Increased 30-Day Complication Rates Associated with Laminectomy in 874 Adult Patients with Spinal Deformity Undergoing Elective Spinal Fusion: A Single Institutional Study

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■ OBJECTIVE: **Recent studies have reported that decompression with fusion leads to superior outcomes in correction of spinal deformity. The aim of this study was to determine if there is a difference in intraoperative and 30-day postoperative complication rates in patients undergoing spinal fusion with and without decompression.**

■ METHODS: **Medical records of 874 adult (≥18 years old) patients with spinal deformity undergoing elective spinal fusion at a major academic institution from 2005 to 2015 were reviewed; 374 (42.8%) patients underwent laminectomy in addition to spinal fusion. The primary outcome investigated was the rate of intraoperative and 30-day complications.**

■ RESULTS: **Patient demographics and comorbidities were similar between groups. The laminectomy cohort had significantly higher estimated blood loss ($P < 0.0001$), incidence of allogeneic blood transfusions ($P = 0.0001$), and rate of intraoperative durotomies (laminectomy cohort 10.4% vs. no-laminectomy cohort 3.1%; $P < 0.0001$). The laminectomy cohort had a significantly higher proportion of patients in the intensive care unit (28.6% vs. 17.7%; $P < 0.001$). There was no significant difference in 30-day readmission rate between cohorts (laminectomy cohort 13.0% vs. no-laminectomy cohort 9.8%; $P = 0.13$). Within 30 days after initial discharge, the laminectomy cohort had significantly higher rates of altered mental status (3.2% vs. 1.2%; $P = 0.05$), urinary tract infection (4.3% vs. 1.4%; $P = 0.009$), wound drainage (7.2% vs. 3.1%; $P = 0.007$), and instrumentation failure (1.1% vs. 0.0%; $P = 0.03$).**

■ CONCLUSIONS: **Patients undergoing spinal fusion with laminectomy may have higher complication rates than patients undergoing spinal fusion alone.**

INTRODUCTION

Adult spinal deformity is a debilitating disease that affects both physical function and overall quality of life.[1,2] Most patients present with concomitant structural misalignment and stenosis. Accordingly, decompression with fusion may be necessary to remove the compressive elements on the neural tissue, while also achieving realignment of the spine.[3]

The efficacy of decompressive surgery in treating spinal stenosis is well documented.[4,5] Multiple studies have shown that decompression for spinal stenosis is associated with greater improvement of back pain, leg pain, and overall disability compared with conservative therapy.[6-8] Furthermore, it has been reported that decompression in addition to fusion is superior to fusion alone in patients with spondylolisthesis and documented radiculopathy.[9,10] However, decompression in patients with degenerative spinal pathologies is associated with increased operative time and perioperative and postoperative complications. There is a paucity of studies comparing the postoperative complication profiles in patients undergoing fusion alone versus decompression with fusion for treatment of adult spinal deformities. The aim of this

Key words
- 30-Day readmission
- Laminectomy
- Spine surgery
- Surgical outcomes

Abbreviations and Acronyms
DVT: Deep vein thrombosis
MI: Myocardial infarction
PE: Pulmonary embolism
PRBC: Packed red blood cell
UTI: Urinary tract infection

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study was to compare intraoperative and 30-day postoperative complication rates between patients with spinal deformity undergoing spinal fusion with and without laminectomy.

MATERIALS AND METHODS

In this retrospective study, we reviewed the medical records of 874 adult (≥18 years old) patients with spinal deformity who underwent elective spinal fusion at a major academic institution during the period 2005–2015. Institutional review board approval was obtained before initiation of the study. The preponderance of patients had degenerative scoliosis, with 270 patients (30.9%) with idiopathic deformity. Of patients, 374 (42.8%) underwent a laminectomy in addition to spinal fusion, and 500 (57.2%) underwent a spinal fusion without laminectomy. Laminectomy was performed mainly for spinal stenosis.

Demographic variables evaluated included patient age, sex, and body mass index. Comorbidities included depression, anxiety, congestive heart failure, coronary artery disease, atrial fibrillation, peripheral vascular disease, diabetes, hyperlipidemia, anemia, pulmonary embolism (PE), deep vein thrombosis (DVT), chronic kidney disease, and end-stage renal disease. Other preoperative variables included current smoking status and alcohol use. Intraoperative variables included operative time; number of vertebral levels involved; estimated blood loss; number of packed red blood cell (PRBC) transfusions; spinal cord injury; nerve injury; durotomy; and use of intraoperative x-ray, fluoroscopy, somatosensory evoked potentials, transcranial motor evoked potentials, or electromyography.

Postoperative complications included length of hospital stay, delirium, urinary tract infection (UTI), fever, ileus, deep and superficial surgical site infections, hypertension, hypotension, hematoma, myocardial infarction (MI), pulmonary embolism (PE), deep vein thrombosis (DVT), stroke, sepsis, weakness, sensory deficit, urinary retention, and discharge with Foley catheter. The 30-day complication and readmission rates were also collected. The 30-day complications assessed included pain, altered mental status, UTI, fever, cellulitis, wound dehiscence, postoperative wound drainage, instrumentation failure (i.e., failure of the interbody graft or fracture of the pedicle screws and/or rods), MI, PE, DVT, new weakness, and sensory or motor deficits.

Parametric data were expressed as mean ± SD and compared using Student t test. Nonparametric data were expressed as median (interquartile range) and compared via the Mann-Whitney U test. Nominal data were compared with χ^2 test. All tests were 2-sided and were statistically significant if the P value was <0.05. Statistical analysis was performed using JMP Version 12 (SAS Institute Inc., Cary, North Carolina, USA).

RESULTS

This study included 874 adult patients (no-laminectomy cohort, n = 500; laminectomy cohort, n = 374). There were no significant differences between cohorts in age (no-laminectomy cohort 63.2 years ± 12.1 vs. laminectomy cohort 64.6 years ± 11.5; P = 0.07), sex (no-laminectomy cohort 39.7% male vs. laminectomy cohort 39.1% male; P = 0.89), or body mass index (no-laminectomy cohort 28.6 kg/m² ± 6.6 vs. laminectomy cohort 29.2 kg/m² ± 6.6; P = 0.14) (Table 1). There were no significant differences between groups in prevalence of comorbidities, such as depression, anxiety, congestive heart failure, coronary artery disease, atrial fibrillation, peripheral vascular disease, diabetes, hyperlipidemia, anemia, PE, DVT, chronic kidney disease, smoking status, or alcohol consumption (Table 1).

The mean number of fusion levels for the no-laminectomy and laminectomy cohorts was 5.5 ± 2.7 and 5.9 ± 3.2 (P = 0.07), respectively (Table 2). The use of intraoperative somatosensory evoked potentials and transcranial motor evoked potentials was similar between cohorts (Table 2). Use of intraoperative electromyography was higher in the laminectomy group (no-laminectomy cohort 10.6% vs. laminectomy cohort 18.6%; P < 0.001) (Table 2). The mean ± SD operative time was 281.2 minutes ± 139.0 for the no-laminectomy cohort and 298.1 minutes ± 130.8 for the laminectomy cohort (P = 0.07) (Table 2). The mean ± SD estimated blood loss was significantly higher in the laminectomy cohort compared with the no-laminectomy cohort (no-laminectomy cohort 745.8 mL ± 1170.2 vs. laminectomy cohort 1153.2 mL ± 1092.9; P < 0.0001) (Table 2). The mean ± SD number of PRBC transfusions was significantly higher in the laminectomy cohort compared with the no-laminectomy cohort (no-laminectomy cohort 0.7 ± 1.5 vs. laminectomy cohort 1.1 ± 1.7; P = 0.0001) (Table 2). Compared with the no-laminectomy cohort, the laminectomy cohort had a significantly higher rate of

Table 1. Patient Demographics and Preoperative Variables

Variable	Laminectomy Cohort (*n* = 374)	No-Laminectomy Cohort (*n* = 500)	*P* Value
Male, %	39.1	39.7	0.89
Age, years, mean	64.6 ± 11.5	63.2 ± 12.1	0.07
BMI, kg/m^2, mean	29.2 ± 6.6	28.6 ± 6.6	0.14
Depression, %	31.7	29.1	0.42
Anxiety, %	20.7	23.1	0.42
CHF, %	2.1	1.9	0.82
CAD, %	12.0	13.1	0.68
A-Fib, %	6.9	6.2	0.68
PVD, %	1.1	2.1	0.30
Diabetes, %	17.6	15.4	0.41
HLD, %	41.0	41.0	0.98
Anemia, %	8.0	7.7	0.90
PE, %	1.6	2.7	0.36
DVT, %	3.5	3.7	0.87
CKD, %	5.6	3.7	0.19
ESRD, %	0.27	0.19	0.82
Smoker, %	16.8	14.3	0.35
Alcohol use, %	31.4	30.6	0.83

BMI, body mass index; CHF, congestive heart failure; CAD, coronary artery disease; A-Fib, atrial fibrillation; PVD, peripheral vascular disease; HLD, hyperlipidemia; PE, pulmonary embolism; DVT, deep vein thrombosis; CKD, chronic kidney disease; ESRD, end-stage renal disease.