

# TREATMENT OF LUMBAR HERNIAS BY ENDOSCOPIC NUCLEOPLASTY WITH RADIOFREQUENCY

TRATAMIENTO DE HÉRNIAS DE DISCO LUMBAR POR NUCLEOPLASTIA ENDOSCÓPICA COM RADIOFREQUÊNCIA

MANEJO DE HERNIAS DE DISCO LUMBAR MEDIANTE NUCLEOPLASTÍA ENDOSCÓPICA CON RADIOFRECUENCIA

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## RESUMEN

**Objetivo:** Evaluar resultados postquirúrgicos de técnica mínimamente invasiva para el tratamiento de hernias discales lumbares en pacientes sometidos a nucleoplastia endoscópica percutánea con radiofrecuencia en el centro de mínima invasión de Veracruz (CEMIVER) del HRAEV. **Métodos:** Estudio descriptivo, comparativo, ambispectivo y longitudinal. Se revisarán expedientes clínicos de pacientes después de cirugía de hernia discal en el periodo de marzo de 2010 a marzo de 2015. Los criterios de inclusión fueron sujetos de ambos sexos, con edades entre 18 y 65 años con diagnóstico de hernia de disco mediante resonancia magnética nuclear, discografía evocativa de dolor y evaluación clínica. Se dimensionaron las variables mediante escala EVA, Índice de discapacidad de Oswestry para valoración funcional y criterios de Macnab modificados para graduación clínica transversal retrospectiva. **Resultados:** Se incluyeron 161 pacientes, 81 mujeres y 80 hombres, con edades comprendidas entre 18 y 65 años, con discapacidad grave (83,8%) y moderada (16,2%) de acuerdo con el índice de discapacidad de Oswestry; se obtuvo un total de 83,8% resultados excelentes, 9,5% buenos, 4,8% medianos y 1,9% resultados pobres según los criterios de Macnab; el tiempo quirúrgico medio fue de 84 minutos por procedimiento, el sangrado postquirúrgico medio fue 65 ml, un total de 87,4% de los pacientes operados tuvieron estancia ambulatoria, 7,6% tuvieron estancia hospitalaria corta. **Conclusión:** Se comprueba que la técnica de nucleoplastia endoscópica percutánea con radiofrecuencia es un procedimiento que brinda grandes beneficios al paciente con hernias discales lumbares, incluyendo, realización bajo anestesia local, con clara visualización del campo quirúrgico, mínimo dolor, escaso sangrado, menor tiempo quirúrgico, no causa inestabilidad de estructuras anatómicas y tiene tasa mínima de complicaciones.

**Descriptores:** Desplazamiento del disco intervertebral; Región lumbosacra; Tratamiento de radiofrecuencia pulsada.

## ABSTRACT

**Objective:** To evaluate the postoperative outcomes of minimally invasive technique for treating lumbar disc herniation in patients undergoing percutaneous endoscopic nucleoplasty with radiofrequency in the center of minimally invasive procedures Veracruz (CEMIVER) of the HRAEV. **Methods:** A descriptive, comparative, ambispective and longitudinal study. The clinical records of patients who underwent herniated disc surgery were reviewed from March 2010 to March 2015. Inclusion criteria were individuals of both sexes, aged 18-65 years, with disc herniation diagnosis by MRI, evocative discography (pain) and clinical evaluation. The variables were analyzed by VAS, Oswestry disability index for functional assessment and Macnab criteria for modified retrospective cross clinical classification. **Results:** 161 patients were included, 81 female and 80 male, aged between 18 and 65 years with severe (83.8%) and moderate (16.2%) disability according to the Oswestry disability index; the total of excellent results was 83.8%, 9.5% were good, 4.8% were median and 1.9% were poor results, according to the Macnab criteria; the average time of surgery was 84 minutes per procedure, and the postoperative average bleeding was 65 ml. Of the total, 87.4% of the patients were on an outpatient basis and 7.6% had a short hospital stay. **Conclusion:** It was found that percutaneous endoscopic nucleoplasty with radiofrequency technique is a procedure that offers great benefits for patients with lumbar disc herniation, including performing it under local anesthesia, with clear visualization of the surgical field, minimal pain, little bleeding, shorter operative time, does not cause instability of anatomical structures and has minimal rate of complications.

**Keywords:** Intervertebral disc displacement; Lumbosacral region; Pulsed radiofrequency treatment.

## RESUMO

**Objetivo:** Avaliar os resultados pós-operatórios de técnica minimamente invasiva no tratamento de hérnia de disco lombar em pacientes submetidos à nucleoplastia endoscópica percutânea com radiofrequência no centro de procedimentos minimamente invasivos Veracruz (CEMIVER) do HRAEV. **Métodos:** Estudo descritivo, comparativo, ambispectivo e longitudinal. Foram revisados os prontuários clínicos de pacientes submetidos à cirurgia de hérnia de disco no período de março de 2010 a março de 2015. Os critérios de inclusão foram indivíduos de ambos os sexos, na faixa etária de 18 a 65 anos com diagnóstico de hérnia de disco por ressonância magnética nuclear, discografia evocativa da dor e avaliação clínica. As variáveis foram analisadas por EVA, Índice de incapacidade de Oswestry para avaliação funcional e critérios de Macnab modificados para classificação clínica transversal retrospectiva. **Resultados:** Foram incluídos 161 pacientes, sendo 81 do sexo feminino e 80 do sexo masculino, com faixa etária entre 18 e 65 anos, com incapacidade grave (83,8%) e moderada (16,2%) de acordo com o Índice de incapacidade de Oswestry; o total de resultados excelentes foi 83,8%, 9,5% foram bons, 4,8% foram

Work conducted at the Hospital de alta especialidad de Veracruz (HAEV) and at the Centro de Mínima Invasión de Veracruz (Cemiver), Veracruz, Mexico.

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medianos e 1,9% foram resultados ruins, segundo os critérios de Macnab; o tempo médio de cirurgia foi 84 minutos por procedimento, a hemorragia pós-cirúrgica média foi 65 ml. Do total, 87,4% dos pacientes operados ficaram em ambulatório e 7,6% tiveram internação hospitalar curta. Conclusão: Constatou-se que a técnica de nucleoplastia endoscópica percutânea com radiofrequência é um procedimento que oferece grandes benefícios para os pacientes com hérnia de disco lombar, entre os quais, realização sob anestesia local, com clara visualização do campo cirúrgico, dor mínima, pouco sangramento, menor tempo cirúrgico, não causa instabilidade de estruturas anatômicas e tem taxa mínima de complicações.

Descritores: Deslocamento do disco intervertebral; Região lombossacral; Tratamento por radiofrequência pulsada.

## INTRODUCTION

The intervertebral disc is the anatomical structure that connects the vertebral bodies. Skeletally, three main zones can be differentiated: the cartilaginous plate, which separates the vertebral bodies from the fibrous ring, the fibrous ring, and the nucleus propulsus.

Lumbar pain syndrome (LPS), associated with lumbar disc herniation, is a lesion that presents clinically as low back pain, which irradiates to the gluteal zone, thighs, legs and feet. It may follow a dermatome and can present weakness, numbness and tingling in the lower limbs. In the majority of individuals who have suffered lumbar pain, generally aged between 20 and 60 years, a high percentage of them have to be operated on, as pain is associated with 45% lumbar disc hernias.

Minimally invasive surgery is the current trend for all types of surgery, especially in the vertebral spine, where the surgical focuses and procedures continue to be considered by many as a last-resort treatment, unless there is evidence of progressive neurological lesion. The indecision over whether to perform surgery is partly due to concerns about the morbidity associated with traditional spine surgery, which can damage muscles during the approach to the vertebral spine. Minimally invasive discectomy is considered adequate by the majority of patients, and by many surgeons, for the treatment of lumbar disc hernias; however, the degree of minimum invasiveness varies widely among surgeons.

The most common modern adaptation of a technique of this type is described as microlumbar discectomy, which offers various surgical advantages. The use of minimum incisions is made possible using specialized or tubular mini-retractors, which retract the muscle. Many surgeons use an endoscope or a surgical microscope to minimize invasivity, and the muscles are divided to the width of the dilators by small incisions that define the majority of microdiscectomies performed today. Minimally invasive adaptations to standard laminectomy, in discectomy include smaller incisions; therefore, in these surgical techniques, there is less manipulation of the nerve root, as well as fenestration of the annulus, and elimination of only the sequestered fragment, which can be easily extracted through the annular defect.<sup>1</sup>

This investigation study begins by giving an overview of the results obtained by various authors, such as the advances in the technique of percutaneous endoscopic nucleoplasty with radiofrequency, with results that enables us to see the benefits obtained in the patients. It also includes the methodological development of the study, through to the final results, which show that the population served at this tertiary hospital, as well as users of the metropolitan area with a diagnosis of herniated discs, will benefit greater from this minimally invasive surgery.

Since earliest times, man has sought ways to alleviate his pain and favorably change the natural course of diseases. In prehistoric times, we have only bone remains in which fractures and dislocations have been found, with signs of bone fusion in the Paleolithic era. One of the first written evidences found dates back to more than 2500 years B.C, in a medical text known as the Edwin Smith papyrus, which refers to traumatic lesions of the spine, giving a clinical description.<sup>2</sup> Hippocrates (460-370 B.C.) and Galen (130-201) were the first to link vertebral spine injury to paralysis of the limbs. Galen also performed experiments on animals, demonstrating that disruption of the spinal cord produces paralysis and anesthesia below the level of the lesion.<sup>3</sup> But it was not until the

mid-eighteenth century that surgical treatments of the spine began to be performed, particularly in the European countries, such as England, Germany and France; at the end of the nineteenth century, specialists began to speculate on the instability generated by laminectomy on the vertebral spine, and various osteoplastic laminectomy techniques are described.<sup>4</sup> In 1905 Cushing<sup>5</sup> formulated indications and contraindications for spine surgeries, in which he mentions the benefit of decompressing the neural elements crushed by bone fragments or bullets, in patients with incomplete nerve injuries. In 1649, French surgeon Ambroise Paré was the first to propose traction for the treatment of traumatic spine lesions.<sup>6</sup> Decompression alone helped improve the neurological symptoms, and until the end of the 20<sup>th</sup> century, this procedure was widely used for a wide range of degenerative cervical problems with anterior spinal compression, but it could present complications due to bone collapse and expulsion, pseudoarthrosis and morbidity at the site of injection into the iliac crest. Instrumentation of the vertebral spine has grown exponentially since the introduction of the anterior approach to the cervical spine, by Cloward<sup>7</sup> in 1955-1956, by Harrington<sup>8</sup> in 1973 for the thoracolumbar spine, and by doctor Eduardo Luque Rebollar apud Apostolides et al.<sup>9</sup> who designed bars and transpedicle screws for segment fixation.<sup>7,8,9</sup> Since then, the technical aspects have been developed, and the next major breakthrough came in the late 1960s and early 1970s when Caspar began using microsurgery.<sup>10,11</sup> Hijikata described the first percutaneous discectomy in 1989, and great efforts are still being made to improve the technique, including the use of endoscopy and laser.<sup>12-14</sup> Today, changes or transformations have been made to the conventional procedure, such as the use of minimally invasive surgical techniques, which avoids the complications associated with the traditional procedures, which use broader approaches and expose more tissue. Among the new techniques, the endoscopic approach using dilators has enabled multiple surgeries, and new routes and multiple approaches have been developed for the application of endoscopic techniques.<sup>15</sup> In recent decades, spine surgery has turned its focus to increasingly less invasive procedures. The universal trend in current surgery is minimum invasion, reducing pain scores, morbidity and postoperative disability. Various works have been published on the treatment of hernias of the nucleus pulposus using the MAST (Minimally Invasive Spinal Technology) system, concluding that: the clinical results are the same as those obtained using classical techniques; the postoperative hospitalization time is significantly shorter, and can be done on an outpatient basis; the time for return to work is significantly shorter; and patient satisfaction is greater. Increased frequency of herniation recurrence has not been shown. The aims of this study are to evaluate the postsurgical results of the minimally invasive technique in the treatment of lumbar disc hernias in patients submitted to percutaneous endoscopic nucleoplasty with radiofrequency, and to establish the functionality and assess the postoperative clinical grading of our patients.

## METHODOLOGY

This is a descriptive, comparative, ambispective, longitudinal study conducted at the Hospital de Alta Especialidad de Veracruz (HAEV) and CEMIVER. Approval of the study was obtained from the Research Ethics Committees of both Institutions, and prior informed consent was obtained from the patients.

Clinical records of the traumatology and orthopedic service were used, particularly those of the modular spine surgery unit, for patients diagnosed, clinically and by imaging, with lumbar disc herniation, with discography. Patients were of both sexes, aged 18 to 65 years. Subjects were excluded if they had obesity, sequestered hernia, hematological diseases, bone marrow syndrome, degenerative congenital bone disorders, instability, degenerative lumbar spondylosis, spondylolisthesis, infections, and tumors, and those for whom there were no medical records.

Clinical records were used in this study, always protecting the patient's integrity, in order to comply with the rules of respect and confidentiality. In each procedure, basic materials for minor surgery were used in the operating theater, with the use of fluoroscopy and nonionic contrast medium in the trans-surgical, as well as Wolf endoscopy for spine surgery and the Disc-Fx radiofrequency team.

All the patient records that met the inclusion criteria were reviewed in the period March 2010 to March 2015 in the area of traumatology and orthopedics in the modular spine surgery unit. The study variables were also evaluated, and clinically correlated. (Table 1)

## ANALYSIS OF THE DATA

The Student t test was used for the descriptive statistics, showing rapid recovery of the patient, and reduced costs and adverse events at the abovementioned hospitals. The variants were measured using the VAS (visual analog scale of pain) scale, the Oswestry disability index for the functional assessment, and the modified Macnab criteria for the clinical grading. The analyses were performed using the software program Microsoft Excel 2010, SPSS 19.

## RESULTS

The study, conducted at the Hospital de Alta Especialidad de Veracruz (HAEV) and CEMIVER, included 161 patients, selected based on the inclusion criteria. The subjects were male and female, with a minimum age of 18 years and a maximum age of 65 years.

At the time of diagnosis, all patients were indicated to receive six months of consistent conservative treatment, with administration

**Table 1.** Demographic description

Sex	
Female	81 (45.9)
Male	80 (54.1)
Age	
18 to 32	32 (19.8)
33 to 47	75 (49.6)
48 to 62	44 (26.1)
63 or more	10 (4.5)
Occupation	
Homemaker	50 (27.0)
Student	20 (9.0)
Working	91 (64.0)
Types of Hernia	
Grade IV	95 (58.6)
Grade V	66 (41.4)
Pain Scale	
10	87 (79.3)
9	50 (12.6)
8	24 (8.1)
Functionality	
Intense	113 (83.8)
Moderate	48 (16.2)

of anti-inflammatory analgesics, weight control, preventive postural techniques for the spine, and rehabilitation and infiltration. The technique of percutaneous endoscopic nucleothermodiscolasty was performed in 100% of the patients; 83.8% with severe disability, and 16.2% with moderate disability, according to the Oswestry disability index (Table 2); a total of 83.8 % excellent results was obtained, with 9.5% good results, 4.8% average, and 1.9 % poor, according to the criteria of Macnab; we found a significant decrease in postoperative pain using the VAS scale (Table 3); the average surgery time was 84 minutes per procedure, average postoperative bleeding of 65 ml; 87.4% of the postoperative patients were treated on an outpatient basis, and 7.6% had a short hospital stay.

## DISCUSSION

Degenerative disease of the lumbar disc, and in particular, lumbar disc herniation, is a disease that is commonly presented to orthopedic doctors, particularly spine surgeons at the Hospital de Alta Especialidad de Veracruz, where percutaneous endoscopic microdiscectomy with radiofrequency is performed using the posterolateral (PTL), extreme lateral (ETL) and interlaminar (ITL) approaches. It is a minimally invasive technique that enables discectomies to be performed through a small skin incision, with fluoroscopic control.

Nowadays, there is experience in the use of this technique in various parts of the country, but so far, there have been no reported data on this technique in the State of Veracruz. This study performed at the HAEV and CEMIVER found favorable results for the use of percutaneous endoscopic nucleoplasty with radiofrequency for the treatment of lumbar disc herniation, with very similar results to those obtained in Germany and the United States by doctors Sebastian Ruetten<sup>16</sup>, Chiu<sup>17</sup> and Yeung,<sup>18</sup> each with their case series, according to their investigation studies. A study carried out in Colombia by Doctor J.F. Ramírez et al., who obtained favorable preliminary results in a population of 3000 patients in a study performed over fifteen years, is a reference of importance and a pioneering work in the use of these minimally invasive techniques of the vertebral spine in Latin America. That study demonstrated immediate stability, good clinical response, absence of intraoperative morbidity, reduced surgery times and bleeding, and a very short hospital stay, as some of the results of this first series of the technique. This three-year study at this hospital institution is promising, and requires longer follow-up time, as well as inviting other hospitals to conduct multi-center studies to determine its efficacy, motivating spine surgeons to use it, and to learn about these new minimally invasive surgical techniques.

## CONCLUSIONS

Nowadays, minimally invasive surgery is still a technique that is little known or practiced in Mexico; to date, and despite some opposition, this new advance in surgical techniques is opening doors and different routes, as the results obtained are successful and have shown great benefits for our population.

The vast majority of surgeons specializing in the vertebral spine continue to perform the conventional procedures described by

**Table 2 .** Comparative data on pre- and postsurgical functionality.

Intense 113 (83.8)	Moderate 25 (15.5)
Moderate 48 (16.2)	Minimum 136 ( 84.5)

**Table 3.** Comparative data on pre- and postsurgical pain

10	87 (79.3)	1	114 (84.7)
9	50 (12.6)	3	34 (12.6)
8	24 (8.1)	5	13 (2.7)

VAS Scale

the old school. Despite and against the opponents to this new technology and surgical techniques for medicine, particularly spine surgery, we have obtained similar, or in some cases better results, and that may bring satisfactory benefits for our population. Those who know and perform these surgical techniques have studied them abroad, and have gradually opened the way for this new technology called minimally invasive spine surgery.

We therefore emphasize and trust, according to our results and benefits in our patients, and described in various studies worldwide, which show that this type of technique used for the treatment of lumbar disc herniation provides great benefits for our patients, such as: it can be performed with local anesthetic, clear visualization of the surgical field through endoscopy, mini-

mum pain, little bleeding, shorter surgery times, it does not cause instability of the anatomical structures, less aggression and damage to the tissues, outpatient procedure, low medical cost, more cosmetic procedure among others, and with a lower risk of trans- and postoperative complications.

Based on our study, we have confidence in the results obtained, therefore we widely recommend these surgical techniques for the patient population of Hospital de Alta Especialidad de Veracruz and the Centro de Mínima Invasión de Veracruz (CEMIVER).

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All authors declare no potential conflict of interest concerning this article.

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