

The Influence of Parkinson Disease on Lumbar Decompression Surgery: A Retrospective Case Control Study

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BACKGROUND: Parkinson disease (PD) is a major risk factor during spine surgery, and its frequency is increasing as the population ages. The study aim was to examine the influence of PD specifically on lumbar decompression surgery.

■ METHODS: A retrospective review was performed of all patients with PD who underwent elective lumbar decompression surgery at 2 university hospital departments between December 2003 and July 2016. For each patient, 2 controls without PD were selected randomly among those who were matched for sex and age and had a similar year of surgery (±3) and comorbidity profile. The main outcomes were complications and reoperation rate.

RESULTS: The mean follow up was 1.2 \pm 1.6 years in the PD group (n = 36) and 1.4 \pm 2.1 years in the control group (n = 72). The overall complication rate was 47.2% in the PD group and 19.4% in the control group (P < 0.01). The reoperation rate was 27.8% in the PD group and 9.7% in the control group (P = 0.02).

CONCLUSIONS: There is a significantly greater rate of perioperative complications in patients with PD undergoing elective decompression surgery. Although the difference in major complication rates was minimal, minor complications were more frequent in patients with PD.

INTRODUCTION

arkinson disease (PD) is an important comorbidity that is becoming seen more frequently among hospitalized patients as life expectancy increases.^{*} Its prevalence is 0.3%

Key words

- Complications
- Lumbar decompression
 Parkinson disease
- Spine

Abbreviations and Acronyms

ASA: American Society of Anesthesiologists BMI: Body mass index PD: Parkinson disease UTI: Urinary tract infection overall but 1% in the population older than the age of 60 years.² The prevalence of spinal deformities in patients with PD has been reported as greater than in age-matched adults without PD.³

Several recent studies have examined the influence of PD on common complications and length of hospitalization in the perioperative setting of spinal surgery.⁴⁻⁸ The largest of these studies examined complication rates, length of hospitalization, and several other covariates drawn from a national database.⁷ They found that patients with PD undergoing instrumented or noninstrumented spinal surgery at any spine level had greater in-hospital mortality, greater rates of major complications, and a longer median length of hospital stay. Another smaller study compared patients with and without PD who underwent elective lumbar spine fusion and found that patients with PD required longer in-patient stays and more frequent postoperative transfers to in-patient rehabilitation centers, but they showed no increase of perioperative complications such as falls, durotomies, urinary tract infections (UTIs), or pneumonia.⁵

Schroeder et al.⁸ performed a retrospective review on all of their 96 patients with PD who underwent lumbar spinal surgery from 2002 to 2012. Revision surgery was required for 20 patients, and a PD severity stage \geq_3 was a statistically significant risk factor for further surgery. They reported good outcomes in mild and moderate PD (Hoehn and Yahr Scale <3) and recommended that patients with severe PD avoid surgery if possible. All studies assessing patients with PD undergoing spine surgery have either included small patient numbers, lacked control groups, or did not differentiate by surgical type and level (cervical, thoracic, lumbar).

Stenosis is the fastest increasing indication for spinal surgery,⁹ with substantially increasing hospital charges.¹⁰ PD appears to be a risk factor for greater complication rates and longer hospital stays, and thus greater-than-average costs. Since the incidence of PD is increasing, the aim of this study was to assess the effect of

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PD on complication rates, length of hospitalization, and the rate of surgical revision among patients undergoing lumbar decompressive surgery.

METHODS

Ethics

This study was approved by the regional ethics committee (Reference number: 17-029).

Study Design and Setting

The research was designed as a retrospective matched-pair study of patients with PD undergoing spine surgery in the Department of Orthopedics of the University Hospital of Cologne Germany and the Department of Neurosurgery of the University Hospital of Cologne Germany between December 2003 and July 2016.

Patients

All patients with PD undergoing lumbar decompression surgery for stenosis at these departments during this time period were eligible for inclusion in the review. The diagnosis of PD had been verified by neurologic consultation. **Figure 1** shows the exclusion/ inclusion flow chart of the study sample in detail.

Control Patients

For each patient with PD, 2 comparison patients were selected randomly from among all eligible matched comparison patients. "Eligible matched comparison patients" were patients without PD who had undergone decompression surgery during the study period and who were matched to the index patient with PD for sex, age (\pm 5 years), timing of surgery (\pm 3 years, but still within the limits of the study period), and comorbidity profile. This comorbidity profile was defined as a similar amount and severity of comorbidities.

Data Collected

The following data were extracted from the hospital charts and surgical and discharge notes: 1) demographic characteristics (age,



sex, body mass index [BMI]); 2) preoperative comorbidities; 3) American Society of Anesthesiologists (ASA) score; 4) severity of PD (modified Hoehn and Yahr staging scale)^{11,12}; 5) previous spinal surgical procedures; 6) duration of anesthesia, length of intensive care unit stay, and length of hospital stay; 7) perioperative complications and reoperations; and 8) the change from the preoperative to the postoperative PD medication.

Surgical Procedure

All procedures were dorsal microsurgical decompression operations with an undercutting technique. All surgeries were performed with a tube-assisted approach with cross-over technique and interlaminar fenestration.

Statistical Analysis

Counts and frequencies were used to describe the sample. Contingency tables were created to show associations. For modeling the influence of ASA score and a diagnosis of PD on complications and reoperations, a conditional logistic regression was performed. To compare for differences within groups, Mann–Whitney U Tests and Students t tests were used, whereas binary variables were compared with the Fisher exact test (for frequencies <5) tests and χ^2 tests. Significance was set at P < 0.05 for all statistical tests. All testing procedures were performed exploratively, so no adjustment for multiple testing has been made. Statistical analyses were performed with IBM SPSS software (version 23; IBM Corp., Armonk, New York, USA) and R Version 3.1.0 (R Foundation for Statistical Computing, Vienna, Austria).

RESULTS

Study Sample

The study included 36 patients with PD with a mean $(\pm$ SD) followup of 1.2 $(\pm$ 1.6) years, and compared them with 72 control patients, without PD, with a mean $(\pm$ SD) follow-up of 1.4 $(\pm$ 2.1) years. The demographics of the study sample are shown in **Table 1**. Five of these patients had a history of a spinal procedure at the same spinal level: 3 decompressions with the same surgical approach, 1 vertebroplasty, and 1 cryodenervation. Among control patients, 3 had also previously undergone spinal decompression surgery at the same spinal level.

PD Disease Severity and Comorbidities

The PD severity according to the Hoehn and Yahr scale was 1 for 9 patients, 2 for 14 patients 2.5 for 1 patient, 3 for 7 patients, and 4 for 5 patients. Medication for PD were modified in 6 patients (16.7%): preoperative in 2, postoperatively in 3, and both in one. The most frequent preoperative comorbidities of both groups are listed in **Table 2**. The mean ASA score was statistically significantly greater in the PD group than in the control group (2.8 ± 0.5 vs. 2.2 ± 0.5 , P < 0.01).

Surgical Procedures

The number of operated segments was 1 for 21 PD patients and 42 controls, 2 for 12 PD patients and 24 controls, 3 for 2 PD patients and 5 controls, and 4 for 1 PD patient and 1 control.

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