

SURGERY FOR LUMBAR DISC HERNIATION: OPEN X MINIMALLY INVASIVE TECHNIQUE

CIRURGIA DE HÉRNIA DISCAL LOMBAR: TÉCNICA ABERTA X MINIMAMENTE INVASIVA

CIRUGÍA DE HERNIA DISCAL LUMBAR: TÉCNICA ABIERTA X MÍNIMAMENTE INVASIVA

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ABSTRACT

Objective: In Brazil, there are no studies comparing endoscopic treatment of lumbar disc herniation with the conventional open technique in SUS (Unified Health System) with regard to hospitalization time and complications occurring within one year, which is the objective of this study. **Methods:** A survey of 32 surgeries performed in 2019 (11 open and 21 endoscopic) to evaluate pain parameters before and after surgery (VAS), days of hospitalization, and complications. The data were submitted to statistical analysis (ANOVA) using the Kruskal-Wallis test. **Results:** Fourteen patients were female and eighteen were male, with a mean age of 41.35 years ($p > 0.05$ between sexes). The pre- and postoperative VAS for pain radiating to the lower limb were similar between the groups: 8.5 ± 0.82 with the open technique and 8.19 ± 1.15 with endoscopic technique. In both groups there was an improvement in the pain pattern with a significant reduction in the VAS ($p < 0.05$) and there was no statistical relevance between the groups in terms of pain improvement. There was statistical relevance between the groups in the comparison of days of hospitalization required, with the group submitted to endoscopic surgery having a lower number of days. The complications reported were compatible with those found in the literature (postoperative dysesthesia, new herniation). **Conclusions:** The endoscopic technique resulted in an important reduction in the number of days of hospitalization, a factor with a high impact on the costs of any surgical procedure, which can be a determining factor in the feasibility of minimally invasive techniques. **Level of evidence IV; Therapeutic Study.**

Keywords: Minimally Invasive Surgery; Endoscopy; Conversion to Open Surgery.

RESUMO

Objetivos: No Brasil, não há estudos que comparem o tratamento endoscópico de hérnia de disco lombar no SUS (Sistema Único de Saúde) com a técnica aberta convencional, no que diz respeito aos resultados com relação ao tempo de internação e complicações ocorridas em um ano, o que vem a ser o objetivo deste estudo. **Métodos:** Levantamento de 32 cirurgias realizadas em 2019 (11 por via aberta e 21 por via endoscópica) para avaliar os parâmetros de dor antes e depois da cirurgia (EVA), dias de internação e complicações. **Os dados foram submetidos à análise estatística (ANOVA) com o teste de Kruskal-Wallis. Resultados:** Catorze pacientes eram do sexo feminino e 18 do sexo masculino, com média de idade de 41,35 anos ($p > 0,05$ para os dois sexos). A EVA de dor irradiada para o membro inferior no pré e pós-operatório foi semelhante entre os grupos: $8,5 \pm 0,82$ com a técnica aberta e $8,19 \pm 1,15$ com a técnica endoscópica. Em ambos os grupos houve melhora do padrão de dor com redução significativa da EVA ($p < 0,05$) e não houve relevância estatística entre os grupos quanto à melhora do dor. Na comparação das diárias de internação necessárias houve relevância estatística entre os grupos, sendo que o grupo submetido à endoscopia teve número menor de diárias. As complicações relatadas são compatíveis com as encontradas na literatura (disestesia pós-operatória, nova hérniação). **Conclusões:** A técnica endoscópica resultou em redução importante do número de dias de internação, fator com alto impacto nos custos de qualquer procedimento cirúrgico, que pode ser determinante para viabilizar técnicas minimamente invasivas. **Nível de evidência IV; Estudo Terapêutico.**

Descritores: Procedimento Cirúrgico Minimamente Invasivo; Endoscopia; Conversão para Cirurgia Aberta.

RESUMEN

Objetivos: En Brasil, no hay estudios que comparen el tratamiento endoscópico de hernia de disco lumbar en el SUS (Sistema Único de Salud) con la técnica abierta convencional, en lo que refiere a los resultados con relación al tiempo de internación y complicaciones ocurridas en un año, lo que viene a ser el objetivo de este estudio. **Métodos:** Levantamiento de 32 cirugías realizadas en 2019 (once por vía abierta y veintiuna por vía endoscópica) para evaluar los parámetros de dolor antes y después de la cirugía (EVA), días de internación y complicaciones. **Los datos fueron sometidos a análisis estadístico (ANOVA) con el test de Kruskal-Wallis. Resultados:** Catorce pacientes eran del sexo femenino y dieciocho del sexo masculino con promedio de edad de 41,35 años ($p > 0,05$ para los dos sexos). La EVA de dolor irradiado para el miembro inferior en el pre y postoperatorio fue semejante entre los grupos: $8,5 \pm 0,82$ con la técnica abierta y $8,19 \pm 1,15$ con la técnica endoscópica. En ambos grupos hubo mejoras del patrón de dolor con reducción significativa de la EVA ($p < 0,05$) y no hubo relevancia estadística entre los grupos cuanto a la mejora del dolor. En la comparación de los días de

Study conducted at the

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internación necesarios hubo relevancia estadística entre los grupos, siendo que el grupo sometido a la endoscopia tuvo número menor de días de internación. Las complicaciones relatadas son compatibles con las encontradas en la literatura (disestesia postoperatoria, nueva herniación). Conclusiones: La técnica endoscópica resultó en reducción importante del número de días de internación, factor con alto impacto en los costos de cualquier procedimiento quirúrgico, que puede ser determinante para viabilizar técnicas mínimamente invasivas. **Nivel de evidencia IV; Estudio Terapéutico.**

Descriptor: Procedimiento Quirúrgico Mínimamente Invasivo; Endoscopia; Conversión a Cirugía Abierta.

INTRODUCTION

Low back pain and sciatica are so common that about 70% of the population may experience them in varying degrees of severity and symptomology at some point in life.^{1,2} One of the causes of pain and the main cause of sciatica is disc herniation, which can lead to irritation and compression of the nerve root. The possible treatments for lumbar disc herniation are basically conservative and surgical. Most cases of disc herniation and sciatica can be treated conservatively, leaving only the cases with more serious symptoms and neurological changes to be indicated for surgical treatment.²

Surgical treatment methods for disc herniation have evolved to be increasingly less invasive while maintaining efficiency or even being superior in terms of the clinical improvement of patients when compared to traditional open approach techniques.^{3,4}

In addition to the learning curve,⁵ another obstacle to greater adherence to minimally invasive techniques is the higher cost of performing this surgical technique as compared to the traditional open technique. The challenge today is trying to balance modern advances in surgical techniques against costs.^{6,9}

One of the most widely used minimally invasive treatments for lumbar disc herniation today is endoscopic surgery,¹⁰ already being performed at the Hospital das Clínicas de Ribeirão Preto of the University of São Paulo Ribeirão Preto Medical School (HCFMRP-USP). There are studies that have shown that, although endoscopic surgery for the resection of lumbar disc herniation is more expensive, the savings on hospital stays, medications, earlier return to work, among other factors would compensate for these costs.¹¹ There are also studies that rate minimally invasive techniques as superior in clinical outcomes than the traditional open technique.¹⁰

The first endoscopic surgeries at HCFMRP-USP were performed in 2018 and consolidated in 2019. The objective of this study was to compare the clinical improvement in those patients submitted to surgical resection of lumbar disc herniation by open and endoscopic techniques in 2019 by evaluating improvement in the level of pain via the visual analog scale for pain (VAS), the number of days of hospitalization required, and complications related to the procedures performed.

METHODS

A survey of the cases operated at HCFMRP-USP (the study center) yielded 32 lumbar disc herniation surgeries performed in 2019 by the HCFMRP-USP spinal orthopedics team, 11 of which were by the open technique and 21 by the endoscopic technique. The parameters of the operated patients analyzed were the levels of preoperative and first postoperative month pain assessed by the visual analog scale for pain (VAS), the number of days of hospitalization required, and any complications related to the procedure that occurred during the first postoperative month. Patients who underwent procedures other than for the resection of disc herniation, or central or foraminal stenosis with or without associated disc herniation, with follow-up less than 1 month following surgery, or younger than 18 years of age were excluded.

The entire survey was conducted by a single researcher, the author, by analyzing pre- and postoperative data from cases operated in 2019 (worksheet of all surgical procedures performed, as well as the mentioned parameters, created annually by the team). Neurological involvement of the cases prior to surgery was not

considered; the indication of all cases involved pain refractory to conservative treatment.

The study was submitted to and approved by the institutional review board with the required authorization to waive the application of the informed consent form (CAAE: 34002020.7.0000.5440, opinion number 4.137.682).

Statistical analysis of the collected data was conducted using ANOVA analysis of variance through the Kruskal-Wallis test.

RESULTS

Of the 32 patients selected, 14 were female and 18 were male with a mean age of 41.35 years. Eleven surgeries were performed using the open technique, with only two for herniation in segment L3-L4, and all the others in L4-L5 or L5-S1. There were 21 patients in the group that underwent endoscopic surgery, with only one in segment L3-L4 and the rest in L4-L5 or L5-S1. There was no statistical difference in relation to age between the two groups ($p=0.52$). The distribution of the patients by technique performed, sex, and age is shown in Table 1.

In the open technique surgery patient group the mean preoperative VAS for pain radiating to the leg was 8.5 with a drop to a mean of 1.9 in the postoperative period, a statistically significant improvement ($p<0.0001$) in the radiating pain pattern. A mean of 1.81 days in the hospital were necessary and 2 cases presented complications, one with reherniation of the same level less than 1 month after surgery and one case of dysesthesia at the root of the level affected by the herniation.

In the endoscopic surgical technique group, the mean preoperative VAS for leg pain was 8.2, improving to a mean of 2.5 in the postoperative period. There was also a statistically significant improvement ($p<0.0001$) in the pattern of radiating pain. A mean of 0.76 days in the hospital were necessary and, in 3 cases, surgical reapproach was required for a remaining herniation fragment with persistent intense pain, with pain improvement following the reapproach. In 6 other cases, we had postoperative dysesthesia at the root of the affected level.

In the comparison between the groups, there was no statistical significance between either the preoperative or postoperative VAS, with $p=0.37$ and $p=0.69$, respectively. (Table 2) Therefore, we had similar improvement in the patterns of radiating pain in the two techniques performed. The comparison of the days of hospitalization required showed statistical significance with $p=0.0016$. Therefore, the endoscopic technique required less hospitalization time, which may correspond to a source of savings in the final cost of the surgery.

Table 1. Distribution of patients by surgical technique used, age, and sex.

| | Number | Age (years) | Sex (number, %) |
|------------|--------|---------------|-----------------------------|
| Open | 11 | 43.81 ± 10.52 | M: 9 (81.81); F: 2 (18.18) |
| Endoscopic | 21 | 40.38 ± 8.17 | M: 9 (42.85); F: 12 (57.15) |

Table 2. Pre- and postoperative VAS scores and days in the hospital with their respective standard deviations.

| | VAS pre (sd) | VAS post (sd) | Days (sd) |
|------------|--------------|---------------|-------------|
| Open | 8.5 (0.82) | 1.9 (1.44) | 1.81 (0.98) |
| Endoscopic | 8.19 (1.15) | 2.55 (2.28) | 0.7 (0.65) |

Key: VAS visual analog scale for pain; pre preoperative; post postoperative; Days number of days of hospitalization required; sd standard deviation.

DISCUSSION

Lumbar disc herniation is a frequent pathology in the population and in some cases surgical treatment is necessary.² The evolution of surgical treatments for disc herniation has been focused on increasingly more minimally invasive approaches in search of clinical results associated with faster recovery.⁹ One of the minimally invasive techniques on the rise in Brazil is the percutaneous endoscopic technique. The disadvantage of minimally invasive treatments is the higher cost of the surgical procedure. There are still few studies that evaluate the real costs of open surgery and endoscopic surgery for lumbar disc herniation. The philosophy of the minimally invasive technique would be to maintain clinical results associated with faster recovery and shorter hospitalization time.

Within its natural evolution, the spinal surgery service of the HCFMRP-USP orthopedics department has sought this advance in the treatment of lumbar disc herniation with the implementation of endoscopic surgery. As expected, we obtained similar results

between the open and endoscopic techniques, with a significant reduction in the length of the hospital stay in the latter, a factor that contributes to a reduction in overall costs. The complications encountered are in accordance with the literature and there was no statistical relevance.

CONCLUSION

In general, patient satisfaction was very good and their treatment highly praised.

One of the obstacles and difficulties of the endoscopic technique other than the higher overall cost is the long learning curve.⁵

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. RRA, HRTC,AD, JPMB: conducted the data survey, data analysis, writing, revision; HLAD: project elaboration, data analysis, writing, review.

REFERENCES

- Konstantinou K, Dunn KM. Sciatica: review of epidemiological studies and prevalence estimates. *Spine (Phila Pa 1976)*. 2008;33(22):2464-72. doi: 10.1097/BRS.0b013e318183a4a2
- Jacobs WC, van Tulder M, Arts M, Rubinstein SM, van Middelkoop M, Ostelo R, et al. Surgery versus conservative management of sciatica due to a lumbar herniated disc: a systematic review. *Eur Spine J*. 2011;20(4):513-22. doi: 10.1007/s00586-010-1603-7
- Smith N, Masters J, Jensen C, Khan A, Sprowson A. Systematic review of microendoscopic discectomy for lumbar disc herniation. *Eur Spine J*. 2013;22(11):2458-65. doi: 10.1007/s00586-013-2848-8
- Mlaka J, Rapcan R, Burianek M, Rapcanova S, Gajdoš M, Kovalicova L, et al. Endoscopic discectomy as an effective treatment of a herniated intervertebral disc. *Bratisl Lek Listy*. 2020;121(3):199-205. doi: 10.4149/BLL_2020_030
- Morgenstern R, Morgenstern C, Yeung AT. The learning curve in foraminal endoscopic discectomy: experience needed to achieve a 90% success rate. *SAS J*. 2007;1(3):100-7. doi: 10.1016/SASJ-2007-0005-RR
- Choi KC, Shim HK, Kim JS, Cha KH, Lee DC, Kim ER, et al. Cost-effectiveness of microdiscectomy versus endoscopic discectomy for lumbar disc herniation. *Spine J*. 2019;19(7):1162-9. doi: 10.1016/j.spinee.2019.02.003
- Arts MP, Peul WC, Brand R, Koes BW, Thomeer RT. Cost-effectiveness of microendoscopic discectomy versus conventional open discectomy in the treatment of lumbar disc herniation: a prospective randomised controlled trial [ISRCTN51857546]. *BMC Musculoskelet Disord*. 2006;7:42. doi: 10.1186/1471-2474-7-42
- Hansson E, Hansson T. The cost-utility of lumbar disc herniation surgery. *Eur Spine J*. 2007;16(3):329-37. doi: 10.1007/s00586-006-0131-y
- Kim CH, Chung CK, Kim MJ, Choi Y, Hahn S, Shin S, et al. Increased Volume of Lumbar Surgeries for Herniated Intervertebral Disc Disease and Cost-Effectiveness Analysis: A Nationwide Cohort Study. *Spine (Phila Pa 1976)*. 2018;43(8):585-93. doi: 10.1097/BRS.0000000000002473
- Nellensteijn J, Ostelo R, Bartels R, Peul W, van Royen B, van Tulder M. Transforaminal endoscopic surgery for symptomatic lumbar disc herniations: a systematic review of the literature. *Eur Spine J*. 2010;19(2):181-204. doi: 10.1007/s00586-009-1155-x
- Al-Khouja LT, Baron EM, Johnson JP, Kim TT, Drazin D. Cost-effectiveness analysis in minimally invasive spine surgery. *Neurosurg Focus*. 2014;36(6):E4. doi: 10.3171/2014.4.FOCUS1449.