OUTCOMES OF UNILATERAL BIPORTAL ENDOSCOPIC LUMBAR DISCECTOMY FOR LUMBAR DISC HERNIATION AT CAN THO UNIVERSITY OF MEDICINE AND PHARMACY HOSPITAL

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ABSTRACT

Background: Lumbar disc herniation is a common condition that significantly impacts patients' quality of life and work capabilities. Unilateral biportal endoscopic (UBE) lumbar discectomy is a minimally invasive approach that effectively reduces pain and improves function after surgery. ***Objectives:*** To evaluate the efficacy and safety of UBE lumbar discectomy in treating lumbar disc herniation. ***Materials and Methods:*** This study included 39 patients diagnosed with single-level lumbar disc herniation who underwent UBE lumbar discectomy at Can Tho University of Medicine and Pharmacy Hospital. Pain and functional outcomes were assessed pre- and post-operatively using VAS and MacNab scores. ***Results:*** The mean VAS score significantly decreased from 4.08 (back) and 7.72 (leg) preoperatively to 1.62 and 2.26 postoperatively. The average hospital stay after surgery was 3.28 days, indicating a quick recovery and return to normal activities. MacNab outcomes indicated that 97.43% of patients achieved "Excellent" or "Good" results. Complications were minimal, with only one case of a small dural tear (2.57%) that did not require repair and did not affect the patient's recovery outcome. ***Conclusions:*** UBE lumbar discectomy is an effective and safe method for treating lumbar disc herniation, providing substantial pain relief, functional improvement, shorter hospital stays, and a low complication rate.

Keywords: *Disc herniation, biportal endoscopic surgery, treatment outcomes, back pain, leg pain, hospital stay.*

I. INTRODUCTION

Lumbar disc herniation is a common condition that negatively impacts patients' health and quality of life, particularly among those of working age. This condition occurs when the nucleus pulposus herniates from its normal position, compressing the nerve roots and spinal cord, resulting in symptoms like back pain, sciatica, and reduced motor function [1][2]. Traditional open surgery was previously the primary treatment for disc herniation, though this approach has drawbacks, including significant invasiveness, extensive soft tissue damage, and long recovery periods.

With the advancement of minimally invasive techniques, two-port endoscopic spine surgery has emerged as an effective alternative that reduces pain, bleeding, and recovery time [3]. This method involves two small incisions to introduce endoscopic and surgical instruments into the affected area,

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delivering high therapeutic efficacy with fewer complications.

This study aims to evaluate the efficacy and safety of two-port endoscopic spine surgery in the treatment of lumbar disc herniation, contributing scientific evidence to support its widespread clinical adoption.

II. SUBJECTS AND METHODS

2.1. Subjects

The study was conducted on all patients with lumbar disc herniation treated via two-port endoscopic discectomy at Can Tho University of Medicine and Pharmacy Hospital from April 2023 to September 2024.

Inclusion Criteria: Patients diagnosed with single-level lumbar disc herniation confirmed by clinical examination and MRI imaging.

Exclusion Criteria: The following conditions led to exclusion:

- Local or systemic infection.
- Multilevel lumbar disc herniation.
- Other spinal conditions such as spinal fractures, spondylolisthesis, or lumbar spinal stenosis.
- Severe internal medical conditions such as cardiovascular, respiratory, diabetes, uncontrolled liver or kidney disease.

2.2 Research Methodology

Study Design: Cross-sectional descriptive study.

Sample Size and Sampling Method:

- **Sample Size:** 39 patients.
- **Sampling Method:** Convenience sampling, including all patients meeting the inclusion criteria who were treated at Can Tho University of Medicine and Pharmacy Hospital during the study period.

Research Content:

- **Patients' Characteristics:**
  - **General Information:** Age, gender.
  - **Clinical Symptoms:** Preoperative back and leg pain levels assessed using the Visual Analogue Scale (VAS).
  - **Herniation Location:** L4/5, L5/S1, or other locations.
- **Surgical Outcomes:**
  - Surgery duration.
  - Postoperative back and leg pain levels assessed with VAS.
  - Functional outcomes assessed by the MacNab score: Excellent, Good, Fair, Poor.
  - Postoperative complications: Bleeding, infection, dural tears.

Data Processing & Analysis: Data was analyzed using SPSS 20.0, with statistical significance set at $p < 0.05$.

III. RESULTS

3.1. Characteristics of the study group

The average age of the study group was 44.74 ± 12.75, with the youngest being 21 and the oldest 70. In our study, 22 out of 39 patients (56.4%) were female.

Preoperative VAS for back pain had an average score of 4.08 ± 0.86, while that for leg pain averaged 7.72 ± 0.75. L4-5 was the most frequently affected level, accounting for 58.97% (23/39 patients), followed by L5-S1 at 41.03% (16/39), with no other affected levels.

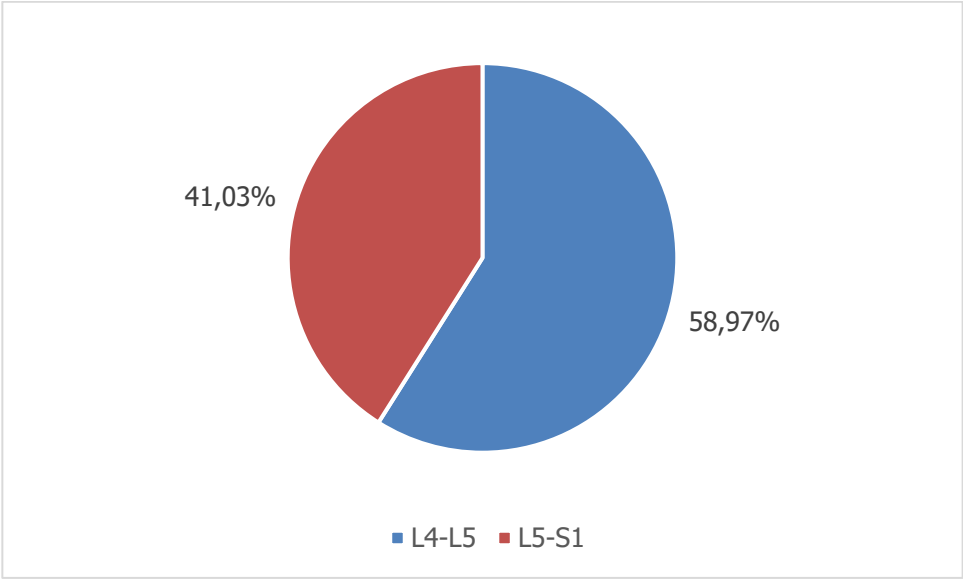

Figure 1. ***Distribution of affected lumbar disc levels***

3.2 Surgical outcomes

The average hospital stay was 3.28 ± 1.34 days (min-max days). Postoperative VAS scores were 1.62 ± 0.86 for back pain and 2.26 ± 0.87 for leg pain.

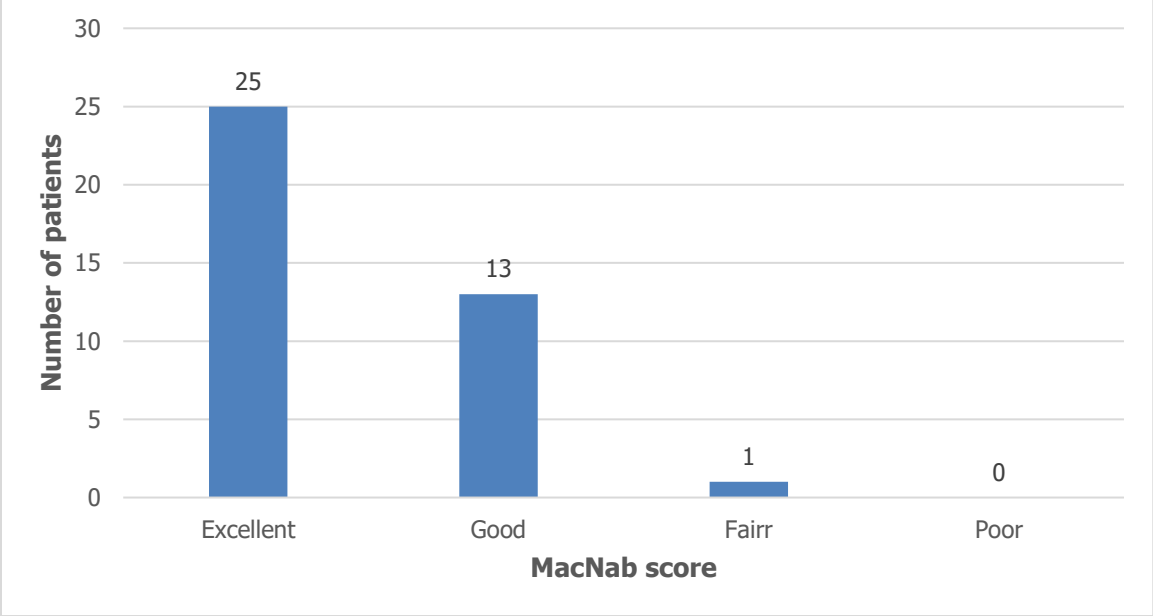

Figure 2. ***Postoperative outcomes by MacNab score***

Comments: Postoperatively, 39 patients were assessed according to the MacNab score with 36 achieving Excellent outcomes (64.1%), 25 attaining Good (33.33%), and 1 attaining Fair (2.57%), with no Poor outcomes.

During treatment, no patients required blood transfusions. No infection complications were recorded, though there was one case of a dural tear during surgery, accounting for 2.57%.

IV. DISCUSSION

4.1 Patients' characteristics

Our study, with a sample size of 39 patients, recorded an average age of 44.74 ± 12.75 years. This indicates that the study group consists mainly of middle-aged individuals, ranging from 21 to 70 years. This finding aligns with the study by Sadayuki Ito et al. (2023) [4], which reported an average age of 46.3 ± 16.6 years. In this age group, the intervertebral discs undergo natural aging, gradually losing hydration and elasticity, which makes them prone to damage. At the same time, surrounding structures, including the annulus fibrosus and articular cartilage, also degenerate, reducing load-bearing capacity and increasing herniation risk.

Furthermore, middle-aged individuals often face various pressures at work and in life, including heavy lifting, prolonged sitting, and lack of physical activities. These factors place substantial strain on the spine, contributing to disc degeneration and an elevated risk of herniation.

Our study recorded a female to male ratio of 56.4% (22/39 patients). While this is slightly higher than the male ratio, overall, there was no significant gender difference within the study group. This finding is consistent with the study by Ito (2023) with no marked gender disparity among patients [4].

The study shows that the L4-L5 level is the most common site of lumbar disc herniation, accounting for 58.97% (23/39 patients). This aligns with prior studies, which suggest that the L4-L5 level bears the greatest mechanical stress as it supports the body's upper weight and is involved in bending, flexing, and twisting movements. The L5-S1 level is also common, accounting for 41.03% (16/39 patients) in this study. Lumbar disc herniation typically occurs at the L4-5 and L5-S1 levels, which can be explained by the anatomical and biomechanical characteristics of this region [5]. These levels bear the highest load in the spine as they are located at the lower end of the lumbar region, supporting the weight of the upper body. When the body performs movements like bending, twisting, or lifting, the pressure on discs at these levels increases, raising the risk of herniation. Moreover, the L4-5 and L5-S1 levels serve as the junction between the lumbar spine and sacrum, bearing downward compression forces while providing the flexibility required for body movements. The anatomical structure with the lumbar lordotic curve also creates continuous pressure on the discs at these levels. Additionally, natural aging causes early degeneration of discs in this region, with a loss of hydration and elasticity, weakening their shock-absorbing capability and increasing herniation susceptibility. Lifestyle and occupational factors, such as poor sitting posture, bending, or heavy lifting, further increase the pressure on the L4-5 and L5-S1 discs. These factors explain why these levels are the most commonly affected in lumbar disc herniation cases.

4.2. Surgical outcomes

Our study evaluated the effectiveness of two-port endoscopic spine surgery in treating disc herniation based on 39 patients. One notable outcome is the relatively short postoperative hospital stay, averaging 3.28 ± 1.34 days. This suggests that two-port endoscopic spine surgery enables patients to recover quickly and resume normal life. For comparison, Do Tuan Anh's study (2024) on 36 patients also recorded an average hospital

stay of 3.53 days following endoscopic spine surgery [6]. The similarity in outcomes between these two studies further strengthens the evidence of the benefits of endoscopic spine surgery in reducing inpatient treatment duration.

A shorter hospital stay provides multiple benefits for both patients and the healthcare system. For patients, early discharge reduces treatment costs, lowers the risk of hospital-acquired infections, and facilitates a return to work and daily activities. For the healthcare system, a shorter hospital stay frees up beds, reduces hospital workload, and optimizes healthcare resources.

Table 1. ***Pre- and Postoperative VAS Pain Scores***

	Preoperative	Postoperative	p (paired t-test)
VAS back	4.08 ± 0.86	1.62 ± 0.86	p < 0.001
VAS leg	7.72 ± 0.75	2.26 ± 0.87	p < 0.001

Our study evaluated the pain-reduction effectiveness of two-port endoscopic spine surgery for treating disc herniation. The results show that both back and leg VAS scores decreased significantly after surgery (p <0.001). Specifically, VAS back pain scores dropped from 4.08 ± 0.86 preoperatively to 1.62 ± 0.86 postoperatively, and VAS leg pain scores dropped from 7.72 ± 0.75 preoperatively to 2.26 ± 0.87 postoperatively.

This significant improvement indicates that two-port endoscopic spine surgery is an effective method for alleviating pain from disc herniation. Pain reduction not only improves patients' quality of life, enables them to resume daily activities sooner, but also reduces dependence on pain medications, thereby minimizing unwanted side effects.

This outcome aligns with the general trend in previous studies on endoscopic spine surgery. Many studies have shown that endoscopic surgery, with its minimally invasive technique, can achieve pain relief equivalent to or even better than traditional open surgery, while reducing complications and shortening recovery time [6][7][8][9][10].

However, when compared with the study by Vo Van Tu (2024), we noted a difference in pre- and postoperative VAS leg scores. Vo Van Tu's study reported an average preoperative VAS leg score of 6.03 ± 1.17 and a postoperative score of 1.10 ± 0.29 [7], which is lower than our results. This difference may arise from several factors, including the specific endoscopic surgical technique used in each study, as well as the relatively small sample sizes in both studies. Additionally, our study specifically focuses on two-port endoscopic spinal surgery, while Vo Van Tu's study (2024) provides a general description of endoscopic spine surgery without distinguishing the type of procedure. Therefore, the difference in surgical techniques may contribute to the discrepancy in VAS leg scores. Despite minor differences, both studies confirm the pain-reducing effectiveness of endoscopic spine surgery in treating disc herniation. In the future, larger-scale studies comparing various endoscopic surgical techniques directly will help us better understand the effectiveness of each method and select the optimal approach for each patient.

Table 2. ***Treatment outcomes according to MacNab score in different studies***

Study	Sample size (n)	MacNab score (%)			
		Excellent	Good	Fair	Poor
Our study	39	64.10%	33.33%	2.57%	0%
Le Tuong Vien (2021) [8]	32	56.25%	37.50%	6.25%	0%
Jin-Chang Wang (2023) [9]	70	57.14%	37.14%	2.86%	2.86%

In addition to assessing hospital stay duration and pain reduction, we also used the MacNab score to evaluate overall treatment outcomes. This score considers factors such as pain reduction, improvement in mobility, and patient satisfaction to classify results into four categories: Excellent, Good, Fair, and Poor. Our findings show that two-port endoscopic spine surgery delivers favorable treatment outcomes based on the MacNab score, with 97.43% of patients achieving favorable results ("Excellent" or "Good"). This rate is comparable to that of Le Tuong Vien and colleagues (2021) (93.75%) and higher than that by Jin-Chang Wang and colleagues (2023) (94.28%) [8][9].

Notably, in our study, no patients had "Poor" outcomes postoperatively. This contrasts with Wang and colleagues (2023), who found 2.86% of patients with "Poor" outcomes. This difference could have been due to variations in sample size and patient characteristics between studies. Otherwise, it suggests that two-port endoscopic spine surgery may offer more stable treatment outcomes with a lower complication rate.

The high effectiveness of two-port endoscopic spine surgery can be attributed to several factors. Firstly, endoscopic spine surgery is less invasive than traditional open spinal surgery, helps minimize soft tissue damage, reduce postoperative pain, and shorten recovery time. Secondly, endoscopic surgery provides the surgeon with a clearer view of the surgical area, allows thorough removal of the herniated disc and reduces the risk of recurrence. Lastly, selecting appropriate patients, such as those with isolated disc herniation without other spinal conditions, also contributes to surgical success.

In this study, we focused on evaluating the safety of two-port endoscopic spine surgery in treating disc herniation. The results indicate that this method has a low complication rate. Specifically, no patients required blood transfusions during treatment, and no cases of infection were recorded. However, there was one case of a dural tear during surgery, accounting for 2.57%. The tear was small (3mm) and did not require suturing. Importantly, this complication did not affect the patient's recovery. A dural tear is a potential complication in spinal surgery and can lead to cerebrospinal fluid leakage, headaches, nausea, and an increased risk of infection [10]. Although the dural tear rate in this study is relatively low compared with previous reports on spinal surgery, caution and appropriate preventive measures are necessary to minimize this complication [6][7][8][9][10].

V. CONCLUSION

Two-port endoscopic discectomy is an effective and safe treatment method for lumbar disc herniation. The study results show that this technique significantly reduces back and leg pain, improves mobility, shortens hospital stay, and allows patients to

resume normal activities sooner. The low complication rate, with only one minor dural tear that did not affect recovery, confirms the safety of this approach.

Two-port endoscopic spine surgery not only offers substantial therapeutic benefits but also reduces the burden on the healthcare system through rapid patient recovery. This study provides further evidence on the efficacy of two-port endoscopic spine surgery in treating disc herniation, presenting a minimally invasive and reliable treatment option for patients. However, larger-scale studies comparing this technique with other surgical methods are needed to optimize this treatment approach.

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