ORIGINAL ARTICLE

Effects of different surgical treatments on pain, disability, anxiety and quality of life in lumbar disc herniation

Efectos de diferentes tratamientos quirúrgicos sobre el dolor, la discapacidad, la ansiedad y la calidad de vida en la hernia de disco lumbar

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Abstract

Objective: *This study aims to compare the effects of microscopic microdiscectomy and microendoscopic discectomy on pain, disability, fear of falling, kinesiophobia, anxiety, quality of life in patients with lumbar disc herniation (LDH).* **Methods:** *A total of 90 patients who underwent microscopic microdiscectomy (n = 40) and microendoscopic discectomy (n = 50) for LDH were included in this study. The patients' pain, disability, fear of falling, kinesiophobia, anxiety, and quality of life were evaluated before the surgery, in the early postoperative period and three months after.* **Results:** *In patients who underwent microendoscopic discectomy, the results of pain, disability, fear of falling, kinesiophobia and anxiety were statistically decreased compared with the microscopic microdiscectomy in the early postoperative period and three months later ($p < 0.05$). Also, a statistically higher increase was observed in the general health perception of patients who underwent microendoscopic discectomy three months after the operation ($p < 0.01$).* **Conclusion:** *Microendoscopic microdiscectomy, remains the most effective and widely applied method with advantages on pain, quality of life, and improved physical functions.*

Keywords: *Lumbar disc herniation. Microscopic microdiscectomy. Microendoscopic discectomy. Pain. Disability.*

Resumen

Objetivo: *Este estudio tiene como objetivo comparar los efectos de la microdiscectomía microscópica y la discectomía microendoscópica sobre el dolor, la discapacidad, el miedo a caer, la kinesiofobia, la ansiedad y la calidad de vida en pacientes con hernia de disco lumbar (LDH).* **Métodos:** *Se incluyeron en este estudio un total de 90 pacientes sometidos a microdiscectomía microscópica (n = 40) y discectomía microendoscópica (n = 50) por LDH. Se evaluó el dolor, la discapacidad, el miedo a caer, la kinesiofobia, la ansiedad y la calidad de vida de los pacientes antes de la cirugía, en el postoperatorio temprano y tres meses después.* **Resultados:** *En los pacientes sometidos a discectomía microendoscópica, los resultados de dolor, discapacidad, miedo a caer, kinesiofobia y ansiedad disminuyeron estadísticamente en comparación con la microdiscectomía microscópica en el postoperatorio temprano y tres meses después ($p < 0.05$). Además, se observó un aumento estadísticamente mayor en la percepción de salud general de los pacientes sometidos a discectomía microendoscópica tres meses después de la operación ($p < 0.01$).* **Conclusión:** *La microdiscectomía microendoscópica sigue siendo el método más eficaz y ampliamente aplicado con ventajas sobre el dolor, la calidad de vida y la mejora de las funciones físicas.*

Palabras clave: *Hernia discal lumbar. Microdiscectomía microscópica. Discectomía microendoscópica. Dolor. Discapacidad.*

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Introduction

Lumbar disc herniation (LDH) is characterized by the change in the normal location of the discs because of excessive load on the vertebral discs and usually occurs during the degeneration process[1]. It is frequently observed between the ages of 30-50 and mostly in men[2]. The sedentary lifestyle we frequently encounter today causes many health problems[3,4]. It is generally accepted that the etiology of disc degeneration is multifactorial and related to physical activity, lifestyle factors, and other individual characteristics[5,6].

Physical inactivity can lead to a narrowing of the distance between the intervertebral discs, an increase in the fat content of the multifidus muscle, and high-intensity low back pain[7]. In addition, due to the very low activation of the lumbar muscles while sitting, the load may be transmitted to passive structures such as ligaments and intervertebral discs, causing degenerative changes in the lumbar spine. This may cause an increase in the prevalence of lumbar disc herniation[8].

Low back pain is one of the most common health problems, causing severe disability in lumbar disc herniation patients, and 70-80% of people experience low back pain at some point in their lives. It is seen as an expensive sociomedical problem due to the need for recurrent treatments, long-term job loss, and social support[1,7].

Lumbar disc herniation is usually seen in L4-L5 and L5-S1 localizations. Displacement of the intervertebral disc causes compression on spinal nerve roots, spinal cord, and pain-sensitive structures. The patient may have lower back-leg pain, pain and limitation in lower back movements, spasms in the lumbar muscles, positive nerve stretching tests, and sensory, motor, and reflex defects due to the sliding disc pressing on the nerve root[9,10]. Most patients with lumbar disc herniation respond well to conservative treatment; hence only 5-10% of patients require surgery[9].

MRI is a valuable, non-invasive tool for demonstrating disc herniation and identifying pathological changes in the disc due to its superiority in soft tissues[11,12]. Contrast-enhanced MRI may also reveal inflammation in the nerve root. Sequestered disc hernias, differentiation of hernias and other lesions, and peridiscal degeneration assessment can be conducted more efficiently with MRI[12].

Following the diagnosis, the treatment in herniation patients is primarily conservative, and options such as medical treatment, physical therapy, and rest are usually advised. In addition, the definitive surgical indication is sacral root paralysis due to massive midline disc herniation. Relative indications are progressive neurological loss, motor weakness, severe excruciating pain, frequent recurrences, and unresponsiveness to appropriate conservative treatment[13]. Microscopic discectomy and endoscopic discectomy options are available as surgical treatments. Recently, the preference for endoscopic discectomy has been increasing because it is less invasive[14].

In previous literature, limited evidence has been published about the effectiveness of these two surgeries on functional parameters such as pain, disability, fear of falling and kinesiophobia in individuals with lumbar disc herniation. Additionally, no research has been published that compared the efficacy of microscopic microdiscectomy treatment and microendoscopic discectomy surgeries. The aim of this study is to compare the effects of microscopic microdiscectomy surgical treatment and micro endoscopic discectomy on pain, disability, fear of falling, kinesiophobia, anxiety and quality of life in patients scheduled for lumbar disc herniation surgery. Secondly, it is aimed to illuminate the disability and loss of quality of life caused by lumbar disc herniation.

Materials and methods

A total of 90 patients who were admitted to two institutions with lumbar disc pathologies between March 2023 to May 2023 enrolled in this prospective study. Ninety patients over 18, who were diagnosed with lumbar disc pathology requiring surgical treatment according to MRI results, and volunteered to participate in the study, were included in the study. Patients who had undergone surgery in the lumbar region previously had lumbar degenerative changes (spondylolisthesis, scoliosis, malignancy status, vertebral fracture, osteoporosis, lumbar osteoarthritis) in the MRI, individuals who were not able to cooperate, pregnant, and did not require surgical treatment were excluded.

All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2008. The study was approved by the Ethics Committee of the University (2023/1282) and written informed consent has been obtained from all patients.

Patients diagnosed with lumbar disc and scheduled for microscopic discectomy and microendoscopic

discectomy were included in the study and divided into two groups: Microendoscopic discectomy (endoscopic surgery) and microscopic discectomy (surgery). The patients were evaluated in their routine outpatient clinic controls, and the patients whose symptoms were compatible with the lumbar disc pathologies were included in the study. The study was conducted on patients diagnosed with a lumbar disc in two hospitals (Karabük University Training and Research Hospital Neurosurgery Department and Malatya Private Gözde Academy Hospital). Demographic characteristics of the patients such as age, genders were recorded. Pain (Numeric Rating Scale), disability (Oswestry Disability Index), fear of falling (Falls Efficacy Scale-International), kinesiophobia (Tampa Scale for Kinesiophobia), anxiety (Beck Anxiety Inventory), and quality of life (Short Form-36) were evaluated to patients who decided to undergo surgical treatment in the preoperative, early postoperative periods, and three months.

Outcome measures

Numeric rating scale

Low back pain severity of individuals was evaluated with the 'Numbered Rating Scale (NRS)'. This scale is horizontally scored between 0-10 (0 = no pain, 10 = unbearable pain). Pain intensity was evaluated for the low back during rest[15].

Oswestry disability index

The Turkish version of the Disability Index (ODI) was used to evaluate the degree of loss of function associated with low back pain. The ODI, developed to assess functional disability in low back pain, has ten items (pain intensity, personal care, lifting, walking, sitting, standing, sleeping, social life, travelling, and changing the degree of pain). Pain-related disability ranges from 0 to 100 points. As the total score increases, the level of disability also increases[16].

Falls efficacy scale-international

Falls Efficacy Scale-International (FES-I) is a scale that evaluates individuals' self-confidence while performing their daily activities. Thus, it aims to predict the probability of falling concerning balance and gait. This scale assesses individuals' fear of falling in daily activities with 16-item questions. Individuals get a score between 16-65. It is observed that the probability of falling increases as the total score increases[17]. Turkish validity and reliability were performed by Ulus et al[18].

Tampa scale for kinesiophobia

The Tampa Scale for Kinesiophobia (TSK) measures individuals' fear of movement and re-injury. The Turkish version of the TSK was used to measure kinesiophobia in the study. The TSK consists of 17 questions and a 4-point Likert score, including the attitudes of individuals (1 = strongly agree, 4 = strongly disagree). When calculating the total score, items 4, 8, 12 and 16 be reversed to obtain a score. The individual gets a score between 17-68, and an increase in the score means an increase in kinesiophobia[19].

Beck anxiety inventory

The Turkish version of the Beck Anxiety Inventory (BAI) was used to measure the anxiety symptoms level of the participants. The BAI is a 21-item questionnaire to reflect the severity of somatic and cognitive anxiety symptoms during the previous week. Items are scored on a 4-point scale (0-3), and the total score ranges from 0 to 63[20].

Short form-36

The Turkish version of Short Fom-36 (SF-36) was used to measure changes in quality of life-related to chronic low back pain. This scale consists of 36 items and includes physical function, physical role difficulty, pain, general health, energy, social function, emotional role difficulty, mental health, etc. It evaluates various sub-parameters. Each sub-parameter is scored out of 0 is the lowest, and 100 is the highest[21,22].

Statistical analysis

Patient data collected within the scope of the study were analyzed with the IBM Statistical Package for the Social Sciences (SPSS) for Windows 23.0 (IBM Corp., Armonk, NY) package program. Based on the pain results from the pilot study, we estimated that a sample size of at least 35 individuals in each group would have 80% power for an α value of 0.05 and an effect size d = 0.60. Considering there would be data loss, 10% more individuals were planned to participate in the study, and at least 40 individuals for each group participated.

Frequency and percentage were given for categorical data, and median, minimum, and maximum descriptive values for continuous data. The "Mann Whitney U-Test" was used to compare the groups, and the "Pearson Chi-Square Test" was used to compare the categorical variables. The results were considered statistically significant when the p-value was less than 0.05.

Results

Within the scope of this prospective research, 90 patients who had undergone lumbar herniation surgeries in two different centers were enrolled in the study. Endoscopic surgery was performed in 55.6% (n = 50) of the patients, and lumbar discectomy was performed in 44.4% (n = 40). The distribution of demographic findings according to the type of surgery of the patients is presented in Table 1. Regarding gender, 51.1% (n = 46) of the patients were female, and 48.9% (n = 44) were male. The median age of the study population was 41 years (range 21 to 73 years).

The outcomes of the NRS pain scores, ODI, FES-I, TSK, and BAI were measured before the surgery, after the surgery, and at the three months after the surgery, according to the surgical types of the patients were elaborated in Table 2. When the table is examined, it is seen that there was no statistically significant difference in the preoperative NRS pain scores and TSK between the two surgical methods. All other scales showed a statistically significant difference between the two surgical methods before, after, and during the three months after the surgery ($p < 0.05$; Table 2).

The distribution of SF-36 quality of life scale scores according to surgery methods measured before, after, and during the three months after the operation has been presented in Table 3. When the table is examined, it is seen that there was a statistically significant difference before the surgery in the "Physical Function" sub-dimension scores between the two methods ($p < 0.05$). Although this difference disappeared after the surgery, there was a statistically significant difference in the three months after the surgery ($p < 0.05$). The difference between the two methods before the surgery in the sub-dimensions of "Physical Role Difficulty" and "Emotional Role Difficulty" disappeared in the postoperative period.

A statistically significant difference has been achieved between the two methods in the preoperative, postoperative, and postoperative three-month measurements in the "Energy/Vivacity/Vitality" sub-dimension ($p < 0.05$). In terms of the "Mental Health" and "Pain" sub-dimensions, although a difference has been observed before and after the surgery, no statistically significant difference was detected in the three months after the surgery. While there was no difference in the "Social Functioning" sub-dimension before the surgery,

Table 1. Baseline demographics of the study population

	Total (n = 90)	Endoscopic Surgery (n = 50)	Surgery (n = 40)	p
	Median (Min-Max) n (%)	Median (Min-Max) n (%)	Median (Min-Max) n (%)	
Age (years)	41 (21-73)	35 (21-73)	49 (23-72)	< 0.001
Gender				
Female	46 (51.1)	25 (50)	21 (52.5)	0.981
Male	44 (48.9)	25 (50)	19 (47.5)	

Min: minimum; Max: maximum.

Table 2. Distribution of the variables according to groups

	Endoscopic surgery (n = 50)	Surgery (n = 40)	p
	Median (Min-Max)	Median (Min-Max)	
NRS			
Before the operation	7 (6-9)	7 (4-9)	0.401
Post-operative	1 (0-4)	1 (0-2)	0.024
3rd month after the surgery	0 (0-3)	1 (0-2)	< 0.001
ODI			
Before the surgery	15.5 (11-15.5)	20 (12-29)	< 0.001
Post-operative	0.8 (0-8.1)	2.5 (0-5.5)	0.002
3rd month after the surgery	0 (0-8.1)	1.5 (0-5)	< 0.001
FES-I			
Before the surgery	35 (30-36)	43 (27-60)	< 0.001
Post-operative	18 (16-33)	23 (16-38)	< 0.001
3rd month after the surgery	16 (16-33)	19.5 (14-34)	< 0.001
TSK			
Before the surgery	49 (46-49)	48 (33-55)	0.761
Post-operative	21 (17-58)	26 (14-40)	< 0.001
3rd month after the surgery	17 (17-58)	20 (14-30)	< 0.001
BAI			
Before the surgery	29 (15-29)	11 (7-19)	< 0.001
Post-operative	4 (0-16)	9 (7-14)	< 0.001
3rd month after the surgery	0 (0-10)	8 (7-12)	< 0.001

Min: minimum; Max: maximum.

there was a statistically significant difference between the two methods in the postoperative and postoperative three-month measurements ($p < 0.05$). On the contrary, the 'General Health Perception" sub-dimension presented a difference between the two methods before the surgery; this difference disappeared after the surgery, and there was a difference again in the three-month measurements after the surgery ($p < 0.05$; Table 3).

Table 3. Distribution of SF-36 Quality of Life Scale Scores by groups

SF-36 Quality of Life Scale	Endoscopic Surgery (n = 50)	Surgery (n = 40)	
	Median (Min-Max)	Median (Min-Max)	
Physical Function			
Before the surgery	65 (65-65)	50 (0-85)	< 0.001
Post-operative	92.5 (45-100)	90 (50-100)	0.055
3rd month after the surgery	100 (45-100)	90 (65-100)	0.023
Physical Role Difficulty			
Before the surgery	0 (0-0)	0 (0-100)	0.002
Post-operative	100 (25-100)	100 (0-100)	0.468
3rd month after the surgery	100 (25-100)	100 (0-100)	0.490
Emotional Role Difficulty			
Before the surgery	33.3 (0-33.3)	0 (0-100)	< 0.001
Post-operative	100 (34.3-100)	100 (0-100)	0.442
3rd month after the surgery	100 (34.3-100)	100 (0-100)	0.447
Energy/Vitality/Viability			
Before the surgery	35 (30-45)	30 (5-45)	< 0.001
Post-operative	50 (0-70)	55 (35-80)	< 0.001
3rd month after the surgery	50 (45-65)	55 (35-80)	< 0.001
Mental Health			
Before the surgery	48 (44-56)	52 (32-64)	0.002
Post-operative	52 (0-60)	56 (40-80)	< 0.001
3rd month after the surgery	52 (40-64)	56 (40-80)	0.201
Social Functioning			
Before the surgery	50 (25-50)	50 (0-62.5)	0.085
Post-operative	37.5 (0-75)	75 (62.5-100)	< 0.001
3rd month after the surgery	62.5 (37.5-87.5)	81.3 (62.5-100)	< 0.001
Pain			
Before the surgery	22.5 (12.5-45)	45 (10-67.5)	< 0.001
Post-operative	35 (0-77.5)	90 (52.5-100)	< 0.001
3rd month after the surgery	78.8 (22.5-100)	90 (52.5-100)	0.071
General Health Perception			
Before the surgery	35 (35-45)	45 (15-65)	0.013
Post-operative	60 (10-85)	55 (30-75)	0.957
3rd month after the surgery	62.5 (40-95)	55 (30-75)	< 0.001

Min: minimum; Max: maximum.

Discussion

This study showed that microendoscopic surgery is more effective than microscopic surgery in reducing pain, disability, fear of falling, and kinesiophobia in the early and long term. It also showed that micro-endoscopic surgery improves the quality of life in a long time.

Herniated intervertebral disc disease is the most common reason for lumbar spinal surgery. In the early 1980s, there was an increasing use after Caspar described the technique and instrumentation for the use of the microscope in the surgery of disc herniations. This technique is still the gold standard in disc surgery today. Although most lumbar disc herniations benefit from conservative treatments, surgical treatment is required in patients with cauda equina syndrome, sudden or progressive loss of strength, failure to respond to conservative treatment for 4-6 weeks, and frequent recurrent disc herniation attacks[1,14].

The anatomical structure of the lumbar spinal column, such as midline, paraspinal and posterolateral, reliably allows minimally invasive surgical intervention with the posterolateral approach. One of these different approaches is the transforaminal approach. If necessary, it is applied for discectomy with the help of an endoscope or microscope[1,21]. Required revision can be achieved by using different angle endoscopy optics. It is known that open surgery in extraforaminal disc herniations causes more anatomical damage than intracanal herniations. Since facetectomy is usually performed in open surgery, 25% instability due to anatomical damage is always one of the topics discussed[3,5]. Microdiscectomy is a modification of the standard open discectomy. Smaller skin incision, less muscle dissection, preservation of the ligamentum flavum and ultimately faster recovery are the advantages of this technique. However, transforaminal and extraforaminal endoscopic methods are minimally invasive[1]. In a study, transforaminal endoscopic discectomy was found to be effective in reducing pain and disability in LDH[23]. In our study, the comparison between endoscopic discectomy and microscopic microdiscectomy on the SF-36 Quality of Life scale revealed favorable outcomes for microendoscopic microdiscectomy. Postoperative pain is the most important complaint of lumbar disc herniation patients, and it was clinically significantly lower in the

microendoscopic microdiscectomy group. Additionally, general health status, which indicated the degree of healing, was also clinically higher in individuals operated via microendoscopic microdiscectomy. Similar to this parameter, social functioning was also significantly better in these patients in the postoperative period and three months after the surgery. Energy–vitality and viability sub-dimensions have also indicated significantly improved outcomes in the preoperative and postoperative period and three months after the surgery. The preoperative results may be attributed to the patient's motivation for a microendoscopic microdiscectomy. The physical functioning scores also revealed statistically significantly higher results in the preoperative period and three months after the surgery[24]. In addition, injections used before surgery also increase the effectiveness of treatment after LDH surgery[25]. Therefore, its use in the microendoscopic surgery process may be important in making healing more effective.

Lew et al. stated that transforaminal percutaneous endoscopic discectomy results have been 85% successful in foraminal and extraforaminal disc herniation[26]. Similarly, Yang reported a success rate of 85.7% with transforaminal endoscopic discectomy[27]. He stated that these rates were comparable to foraminal and extraforaminal disc hernias treated with traditional surgical methods[28]. Yeung reported excellent and good results in 83.6%, poor results in 9.3%, and reoperation in 5% of 307 patients with primary lumbar disc herniation who underwent posterolateral endoscopic discectomy with a minimum follow-up of 1 year[28]. In this study, 80% success was achieved with the full endoscopic method in lumbar disc disease despite the inexperience of the surgeons. It was determined that the success rate obtained in this study was comparable to the studies in the literature. More importantly, 93.3% of cases reported that the same surgery could be repeated despite recurrence[28].

Recurrence is an inevitable complication of disc surgery. Even in microsurgery series, recurrence rates between 5% and 18% have been reported. The recurrence rate in endoscopic discectomy surgery is between 0% and 12%[26]. Many authors have reported it completing the learning curve with increased cases recommended to avoid recurrence[28,29].

While microdiscectomy was widely used for the surgical treatment of soft sequestered disc herniations, it was later used frequently in treating pathologies associated with advanced degeneration. Microendoscopic microdiscectomy performed in lumbar disc herniation surgery may have many advantages compared to open standard discectomy, such as being a minimally invasive method, using a small incision, very little subperiosteal muscle dissection, good, and less. In addition, this surgical method has less postoperative pain. The period includes many postoperative advantages, such as more comfortable mobilization and early return to work. Considering the length of hospital stay and the amount of blood loss, some studies reported results favoring microendoscopic microsurgery[30].

The results of our study supported the advantages of microscopic microdiscectomy. Although there was no statistically significant difference between the two surgical methods in the preoperative NRS pain scores and TSK, they favored the microendoscopic microdiscectomy group in the postoperative period and three months after the surgery. Additionally, ODI scores have also denoted clinically significant results in the postoperative period and three months after the surgery. Falls Efficacy Scale-International and BAI scores were statistically significantly better in all three measurements in the microendoscopic microdiscectomy group.

Regarding the outcomes of this research, it was shown that microendoscopic microdiscectomy surgical treatment is more effective in reducing pain than endoscopic discectomy. Additionally, microendoscopic microdiscectomy surgical treatment is more effective in reducing disability and increasing quality of life. Microendoscopic microdiscectomy surgical treatment effectively reduces kinesiophobia, anxiety, and fear of falling.

Conclusion

In conclusion, microendoscopic discectomy surgery performed in patients with lumbar disc hernia reduces pain, disability, fear of falling, kinesiophobia and anxiety more than microscopic microdiscectomy surgery in both the early and long term after surgery. Also, microendoscopic discectomy is more effective in improving quality of life. In this context, microendoscopic microdiscectomy, a minimally invasive method, continues to be the most effective and widely applied method with the advantages of improving pain, quality of life and physical functions.

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Conflicts of interest

The authors declare that they have no conflicts of interest.

Ethical disclosures

Protection of human and animal subjects. The authors declare that no experiments were performed on humans or animals for this study.

Confidentiality of data. The authors declare that they have followed the protocols of their work center on the publication of patient data.

Right to privacy and informed consent. The authors have obtained the written informed consent of the patients or subjects mentioned in the article. The corresponding author is in possession of this document.

Use of artificial intelligence for generating text. The authors declare that they have not used any type of generative artificial intelligence for the writing of this manuscript, nor for the creation of images, graphics, tables, or their corresponding captions.

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