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Importance of Physiotherapy after Lumbar Microdiscectomy

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ABSTRACT

AIM: To investigate the effects of a lumbar exercise program after single-level lumbar microdiscectomy on the recurrence of lumbar disc diseases.

MATERIAL and METHODS: Between 2018 and 2021, 223 patients (104 women, 119 men, median age: 49 years) who received their first corrective surgery for lumbar disc herniation were included in this retrospective study. Their clinical status was evaluated before surgery, early post-surgery, and 6-months after surgery using the Visual Analog Scale (VAS) and Oswestry Disability Index (ODI). Patients were divided into two groups: group A (n=124) included those who regularly participated in the postoperative physical therapy and rehabilitation program for 6 months; group B (n=99) included those who did not regularly participated or did not participate at all in the physical therapy and rehabilitation program. Their compliance to the 6-month physical therapy program (started at our clinic in the 1st postoperative month) and its relation to recurrent lumbar disc hernia at the same level was evaluated.

RESULTS: In group B, 82 patients showed irregular compliance to the physical therapy program and 17 patients did not participate in the physical therapy program. During the 6-month follow-up period, 27 patients developed recurrent disc hernia at the same level (group A, 9 patients; group B, 18 patients) and they accordingly underwent repeat microdiscectomy surgery.

CONCLUSION: Compliance with the postoperative physical therapy program after single-level lumbar microdiscectomy is one of the factors that prevented recurrent disc hernia during the early postoperative period.

KEYWORDS: Annulus fibrosus, Lower back pain, Microdiscectomy, Physical therapy program, Recurrent disc herniation

INTRODUCTION

Lumbar discectomy remains the most effective treatment for resolving nerve compression from lumbar disc hernia, and the procedure can be conducted safely with minimally invasive methods (8,16,23). However, this approach does not entail repair of the damaged discs but rather impairs the stability due to the removal of a fragment of the disc (2,5,9). Another important aspect is the relatively high incidence of recurrence (mean recurrence rate in previously reported series: 15%) (1,2,7,19).

Annulus fibrosus (AF) is the most important structure to be considered for the treatment of an impaired disc (22). The larger is the AF defect, the bigger is the problem related to the lack of self-repair (2,20). In this respect, AF is a pivotal anatomic structure that contributes to the failure of surgical intervention as well as physical therapy.

Lumbar stabilization exercises are the major component of conservative treatment and are effective in 3 main clinical contexts (9). First, these prevent the development of lumbar disc herniation. Second, these are utilized to prevent recurrence following spontaneous remission of a disc herniation. Lastly, lumbar stabilization exercises are also used to prevent recurrence after lumbar discectomy and to eliminate pain caused by spinal instability. The most important aspect is to determine the appropriate timing for the initiation of exercise.

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In this report, we present the 1-year follow-up data of patients who received our rehabilitation program following a simple microdiscectomy. The recommended rehabilitation program is also discussed in detail.

MATERIAL and METHODS

Patient Population

This study was approved by the Institutional Review Board of Uskudar University (61351342/Aug 2022-20).

A total of 223 patients (104 women, 119 men, median age: 49 years) who received their first corrective surgery for lumbar disc herniation between 2018 and 2021 were enrolled in this study. Their clinical status was evaluated preoperatively, in the early post-surgery phase, and at 6 months after surgery using visual analog scale (VAS) and Oswestry Disability Index (ODI). Patients were divided into two groups: Group A (n=124) included patients who regularly participated in the physical therapy and rehabilitation programs for 6 months during the postoperative period, while Group B (n=99) included those who did not regularly participate or did not participate at all in physical therapy and rehabilitation programs during the postoperative period. All patients enrolled in the study had single-level lumbar disc hernia that impaired the quality of their daily life. All patients had failed to respond to conservative treatment prior to surgery. Patients with neurological deficit, disc hernia at multiple levels, additional degenerative vertebral diseases, and body mass index (BMI) >25 were excluded from the study to obtain as homogeneous a patient group as possible.

Study Design

We retrospectively evaluated the compliance of patients to the standard 6-month physical therapy program that was started at our clinic in the 1st postoperative month and assessed its relation with the occurrence of recurrent lumbar disc hernia at the same level. All enrolled patients were recommended the same exercise program. Patients were encouraged to regularly perform exercise sets for 6 months, starting from 1 month after the surgery. Training for each exercise set was provided by physical therapy and rehabilitation specialists.

The program was started one month after surgery because, theoretically, by this time, there is closure of the defect in the AF due to formation of granulation tissues and the contraction process in the wound begins. The active exercise program was started after the seventh week, when the repair process in AF was stronger. This approach was aimed at avoiding excessive load on the disc before the complete closure of the AF defect or before adequate strengthening of the granulation tissues by monitoring the connective tissue healing in all exercise phases.

Recommended Program:

Preoperative evaluation phase: The patients were informed about the surgery and the forthcoming period.

Active resting phase (0–3 weeks): Patients were mobilized under the supervision of a physiotherapist on the first postoperative day. Patients were asked to remain mobile and change their position frequently in at least 30-min intervals. They were informed about maintaining the correct posture on the 3rd postoperative day. Avoiding lumbar hyperextension and maintaining the lumbar region straight was emphasized. They were also advised to avoid lifting, bending, and hyperextension for 6 weeks.

According to our rehabilitation protocol, the lumbar rotation was restricted within the last 3 weeks. They were also advised to avoid driving for at least 2 weeks.

The goal of the following exercise was to learn how to flex the abdominal muscles in a controlled manner while maintaining the spine in a neutral position (Figure 1).

1. With your knees bent, assume a supine position.
2. Flex your abdomen and set it to a neutral position, while flexing and maintaining normal respiration.

Another goal of this exercise was to use the arms for resistance while maintaining the vertebral column in a neutral position to strengthen abdominal muscles (Figure 2).

1. Flex your abs and attain a neutral position.
2. Move one arm up and then the other while stabilizing your body with your abdominals. Remember to keep breathing in and out.

Strenuous abdominal exercises were not allowed during the postoperative 6 weeks. Swimming and running were started after 6 weeks. The patients were not allowed to attend team sports for the first 6 months.

Early protective phase (4–6 weeks): Pelvic curve exercises were started within pain-free limits under the supervision of a physiotherapist.

The goal of this exercise was to strengthen the abdominal muscles by attempting to maintain a neutral position against resistance (Figure 3).

1. Flex your abs and attain a neutral position.
2. Lift one of your legs while keeping your hips still and on the floor, followed by opening and extending your leg from the knee. Then, repeat the same with the other leg. While moving your knees, flex your abs more than normal in order to keep the body stable. While performing the exercise, ensure that your hips stay at the level and on the floor. Remember to breathe in and out regularly and always maintain good form.

Figure 1: Posterior pelvic tilt.

Figure 2: A) Neutral position, **B)** Upper extremity reciprocal exercises.

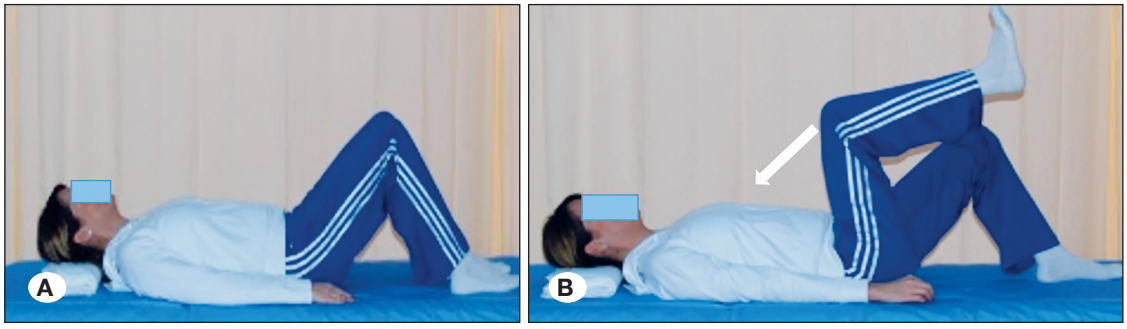

Figure 3: A) Neutral position, **B)** Lower extremity reciprocal exercises.

3. While performing the exercise, make sure that your hips stay level and on the floor. Remember to breathe in and out regularly and always maintain good form.

The importance of maintaining the correct posture and compliance with lumbar protection principles was emphasized. Patients attended the physical therapy and rehabilitation department weekly for the evaluation of pain and compliance with the exercise program.

Dynamic phase (7 weeks–6 months): Pelvic tilt exercises, and depending on the tolerance level, core stretching exercises were started in the 6th postoperative week. Dynamic lumbar stabilization exercises were started under supervision within pain-free limits. Any exercise that increased pain was excluded. Weekly control visits were recommended until the end of the 12th week. A physiotherapist and specialized doctor applied control examinations once every 3 weeks. The patients were enrolled in a kinetic chain strengthening exercise program involving proprioceptive exercises, which was customized according to the patient. The examinations were performed at 6-week intervals after the 12th week.

Return to the sports phase (6 months later): Patients were allowed to attend sports activities. Low resistance high-repetition sporting activities were preferred. Contact sports were allowed; however, the patients were counseled about the risks of trauma and falling. The patient's preference was an important determinant of selecting the sports activity; in this respect, special precautions taken according to the specific activity and program were customized.

Preoperative and early postoperative VAS and ODI were evaluated, and the relationship between compliance to the exercise program and the recurrent disc hernia that developed at the same level was evaluated by statistical analysis.

Statistical Analyses

Data analysis was performed using the IBM SPSS statistics version 25. The data were first analyzed using one-way analysis of variance. Homogeneity of variance was determined by Mauchly's Sphericity test. Bonferroni test was used to assess between-group differences with respect to ODI and VAS scores. P values <0.05 were considered indicative of statistical significance.

RESULTS

Group A included 124 patients who regularly complied with the 6-month physical therapy program, while group B consisted of 99 patients who were irregular or did not comply with the 6-month physical therapy program. In group B, irregular compliance was noted in 15 patients for 15 days, 11 patients for 1 month, 49 patients for 3 months, and 7 patients for 4 months, while 17 patients did not participate at all in the physical therapy program. During the 6-month follow-up period, 27 patients developed recurrent disc hernia at the same level. Nine patients in group A and 18 in group B underwent repeat surgery. The demographic data and preoperative VAS and ODI values are summarized in Table I. Table I gives the early postoperative VAS and ODI values, compliance to exercise, and recurrent disc hernia information.

DISCUSSION

Lumbar disc herniation is a common process involved in degenerative disc disease. Over the years, various researchers attempted to explain the chronic and degenerative instabilities, implying an important role in the process of degenerative vertebrae segment (3). The treatment approaches and surgical options for lumbar disc herniation are required to be planned taking cognizance of chronic instability. The instability phase

Table I: Shows Patients Demographic İnformations, Diagnosis, Preoperative- Early and Late Postoperative VAS and ODI Scores

	Mean Age	Preoperative VAS	Postoperative VAS	6. month VAS	Preoperative ODI	Postoperative ODI	6. month ODI
Group A (n=124)	50.12	7.12	1.21	1.07	68.33	14.03	12.32
Group B (n= 99)	51.05	7.48	1.23	1.77	67.07	13.97	18.36

Table II: Shows Early Postoperative and 6. Months Correlations VAS and ODI Scores in Statistically Analysis

Tests of Within-Subjects Contrasts

Measure: MEASURE_1

Source	Time	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Postop Vas- Post op 6 month VAs * Group	Linear	12.879	1	12.879	5.144	0.024	0.023
Error (VAS)	Linear	550.862	220	2.504			

A significant difference was found between the Postop Vas and the Postop 6th Month Vas in terms of treatment response (p<0.05).

Table III:

Tests of Within-Subjects Contrasts

Measure: MEASURE_2

Source	Time2	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Postop ODI- Post op 6month ODI * Group	Linear	1017.557	1	1017.557	5.538	0.019	0.025
Error(ODI)	Linear	40421.407	220	183.734			

A significant difference was found between the Postop ODI and the Post Op 6th Month ODI in terms of treatment response (p<0.05).

is a painful process that impairs the quality of life of patients. Although the pain resolves by the restabilization phase, it still entails a long period of time with excessive pain (15). The presence of instability during the preoperative period should be carefully examined. In order to prevent instability during the postoperative period, it is important to strengthen the paravertebral muscles and support the spine (3,15). However, there is no consensus on the optimal timing to start postoperative exercises.

The key to the repair of degenerated discs lies in AF. The nucleus pulposus fragments that enter in-between ruptured layers during an annular tear are forced to remain between these layers owing to continuous weight-bearing, which prevents total recovery (21). This is one of the biggest stalemates faced by the bipedal humankind because of the absolute need for a healthy vertebral column to survive; this small pathology initiates a detrimental process (17).

This is essentially the first step in the gradual deterioration of the intact movement segment. Eventually, there is gradual slackening and impairment of movements over time, which significantly impairs the quality of life or may warrant an emergency surgery due to protrusion or extrusion leading to compression of nerve roots (12). An important question that is raised here is “does disc surgery solve the problem?” Lumbar disc surgery does not aim for disc repair; rather it entails removal of the fragment compressing the nerve (6). However, the lack of consensus between those favoring notions of “removing the fragment” and “preventing the recurrence by emptying the site as much as possible” has not yet been resolved. The justification lies in the size of the annular defect; the latter approach is valid when the annular defect is large and fragmentectomy is justified when the annular defect is small (10). The most common complication of the latter option is the development of instability due to damaged movement segment, leading to the onset of a period when the patient experiences pain in the upright position (12). The success of surgery partially depends on the adequacy of the patient’s muscular compartment, as indicated by Panjabi (17,21).

In this respect, we have an important key in our hands when patients present to a hospital due to AF rupture. This can also be applied as an effective postoperative intervention for spinal stabilization. The gist here is “when and how?”

Repair of the AF occurs due to connective tissue proliferation and modeling; therefore, maximum connective tissue repair is

achieved in at least 2 months (12). Weight-bearing exercises of the lower back should be avoided in such a situation, and we do not recommend initiation of exercises in the early postoperative period. The resting period should last for at least 2 months when the connective tissues regain optimal strength (9). We encourage passive bedside exercises during this time.

Our active exercise program involves abdominal and back muscles in a gradually increasing fashion. This exercise program has been detailed above. Occurrence of pain is the indication for withdrawal from exercise. The program should be customized according to the body structure and psychological state of individual patients.

The incidence of disease or pain recurrence in the patient's group performing the exercise program was significantly lower than that in the group avoiding this exercise program (10). Starting exercise during the early period can facilitate the separation of the AF layers that have not yet totally recovered. In this respect, patients clearly benefit from the accurate timing of starting their exercise program.

There were no significant sex-based differences in outcomes in our study. Women and men both showed significant improvement in the early phase and during follow-up. An increase in VAS and ODI scores was also noted for women and men between the subsequent follow-ups, indicating a slight worsening of pain and disability. No study has yet assessed the effect of sex in this respect. Both groups in this study showed improved VAS and ODI scores after one month, and improvement was also noted after the 6th month. During the follow-up, worsening of pain and disability was recorded in group B, but not in group A. These results are consistent with those of previous studies (6,10,11,14).

An Evidence-based Clinical Practice Guideline, published by the American Pain Society in 2009, recommends an interdisciplinary rehabilitation approach (3,4). Interdisciplinary treatment options are not recommended for patients with radiculopathy and symptomatic spinal stenosis. Patients should be involved in the decision-making to pursue surgical intervention (15). After a patient is counseled about all possible results and complications, a common decision should be reached, especially when there are two or more treatment options required. The patient should actively participate in the treatment decision. Patients with disc herniation and signs of lumbar radiculopathy who wish to recover as soon as possible may prefer surgery. Conservative treatment is recommended for patients after surgery to avoid recurrence and to enable rapid recovery (18). In our study, we followed the same guidelines and started an early physiotherapy program for patients and obtained similar results as those reported in the literature.

Most of the patients with recurrent disc herniation had a central disc herniation and had Modic type 2 changes at the same level. The recurrence rate of lumbar disc herniation in our study was 14.3%, which is consistent with that reported in previous studies (range, 5%–18%) (6,10).

Some limitations of our study should be acknowledged. For instance, the sample size in our study was relatively small (223 patients), which may have limited the statistical power, especially in the comparison of VAS scores and ODI between the two groups. We had no control over the consumption of analgesics during the follow-up period; however, no narcotics were used during the time of the study.

CONCLUSION

The postoperative exercise program helped improve pain and reduce disability in patients who underwent microdiscectomy surgery for back and leg pain, irrespective of sex. In this respect, it seems the patients who did not undergo recurrent surgery benefited more from the treatment. However, the exercise program can be a good alternative treatment for all groups of patients with same symptom manifestations, with the estimated improvement lasting for at least 6 months.

AUTHORSHIP CONTRIBUTION

Study conception and design: OC

Data collection: ATB

Analysis and interpretation of results: ATB

Draft manuscript preparation: OC, ATB

Critical revision of the article: OC

All authors (OC, ATB) reviewed the results and approved the final version of the manuscript.

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