26.9

Table 1. Individuals submitted to endoscopic lumbar discectomy.

	N	Percentage
	BMI(Kg/m²)	
Obese	21	33.4%
Not obese	42	66.6%
	Sex	
Male	29	46.1%
Female	34	53.9%
	Approach	
Interlaminar	39	62%
Transforaminal	24	38%

Source. Data from the medical records of the Hospital do Trabalhador da UFPR. Curitiba, Brazil.

and median 26.5). The ODI scores on the first day following surgery ranged from 0 to 37 (mean 5.19 and median 3) and at six months following surgery, the scores ranged from 0 to 34 (mean 4.95 and median 2). The preoperative VAS scores ranged from 6 to 10 (mean 8.49 and median 9). The VAS scores on the first postoperative day ranged from 0 to 9 (mean 2.28 and median 2) and six months following surgery the scores ranged from 0 to 9 (mean 1.87 and median 1), as shown in Figure 4.

The surgical time ranged from 40 to 180 minutes (mean 112.5 and median 112), with no statistical difference between the groups ($p=0.34$). No statistical difference was observed in the rate of postoperative complications between the groups, regardless of age, sex, or endoscopic approach used ($p=0.56$). No case of excessive bleeding was described in either of the groups and there were no hemodynamic changes in the present case series. Of a total of five postoperative complications (7.9% of the sample), two occurred in Group A and three in Group B. One patient in Group A evolved with hyperemia in the surgical wound a week after discharge from the hospital, was rehospitalized for clinical and radiological investigation, and diagnosed with a superficial skin infection without abscess, which was resolved after empirical oral antibiotic therapy with cephalexin for 14 days. Two patients in Group B returned (both two weeks after discharge) with infection of the surgical site, one of them with a superficial abscess treated with open surgical drainage and the empirical use of intravenous oxacillin and gentamicin (the cultures were negative) with resolution and discharge after 14 days in the hospital. The other patient with an infection of the surgical wound had spontaneous drainage of the purulent content and the MRI suggested deep infection without involvement of the intervertebral disc. Posterior access open surgical debridement was performed (intravenous oxacillin was used for multi-sensitive *Staphylococcus aureus*). The patient contracted nosocomial pneumonia (treated in the intensive care unit with ceftriaxone) and was discharged after six weeks with clinical and laboratorial improvement. They remained asymptomatic in the last return six months after the endoscopic approach and without instability in the dynamic lumbar spine radiographs. One individual in Group A persisted with radiating pain and was submitted to an open discectomy on the second postoperative

day (MRI with a remnant of a disc fragment in contact with the root, corresponding to the location of the radiating pain) and was discharged two days following surgery with mild lumbalgia and without signs of instability in the dynamic lumbar spine radiographs taken at discharge and after six months. (Table 2).

There was statistically significant improvement in the ODI functional score on the first postoperative day as compared to the preoperative score, which was maintained at six months following the surgery ($p < 0.05$), with no statistical difference between the interlaminar and transforaminal techniques ($p = 0.34$). There was no statistical difference between the men and the women for the pre- and postoperative ODI scores ($p = 0.36$). The comparison of the pre- and postoperative ODI scores between Group A and Group B did not show any statistical difference ($p = 0.36$) (Figure 5). Analysis of the VAS scores showed a significant reduction in pain on the first postoperative day in relation to the preoperative period, which was maintained at six months following surgery ($p < 0.05$). In our VAS score analysis, we observed superiority of the interlaminar technique in relation to the transforaminal technique in terms of improvement of pain both at one day and six months following surgery, ($p = .002$), but there was no difference between the sexes ($p = 0.47$). There was no statistical difference between obese and non-obese individuals in the pre- and postoperative VAS scores ($p = 0.54$) (Figure 6).

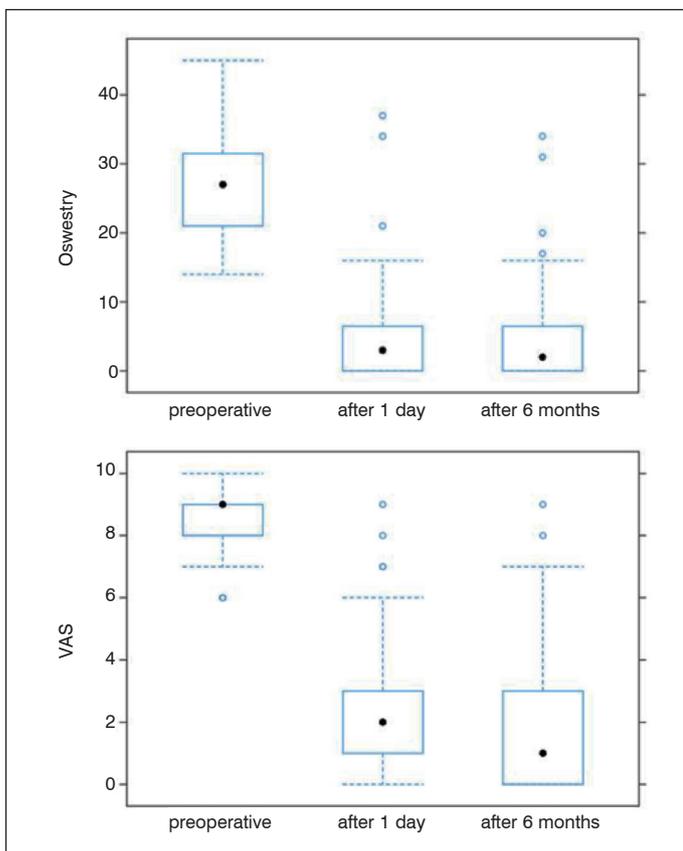


Figure 4. Oswestry Disability Index (ODI) and Visual Analog Scale for pain (VAS) scores in the preoperative period, on the first postoperative day, and six months following surgery for all individuals submitted to endoscopic lumbar discectomy at the Hospital do Trabalhador da UFPR - Curitiba, Brazil.

Table 2. Postoperative complication rate.

	Group A	Group B	
Infection of the surgical wound	1	2	3 (60%)
Nosocomial pneumonia	0	1	1 (20%)
Permanence of radiculopathy	1	0	1 (20%)
Total (N = 63)	2	3	5 (7.9%)

Source: Data from the medical records of the Hospital do Trabalhador da UFPR - Curitiba, Brazil.

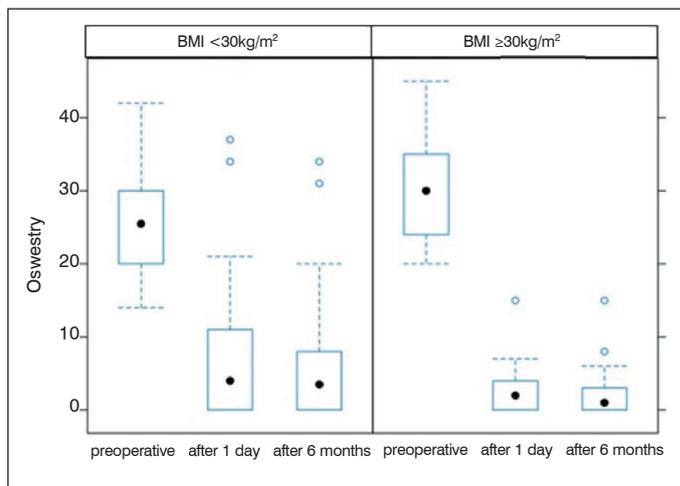


Figure 5. Comparison of the Oswestry Disability Index (ODI) in the pre- and postoperative periods of endoscopic lumbar discectomy between obese and non-obese patients.

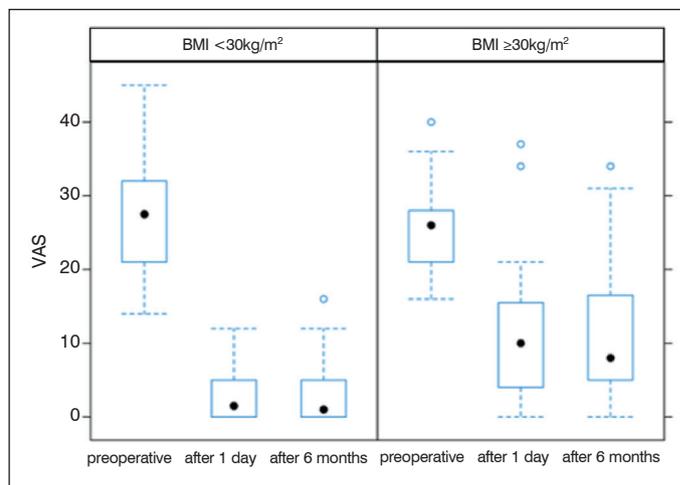


Figure 6. Comparison of the Visual Analog Scale (VAS) in the pre- and postoperative periods of endoscopic lumbar discectomy between obese and non-obese patients.

DISCUSSION

Patel et al. evaluated 84 obese individuals submitted to open lumbar spine discectomy and observed a higher incidence of perioperative complications in obese individuals, among them excessive bleeding, prolonged surgical time with a greater need for bladder catheterization, associated with a higher rate of urinary tract infections. In the same study, complications related to a long hospitalization period, mainly pneumonia, were observed.¹⁵ In our study, the main postoperative complications observed were infection of the surgical wound, persistence of radicular symptoms, and pneumonia. However, there was no difference in clinical outcome between the groups.

Yao et al. observed 3.4% recurrence of the herniation following endoscopic lumbar discectomy in a sample of 116 individuals.¹⁶ In the sample analyzed in our study, the only patient with recurrence of the herniation following the endoscopic approach was in Group A (obese group).

According to Burks et al., open lumbar discectomy in obese patients is associated with 0.5 to 2.6% of accidental durotomies.¹⁷ In our study, no patient had a lesion of the dura mater during the endoscopic procedure, demonstrating the safety of this technique in terms of this type of complication.

The Visual Analog Scale for pain (VAS) and the Oswestry Disability Index (ODI) are widely used by spine surgeons as treatment and

rehabilitation scores. These tools make it possible for the patient to quantify their pain and functional capacity in order to determine the impact of treatment on the quality of life. Ghedini et al. conducted a study of 15 patients who underwent endoscopic lumbar discectomy and observed improvement in the VAS and ODI in the entire sample, regardless of complications ($p < 0.05$).¹⁴ Similarly, our study showed an improvement in the VAS and ODI scores ($p < 0.05$) in both groups analyzed, without any statistical difference between them (ODI $p = 0.36$; VAS $p = 0.54$).

Due to the increasingly frequent use of spinal endoscopy and the worldwide growth of the obese population, more studies should be conducted focused on the endoscopic approach in this group of individuals, given the good results achieved up to the present time using this technique when indicated in selected cases. However, this study is limited by the fact that we did not compare our results with those of individuals who underwent open microdiscectomy

(the method considered the gold standard) performed by the same group of spine surgeons.

CONCLUSIONS

Endoscopic discectomy performed for the surgical treatment of disc herniation has similar pain and quality of life outcomes in obese and non-obese patients, without presenting higher complication rates in the obese patients.

Endoscopic surgery causes less surgical risk in obese individuals than in non-obese patients, showing that it is a safe technique with promising results.

All authors declare no potential conflict of interest related to this article.

CONTRIBUTION OF THE AUTHORS: Each author made significant individual contributions to this manuscript. ALK (0000-0002-0132-6083), ETB (0000-0002-4096-642X), and XSG (0000-0002-9636-9165) were the main contributors to the writing of the manuscript. ALK performed the surgeries. ALK, PGS (0000-0002-8326-4823), ETB, and GSM (0000-0002-2940-5226) followed-up with the patients and collected clinical data from the medical records, and together with XSG and MLB (0000-0002-2903-8550) they evaluated the statistical analysis data. ALK, ETB, XSG, and GSM conducted the bibliographical research and reviewed the manuscript. ALK and XSG contributed with the intellectual concept of the study. *ORCID (Open Researcher and Contributor ID).

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