

The physical activity of patients after herniated lumbar disc surgery

Yucel Yildirim, PhD, PT, Bilde Kara, PhD, PT, Nursen Teoman, MSc, PT, Arzu Genc, PhD, PT, Serhat Erbayraktar, MD, Umit Acar, MD.

ABSTRACT

الأهداف: لتقدير مستوى الألم، الإعاقة، الأداء، وتغيرات النشاط البدني لدى المرضى الذين خضعوا لعملية جراحية نتيجة فتق القرص القطني.

الطريقة: شملت الدراسة 31 مريضاً خضعوا لعملية فتق القرص القطني الجراحية، في قسم جراحة الأعصاب بجامعة Dokuz Eylul الجامعي - إزمير - تركيا لفترة 13 شهراً. تم تحديد تغيرات الألم لدى المرضى باستعمال النقاط البصرية، كما تم تحديد تغيرات الإعاقة باستعمال مدخلات أوسويستري للإعاقة. سُجل الوقت الكلي لاختبارات الأداء التالية: الانقلاب من اليمين إلى اليسار والعكس - الوصول إلى تحمل الوزن - تكرار الجلوس والوقوف - المشي لمسافة 50 قدم - والمشي لمدة خمس دقائق. تم استعمال استبيانات بالخلاصة الواقية للأنشطة البدنية لتقدير مستويات النشاط البدني في 24 ساعة. أُجري هذا التقدير بعد شهرين، 4 أشهر، و6 أشهر على التوالي من العملية الجراحية.

النتائج: كان هناك اختلافات ملحوظة في الألم، الإعاقة، الأداء، ومستوى النشاط البدني في الشهر الثاني والرابع والسادس بعد العملية الجراحية ($p=0.000$), مع كون أسوأ قيمة عند الشهر الثاني وأفضل قيمة عند الشهر السادس.

خاتمة: تبقى الحاجة موجودة ليس فقط من أجل توجيه المرضى نحو نمط حياة أكثر فعالية ولياقة بدنية، ولكن أيضاً من أجل استعمال تقييمات لتسرير الشفاء وضمان استمرارية ذلك في الفترة ما بعد العملية الجراحية.

Objective: We evaluated the level of pain, disability, performance, and physical activity changes in patients who underwent lumbar disc hernia surgery.

Methods: This study included 31 patients who underwent lumbar disc hernia surgery in the Neurosurgery Department of Dokuz Eylul University Hospital, Izmir, Turkey over a 13-month period from April 2003 to May 2004. Changes in the patients' pain were determined using a visual analog scale, and disability changes were evaluated using the Oswestry Disability Index.

Total times for the following performance tests were recorded: rolling from right to left and vice versa, loaded reach, repeated sitting/standing, 50-foot walk, and 5-min walk. The Compendium of Physical Activities questionnaire was used to assess physical activity levels in a 24-hour period. The assessments were performed 2, 4, and 6 months postoperatively.

Results: Significant differences were observed in the pain, disability, performance, and physical activity levels 2, 4, and 6 months postoperatively ($p=0.000$), with the worst values at 2 months and the best at 6 months.

Conclusion: A need exists not only to direct patients toward more active lifestyles and physical fitness, but also to use assessments to accelerate the recovery period, ensuring continuity in the postoperative period.

Neurosciences 2008; Vol. 13 (4): 421-425

From the School of Physical Therapy (Yildirim, Kara, Teoman, Genc) and the Department of Neurosurgery (Erbayraktar, Acar), School of Medicine, Dokuz Eylul University, Izmir, Turkey.

Received 14th January 2008. Accepted 18th August 2008.

Address correspondence and reprint request to: Dr. Arzu Genc, Lecturer, School of Physical Therapy, Dokuz Eylul University, Inciralti 35340, Izmir, Turkey. Tel. +90 (232) 4124932. Fax. +90 (232) 2705030. E-mail: arzu.genc@deu.edu.tr

The success rates of lumbar disc surgery range from 60-97%, depending on the criteria selected for assessing the results.^{1,2} To maximize the outcome evaluation objectively, multimodal assessments (namely, a variety of dependent variables and assessment methods) have been proposed to lend consensual confidence to the observations. In general, following lumbar disc surgery, assessing postoperative pain, disability, performance, and physical activity are important, and because these items are subjective instruments, knowing how these components are affected by illness and treatment is critical.³⁻⁸ An active physiotherapy program after the surgical treatment of herniated lumbar discs has been

previously evaluated.⁹ The postoperative evaluation also contributed to pain relief, and ultimately to the surgical success.¹⁰ Traditionally, standard clinical assessments of lower back pain (LBP) after herniated disc surgery have focused on the degree of impairment in the lower back, specifically the range of motion and muscle strength as they relate to the back.¹¹ The present trend is to assess physical performance tasks in patients with chronic LBP based on measurement examples.¹²⁻¹⁴ Despite numerous studies assessing the performance and disability levels of patients with chronic LBP, few have evaluated the disability, pain, performance, and physical activity levels of the patients following surgery for herniated lumbar discs. Therefore, we evaluated the changes in disability, performance, pain, and physical activity of the patients following lumbar disc surgery, as these are considered crucial for the return to daily activities, physical fitness, and work.

Methods. Thirty-one patients who underwent lumbar disc hernia surgery in the Neurosurgery Department of Dokuz Eylul University Hospital, Izmir, Turkey, in a 13-month period were referred to the Physical Therapy Department for exercise therapy from April 2003 to May 2004. All the measurements used in the assessments were repeated 2, 4, and 6 months postoperatively. Patients who were older than 55 years or had spondylolisthesis, inflammatory spinal stenosis, neoplasms, neurological deficits, or more than one operation were excluded from the study. Of the 31 patients assessed at 2 months, 27 returned at 4 months, and 15 returned at 6 months (Figure 1). The patients who dropped out at 4 and 6 months were excluded from the analysis. Approval of the medical ethics committee was obtained for the study, and all patients completed an informed consent form before beginning the study. All patients took part in a physiotherapy program that included instruction in body mechanics and adaptation of the basic and advanced activities of daily living

and occupation to proper lumbar spine mechanics. The patients were given exercises for their abdominal muscles, back extensor muscles, and coordination at 2 months postoperatively.^{15,16} The abdominal exercises were for the upper and oblique abdominals in the supine position, and included heel slides and lower extremity crunches. Back extensor exercises included lifting the trunk to the neutral position from the prone position with a pillow under the stomach and the arms by the side, bridging (namely, lifting the trunk from the neutral position and elevating the arms), and single-leg extensions from the prone and 4-point kneeling positions. The coordination exercises were pelvic tilting from lying, sitting, and standing positions. The patients all performed the same exercises, but the loads, and number of repetitions for each exercise were adjusted to each patient's condition. The number of repetitions of each exercise ranged from 2×15 at the second month to 3×30 at the end of the training period. The patients were evaluated 2, 4, and 6 months postoperatively. Pain during rest and activity was assessed on a vertical visual analog scale (VAS) ranging from 0 (no pain) to 100 (maximum pain).¹⁷ Patient disability levels were evaluated using the Oswestry Disability Index (ODI) developed by Fairbank et al.¹⁸ The ODI assesses general function disability associated with back pain. Scores range from 0 to 100, with 0 to 20 indicating minimal disability; 20 to 40, moderate disability; 40 to 60, severe disability; and 60 to 100, extremely severe to crippling disability. To evaluate the physical performance, the following tests were used: 1. Time to roll from right to left: While lying in the supine position on a mat, the patient was asked to roll to one side and return to the supine position as quickly as possible. Then, the patient repeated the roll to the opposite side.¹⁹ 2. Loaded reach: The subjects were asked to hold an object weighting 4.5 kg and to reach forward with it as far as possible without taking a step. The loaded reach distance in the test was recorded in centimeters.²⁰ 3. Sit and stand: The patients performed 5 continuous sit/stand movements from a chair as rapidly as they could. The time to stand up and sit down 5 times was recorded in seconds.²¹ 4. Fifty-foot walking test (50 FW): The patients were timed while they walked 25 feet, turned, and walked back to the starting point as quickly as possible. The result was recorded in seconds.²² 5. Five-minute walk test (5 MW): The participants were asked to walk as fast as possible for 5 minutes in a rectangular hallway, and the distance covered was recorded in meters.²¹ The Compendium of Physical Activities (CPA) scale, which measures physical activity using a questionnaire, is based on the concept that the intensity of every specific activity can be expressed in metabolic equivalents (METs), allowing an estimation of the energy expenditure of specific physical activities.

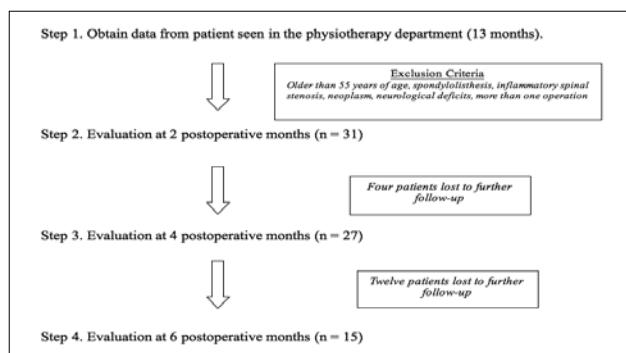


Figure 1 - Recruitment and follow-up study of participants.

Physical activity is any bodily movement produced by the contraction of skeletal muscles that results in energy expenditure. Therefore, a measurement of physical activity should ideally include all physical activity and inactivity 24 hours a day. Multiplying the MET value of an activity by body weight gives the estimated energy expenditure.²³ A physical activity diary was constructed in which the patient recorded the number of minutes (15, 30, or 45 minutes) and hours (1-10 hours) spent on each MET activity level in an average 24 hour weekday. The CPA scale consists of 9 levels, which were described using examples of specific activities at each MET level: A = [Sleep and rest] × [0.9 MET]; B = [Sitting quietly, watching television, listening to music, or reading] × [1.0 MET]; C = [Working on a computer or at a desk, sitting in a meeting, eating] × [1.5 METs]; D = [Standing, washing dishes or cooking, driving a car or truck] × [2.0 METs]; E = [Light cleaning work, sweeping floors, food shopping with a grocery cart, slow dancing, or walking downstairs] × [3.0 METs]; F = [Bicycling to work or for pleasure, brisk walking, painting, or plastering] × [4.0 METs]; G = [Gardening, carrying, loading, carrying a light object upstairs] × [5.0 METs]; H = [Aerobics, health club exercise, chopping wood, or shoveling snow] × [6.0 METs]; I = [More effort than level H: Running, racing on a bicycle, playing soccer, handball, or tennis >METs]. For each activity level (A-I activity), the MET value is multiplied by the time spent at that particular level. The MET time for each level is added to the total 24 hour MET time, representing the physical activity

level on an average weekday. A higher score indicated a correlation with the sum and each MET level.

Statistical analysis. Descriptive statistics included the frequency distribution for categorical variables and the mean, median, range, and standard deviation for continuous variables. To compare the disability, pain, physical performance, and physical activity at 2, 4, and 6 months, an analysis of variance (ANOVA) was used, and a post hoc test was performed to determine in which month the difference occurred. The level of significance was set at $p<0.05$. The statistical analysis was performed using the Statistical Package for Social Sciences (version 11.0; SPSS Inc., Chicago, IL, USA).

Results. The age, gender, body mass index (BMI: kg/m²), education level, and occupational classification of the patients is summarized in Table 1. When the pain, disability, performance, and physical activity levels at 2, 4, and 6 months postoperatively were compared, significant differences were found ($p=0.000$ for each parameter), with the worst values at 2 months and the best at 6 months. The resting pain was significantly ($p=0.002$) lower at 4 months compared to that at 2 months ($p=0.007$), while the activity pain did not decrease significantly ($p>0.05$). In contrast, the decreases in resting ($p=0.007$) and activity ($p=0.003$) pain at 6 months were significant, Figure 2a). The change in the disability score between 4 and 6 months was not significant ($p>0.05$), while the difference from 2 months was significant ($p=0.001$, Figure 2b).

Table 1 - Demographic and clinical characteristics of the patients assessed at 2, 4, and 6 months postoperatively.

Characteristics	2 months	4 months	6 months
Age (years) mean ± SD	47.64 ± 8.84	47.18 ± 9.37	46.28 ± 6.61
Gender (n) Female/Male	15/16	13/14	7/8
BMI (kg/m ²) mean ± SD	27.01 ± 3.29	26.68 ± 2.92	26.88 ± 2.81
Education level (n) b ¹ / b ² /b ³	6/7/18	5/6/16	3/4/8
Occupation (n) c ¹ /c ²	15/16	12/15	7/8
<i>Pain</i>			
Rest (0-10)	2.32 ± 2.78	1.14 ± 1.83	0.07 ± 0.26
Activity	3.90 ± 2.63	2.81 ± 2.49	1.07 ± 1.63
Disability (0-100)	28.06 ± 8.40	21.73 ± 6.21	16.78 ± 6.14
<i>Performance</i>			
Loaded reach (cm)	62.29 ± 13.59	75.31 ± 11.33	82.50 ± 13.17
Sit/stand (s)	19.52 ± 8.28	13.94 ± 3.85	11.07 ± 2.25
Total for rolling (s)	12.34 ± 4.44	8.22 ± 3.63	5.55 ± 1.17
50 FW (s)	31.22 ± 4.58	28.76 ± 3.36	26.96 ± 2.62
5 MW (m)	309.22 ± 110.28	370.92 ± 88.38	416.64 ± 6.14
Physical Activity (METs)	16.99 ± 5.53	23.38 ± 6.73	31.64 ± 8.43

BMI = body mass index, s = seconds, b¹ - primary school, b² - secondary school, b³ - higher education,
c¹ - unemployed/retired, c² - actively working, 50 FW - 50 foot walking test,
5 MW - 5 minute walk test, MET - metabolic equivalent

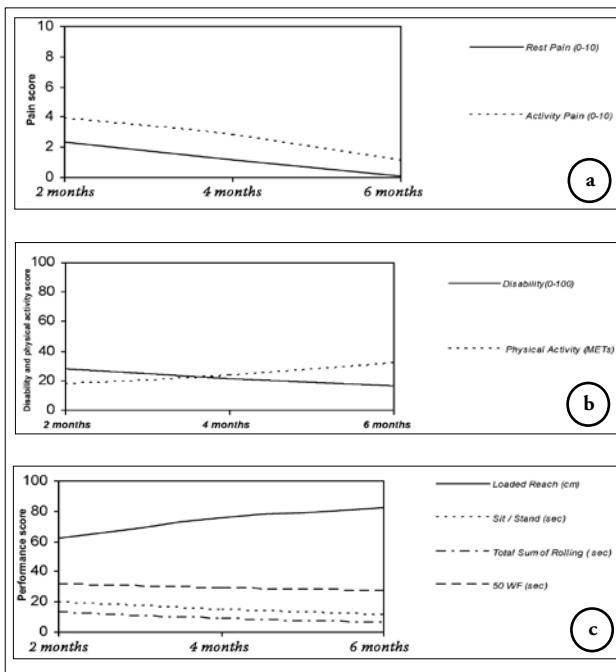


Figure 2 - Changes in a) rest and activity pain, b) disability and physical activity, and c) performance.

In the analysis of the performance measurements, the change in the 50 FW test was not significant at 2 and 4 months ($p>0.05$), while other performance measurements improved significantly starting from 2 months until 4 and 6 months ($p=0.000$, Figure 2c). On evaluating the physical activity measurements, no significant difference was observed in the sitting activities ($p>0.05$), while significant increases were seen in the light and moderately heavy housework, such as resting by lying down, working and eating at a table, and driving ($p=0.000$). The increases in the MET values for difficult activities such as carrying heavier objects and gardening at 2 and 4 months were nonsignificant ($p>0.05$, Figure 2b). None of the patients took part in regular exercise or sports at 2, 4, and 6 months after the operation, however, none of our patients had done so in the period before the operation (Table 1).

Discussion. The outcome of surgical treatment in patients with lumbar disc hernia depends on the postoperative regimes offered. To implement rehabilitation programs in the postoperative period requires appropriate and reliable evaluation of patient status.²⁴ After disc surgery, the activity of patients is usually restricted to reduce the physical load on the back to protect the spine, although the benefits conferred by these restrictions are not clear. Restricted activity has been recommended for the first 6-8 weeks after surgery. Some studies, however, have reported good outcomes

after early training programs.¹ A variety of obstacles may prevent patients from resuming daily activities and work life. Mayer et al²⁵ considered the effect of these obstacles and documented markedly improved outcomes regarding return to work and work life retention, which were achieved functional restoration and resuming physical activities after spine surgery.²⁵ In our literature review, we found only 2 studies that assessed the patients in the postoperative period.^{26,27} Since our patients were placed on bed rest and activity restriction for the first 8 postoperative weeks, we started our assessments on the patients who had been allowed to return to daily activities as of the second postoperative month, and continued until 6 months. We assessed their physical performance, physical activity, physical fitness, pain, and disability levels. The instruments used included rolling from left to right or vice versa, repetitive sitting/standing, loaded reach, and 50-foot and 5-minute walking tests.

Comparing the pain at 2 and 4 months, a significant decrease in the resting pain was observed, while the activity pain did not decrease significantly. Comparing the results at 6 months to those at 2 and 4 months, the reductions in resting and activity pains were significant. While no significant differences were detected in pain, disability, physical activity, or measurements in the assessments made at 2 and 4 months in our study, a clear change was seen at 6 months. Considering the perceived severity of pain, only the activity pain at 4 months did not change, while a considerable decrease in activity and resting pain was observed at 6 months. Since no significant difference was seen in the disability scores at 4 and 6 months, physical activity was thought to be restricted due to lifestyle because none of our patients participated in regular exercise programs before their operations. Such patients need to be directed toward a more active lifestyle, as well as given a physiotherapy program for a period exceeding 6 months.

The natural course of recovery after surgery probably influences the return to work life to a great extent. If patients are absent from work following lumbar disc surgery, and if returning to work is of paramount importance to them, more specific reintegration approaches focusing primarily on the early resumption of professional activities are probably needed to improve the chance of returning to work.^{28,29} We observed that the patients who were allowed to return to daily living and work were ready to perform such activities at 2 and 4 months postoperatively. Despite their increased performance, however, the physical activity levels and defects of the patients persisted after the second postoperative month.

This study is limited in that the patients were not assessed preoperatively, the study population was

small, and the study was of short duration. . Therefore, further long-term studies are needed to determine the relationship between recovery and physical activity level after lumbar disc surgery in a larger population. Assessing the effects of pain, disability, performance, physical activity, and fitness levels on the recovery of patients undergoing surgery for herniated lumbar discs is necessary in terms of the activities of daily life and return to work in the postoperative period. Such patients need to adopt more active lifestyles and exercise regularly, as these have a positive effect on the results.

References

- Danielsen JM, Johnsen R, Kibsgaard SK, Hellevik E. Early aggressive exercise for postoperative rehabilitation after discectomy. *Spine* 2000; 25: 1015-1020.
- Taylor VM, Deyo RA, Ciol M, Farrar EL, Lawrence MS, Shonnard NH, et al. Patient-Oriented Outcomes From Low Back Surgery. *Spine* 2000; 25: 2445-2452.
- Abramovitz JN, Neff SR. Lumbar disc surgery: Results of the Prospective Lumbar Discectomy Study of the Joint Section on Disorders of the Spine and Peripheral Nerves of the American Association of Neurological Surgeons and the Congress of Neurological Surgeons. *Neurosurgery* 1991; 29: 301-307.
- Coskun E, Suzer T, Topuz O, Zencir M, Pakdemirli E, Tahta K. Relationships between epidural fibrosis, pain, disability, and psychological factors after lumbar disc surgery. *Eur Spine J* 2000; 9: 218-223.
- Graver V, Loeb M, Rasmussen F, Lie H, Ljunggren AE. Clinical overall score: outcome evaluation after lumbar disc surgery, assessments of reliability and validity. *Scand J Rehabil Med* 1998; 30: 227-233.
- Dvorak J, Gauchat MH, Valach L. The outcome of surgery for lumbar disc herniation. I. A 4-17 years' follow-up with emphasis on somatic aspects. *Spine* 1988; 13: 1418-1422.
- Hurme M, Alaranta H. Factors predicting the result of surgery for lumbar intervertebral disc herniation. *Spine* 1987; 12: 933-938.
- Hakkinen A, Kautiainen H, Sintonen H, Ylinen J. Health related quality of life after lumbar disc surgery: a prospective study of 145 patients. Health related quality of life after lumbar disc surgery: a prospective study of 145 patients. *Disabil Rehabil* 2005; 4: 94-100.
- Kjellby-Wendt G, Styf J, Carlsson SG. Early active rehabilitation after surgery for lumbar disc herniation: a prospective, randomized study of psychometric assessment in 50 patients. *Acta Orthop Scand* 2001; 72: 518-524.
- Mannion AF, Denzler R, Dvorak J, Müntener M. A randomised controlled trial of post-operative rehabilitation after surgical decompression of the lumbar spine. *Eur Spine J* 2007; 16: 1101-1117.
- Caspersen CJ, Powell KE, Christenson GM. Physical activity, exercise, and physical fitness: definitions and distinctions for health-related research. *Public Health Rep* 1985; 100: 126-131.
- Gronblad M, Hurri H, Kouri JP. Relationships between spinal mobility, physical performance tests, pain intensity and disability assessments in chronic low back pain patients. *Scand J Rehabil Med* 1997; 29: 17-24.
- Jette AM. State of the art in functional status assessment. In: Rothstein JM, editor. *Measurement in physical therapy*. New York (NY): Churchill Livingstone; 1985. p. 137-168.
- Waddell G. Evaluation of results in lumbar spine surgery. Clinical outcome measures-assessment of severity. *Acta Orthop Scand Suppl* 1993; 251: 134-137.
- Koumantakis GA, Watson PJ, Oldham JA. Trunk muscle stabilization training plus general exercise versus general exercise only: randomized controlled trial of patients with recurrent low back pain. *Phys Ther* 2005; 85: 209-225.
- van Tulder M, Malmivaara A, Esmail R, Koes B. Exercise therapy for low back pain: a systematic review within the framework of the cochrane collaboration back review group. *Spine* 2000; 25: 2784-2796.
- Bolton JE. Accuracy of recall of usual pain intensity in back pain patients. *Pain* 1999; 83: 533-539.
- Fairbank JC, Couper J, Davies JB, O'Brien JP. The Oswestry low back pain disability questionnaire. *Physiotherapy* 1980; 66: 271-273.
- Simmond MJ, Claveau Y. Measures of pain and physical function in patients with low back pain. *Physiother Theory Pract* 1997; 13: 53-65.
- Simmonds MJ, Olson SL, Jones S, Hussein T, Lee CE, Novy D, et al. Psychometric characteristics and clinical usefulness of physical performance tests in patients with low back pain. *Spine* 1998; 23: 2412-2421.
- Reuben DB, Siu AL. An objective measure of physical function of elderly outpatients. The Physical Performance Test. *J Am Geriatr Soc* 1990; 38: 1105-1112.
- Bruske-Hohlfeld I, Merritt JL, Onofrio BM, Stonnington HH, Offord KP, Bergstrahl EJ, et al. Incidence of lumbar disc surgery. A population-based study in Olmsted County, Minnesota, 1950-1979. *Spine* 1990; 15: 31-35.
- Aadahl M, Jorgensen T. Validation of a new self-report instrument for measuring physical activity. *Med Sci Sports Exerc* 2003; 35: 1196-1202.
- Carriagee EJ, Han MY, Yang B, Kim DH, Kraemer H, Billys J. Activity restrictions after posterior lumbar discectomy. A prospective study of outcomes in 152 cases with no postoperative restrictions. *Spine* 1999; 24: 2346-2351.
- Mayer T, Tabor J, Bovasso E, Gatchel RJ. Physical progress and residual impairment quantification after functional restoration. Part I: Lumbar mobility. *Spine* 1994; 19: 389-394.
- Kara B, Genc A, Yildirim Y, Acar U. Evaluation of early period physical performance, physical activity, pain and disability levels of patients operated for cervical disc hernia. *J Back Musculoskeletal Rehabil* 2006; 19: 41-48.
- Selkowitz DM, Kulig K, Poppert EM, Flanagan SP, Matthews ND, Beneck GJ, et al. Physical Therapy Clinical Research Network. The immediate and long-term effects of exercise and patient education on physical, functional, and quality-of-life outcome measures after single-level lumbar microdiscectomy: a randomized controlled trial protocol. *BMC Musculoskeletal Disord* 2006; 7: 70.
- Houben RM, Ostelo RW, Vlaeyen JW, Wolters PM, Peters M, Stomp-van den Berg SG. Health care providers' orientations towards common low back pain predict perceived harmfulness of physical activities and recommendations regarding return to normal activity. *Eur J Pain* 2005; 9: 173-183.
- Choi G, Raiturker PP, Kim MJ, Chung DJ, Chae YS, Lee SH. The effect of early isolated lumbar extension exercise program for patients with herniated disc undergoing lumbar discectomy. *Neurosurgery* 2005; 57: 764-772.