Does Obesity Affect Outcomes After Decompressive Surgery for Lumbar Spinal Stenosis? A Multicenter, Observational, Registry-Based Study

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OBJECTIVE: **To evaluate the association between obesity and outcomes 1 year after laminectomy or microdecompression for lumbar spinal stenosis (LSS).**

METHODS: **The primary outcome measure was the Oswestry Disability Index (ODI). Obesity was defined as body mass index (BMI) ≥30. Prospective data were retrieved from the Norwegian Registry for Spine Surgery.**

RESULTS: **For all patients (n = 1473) the mean improvement in ODI at 1 year was 16.7 points (95% CI 15.7–17.7, P < 0.001). The improvement in ODI was 17.5 points in nonobese and 14.3 points in obese patients (P = 0 .007). Obese patients were less likely to achieve a minimal clinically important difference in ODI (defined as ≥8 points improvement) than nonobese patients (62.2 vs. 70.3%, P = 0.013). Obesity was identified as a negative predictor for ODI improvement in a multiple regression analysis (P < 0.001). Nonobese patients experienced more improvement in both back pain (0.7 points, P = 0.002) and leg pain (0.8 points, P = 0.001) measured by numeric rating scales. Duration of surgery was shorter for nonobese patients for both single- (79 vs. 89 minutes, P = 0.001) and 2-level (102 vs. 114 minutes, P = 0.004) surgery. There was no difference in complication rates (10.4% vs. 10.8%, P = 0.84). There was no difference in length of hospital stays for single- (2.7 vs. 3.0 days, P = 0.229) or 2-level (3.5 vs. 3.6 days, P = 0.704) surgery.**

CONCLUSIONS: **Both nonobese and obese patients report considerable clinical improvement 1 year after surgery for LSS, but improvement was less in obese patients. Obese patients were less likely to achieve a minimal clinically important difference.**

INTRODUCTION

Lumbar spinal stenosis (LSS) is the most frequent indication for spinal surgery in the elderly, and it is likely to increase (10, 13, 20). Evidence indicates that decompressive surgery offers an advantage over nonsurgical management for selected patients with persistent severe symptoms (1, 4, 5, 30, 49). A recent study has shown that the effectiveness of microdecompression is equivalent to laminectomy in the surgical treatment of central LSS with favorable outcomes at 1 year and low complication rates in both groups (34). The prevalence of obesity has been increasing

Key words
- Neurosurgical procedures
- Obesity
- Quality of life
- Spinal stenosis
- Spondylosis

Abbreviations and Acronyms
ASA: American Society of Anesthesiologists
BMI: Body mass index
DVT: Deep vein thrombosis
LSS: Lumbar spinal stenosis
MCID: Minimal clinically important difference
NORspine: Norwegian Registry for Spine Surgery
NRS: Numerical rating scales
ODI: Oswestry Disability Index
PE: Pulmonary embolism
SPORT: Spine Patient Outcomes Research Trial

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steadily over the past 3 decades with negative implications for general health (9, 23, 37) and surgical outcomes (6, 28, 48). However, data on the impact of obesity on outcomes following surgery for LSS are limited because most published studies are retrospective case series, often investigating fusion procedures (11).

The primary aim of this prospective multicenter observational study was to investigate the association between obesity and patient-reported outcomes using the Oswestry Disability Index (ODI) after laminectomy or microdecompression for single- and 2-level lumbar spinal stenosis.

PATIENTS AND METHODS

Patients were identified from a study comparing 2 different surgical methods for LSS (ClinicalTrials.gov: NCT02006901) (34).

Study Population

Data for this observational study were collected through the Norwegian Registry for Spine Surgery (NORspine), a comprehensive registry for quality control and research. In total, 36 of 40 centers performing lumbar spine surgery in Norway report to NORspine. NORspine is linked to the National Registry and Statistics Norway, which contain information concerning everyone who either is or has been a resident in Norway. According to the Norwegian Directorate of Health approximately 65% of all patients who undergo lumbar spine surgery in Norway are included in NORspine. The inclusion rate is presumably higher for lumbar spinal stenosis surgery as the majority of these procedures are scheduled surgeries. Participation in the registration by providers or patients was not mandated, nor was participation required as a necessary condition for a patient to gain access to health care or for a provider to be eligible for payment. Follow-up time from the date of the operation was 1 year. Follow-up time from the date of the operation (baseline) in this study was 12 months. Using the World Health Organization classification, patients were categorized according to their body mass index (BMI) as normal (<25 kg/m^2, reference), overweight (25–29.9 kg/m^2), obese class I (30–34.9 kg/m^2), and obese class II–III (≥ 35 kg/m^2).

Inclusion Criteria

1. Diagnosis of lumbar spinal stenosis
2. Scheduled operation in ≤ 2 lumbar levels with either open laminectomy or microdecompression in the time period between January 2006 and December 2012
3. Included in the NORspine registry

Exclusion Criteria

1. Diskectomy as part of the decompression
2. History of lumbar spine surgery
3. Fusion surgery

Ethical Approval. The study was approved by the regional committee for medical research in central Norway, and all participants provided written informed consent. The Data Inspectorate of Norway approved the registry protocol.

Primary Outcome Measure. We used version 2.0 of the ODI (17) as the measure of main outcome. This version is translated into Norwegian and has been validated for psychometric properties (19, 44). ODI contains 10 questions on limitations of activities of daily living. Each variable is rated on a 0- to 5-point scale, summarized, and converted into a percentage score. Scores range from 0 to 100, with lower score indicating less severe pain and disability. The minimal clinically important difference (MCID) in ODI score is considered to be in the range of 8 to 10 points (25, 34, 35). In this study we used 8 points as a cutoff value for MCID.

Secondary Outcome Measure. Intensity of pain was graded in 2 separate 0–10 numerical rating scales (NRS) for back pain and leg pain where 0 equals no pain (24). The NRS pain scales and ODI have shown good validity and are frequently used in research on back pain (19).

Data Collection and Registration by the NORspine Registry Protocol. On admission for surgery, the patients completed the baseline questionnaire, which included questions about demographics and lifestyle issues in addition to the primary and secondary outcome measures. Information about marital status, educational level, BMI, and tobacco smoking was available in the NORspine registry. During the hospital stay, using a standard registration form, the surgeon recorded data concerning diagnosis, previous lumbar spine surgery, comorbidity, American Society of Anesthesiologists (ASA) grade, treatment, and image findings. The surgeons provided the following complications and adverse events to the NORspine registry: intraoperative hemorrhage requiring blood replacement, postoperative hematoma requiring repeated surgery, unintentional durotomy, nerve injury, cardiovascular complications, respiratory complications, anaphylactic reactions, and wrong-level surgery. Patients reported the following complications if they occurred within 3 months of surgery: wound infection, urinary tract infection, pneumonia, pulmonary embolism (PE), and deep vein thrombosis (DVT). A questionnaire was distributed to all patients at 3 and 12 months after surgery. The patients who did not respond received 1 reminder with a new copy of the questionnaire. The patients completed preoperative questionnaire data and postal follow-up questionnaires without any assistance from the treating surgeon.

Surgical Procedures. Patients underwent noninstrumented decompressive surgery. Microdecompression and laminectomy are the most common noninstrumented decompressive procedures in the surgical treatment of lumbar spinal stenosis. Microdecompression is performed via a small skin incision using a bilateral or unilateral approach depending on the surgeon's preference and the individual patient's anatomy and symptoms. Unlike a laminectomy, the spinous process and the supraspinous and interspinous ligaments are left intact when performing a microdecompression (46).

Statistical Analysis. Statistical analyses were performed with SPSS version 18.0 (IBM Corporation, Chicago, Illinois, USA). Statistical significance level was defined as $P \leq 0.05$ on the basis of a 2-sided hypothesis test with no adjustments made for multiple comparisons. Central tendencies are presented as means when normally distributed and as medians when skewed. We used the chi-square test for categorical variables. Baseline and 1-year scores were

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