Clinical Outcomes Following Surgical Management of Coexistent Parkinson's Disease and Cervical Spondylotic Myelopathy

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CNS 2016 ANNUAL MEETING San Diego CALIFORNIA SEPTEMBER 24-28, 2016

Introduction

Coexisting Parkinson's disease (PD) and cervical spondylotic myelopathy (CSM) presents a diagnostic and therapeutic challenge due to symptomatic similarities. While CSM is routinely treated with surgery, PD patients face poorer outcomes following spine surgery. No study has reported clinical outcomes following decompression in patients with PD and CSM. The purpose of this study was to report clinical outcomes following cervical decompression for patients with coexisting PD and CSM.

Methods

A matched cohort study of all patients with coexisting PD and CSM undergoing cervical decompression at a single tertiary-care center between 1996 and 2014 were included. These patients were matched to controls with CSM alone by age, gender, ASA, and operative parameters. The primary outcome measure was clinical outcomes assessed by change in the Nurick scale and the modified Japanese Orthopaedic Association (mJOA) classification of disability. Achievement of the minimal clinically important difference (MCID) in the mJOA scale was secondary. Multivariable linear regression was used to model the effect of PD on mJOA.

Learning Objectives

By the conclusion of this session, participants should be able to:

1) Describe the importance of cervical decompression to treat cervical spondylotic myelopathy in both typical patients and patients with coexisting Parkinson's disease.

2) Discuss, in small groups, the role of cervical decompression in treating upper extremity motor, sensory, and sphincter-related symptoms associated with cervical spondylotic myelopathy in patients with Parkinson's disease.

3) Identify an effective treatment of coexisting cervical spondylotic myelopathy and Parkinson's disease, including cervical decompression to treat upper extremity motor, sensory, and sphincter-related symptoms.

Table 1

Table 1. Unadjusted Myelopathy Outcomes

Characteristic	Baseline	FFU	Change	*p*-value†	LFU	Change	*p*-value†
PD							
Nurick	3.2 ± 1.0	3.2 ± 1.1	0.0 ± 0.4	1.00	3.2 ± 1.1	0.0 ± 0.4	1.00
mJOA	12.3 ± 1.6	13.1 ± 1.6	0.8 ± 1.7	< 0.01*	13.2 ± 1.5	0.9 ± 1.1	< 0.01*
UE Motor	3.4 ± 0.7	3.9 ± 0.7	0.5 ± 0.7	0.01*	3.8 ± 0.7	0.4 ± 0.7	0.04*
LE Motor	4.1 ± 1.1	3.7 ± 1.1	-0.4 ± 0.7	0.04*	3.8 ± 1.1	-0.3 ± 0.7	0.03*
UE Sensory	2.0 ± 0.8	2.7 ± 0.6	0.7 ± 0.7	< 0.01*	2.7 ± 0.6	0.7 ± 0.8	< 0.01*
Sphincter	2.9 ± 0.4	3.0 ± 0.0	0.1 ± 0.4	0.25	3.0 ± 0.0	0.1 ± 0.4	0.25
mJOA MCID		5 (24%)			6 (29%)		
Control							
Nurick	2.3 ± 1.1	1.8 ± 1.4	-0.5 ± 0.8	0.01*	1.2 ± 1.1	-1.0 ± 0.9	< 0.01*
mJOA	12.7 ± 1.9	14.3 ± 2.0	1.7 ± 1.6	< 0.01*	15.2 ± 1.7	2.5 ± 2.1	< 0.01*
UE Motor	3.7 ± 0.7	4.1 ± 0.8	0.4 ± 1.0	0.11	4.3 ± 0.6	0.6 ± 0.9	0.02*
LE Motor	4.5 ± 1.3	5.1 ± 1.3	0.6 ± 1.4	0.08	5.7 ± 1.1	1.2 ± 1.3	< 0.01*
UE Sensory	1.8 ± 0.8	2.0 ± 0.9	0.3 ± 0.8	0.17	2.2 ± 0.9	0.5 ± 0.9	0.04*
Sphincter	2.7 ± 0.6	3.0 ± 0.2	0.2 ± 0.6	0.19	3.0 ± 0.2	0.2 ± 0.5	0.13
mJOA MCID		10 (48%)			12 (57%)		
p-value§							
Nurick	0.05*	< 0.01*	0.02*		< 0.01*	< 0.01*	
mJOA	0.12	0.10	0.28		< 0.01*	< 0.01*	
UE Motor	0.15	0.36	1.00		0.02*	0.56	
LE Motor	0.28	< 0.01*	< 0.01*		< 0.01*	< 0.01*	
UE Sensory	0.27	0.02*	0.22		0.05*	0.54	
Sphincter	0.56	1.00	0.78		1.00	0.77	
mJOA MCID		0.20			0.12		

FFU, first follow-up; LFU, last follow-up; PD, Parkinson's disease; mJOA, modified Japanese Orthopaedic Association; UE, upper extremity; LE, lower extremity; MCID, minimal clinically important difference.
Values are reported as mean ± standard deviation or count (percent). Nurick and mJOA changes in score represent the change in the respective score following surgery.
†Wilcoxon signed-rank tests to compare changes between preoperative and postoperative myelopathy measures.
§Wilcoxon signed-rank tests for nonparametric continuous data and Fisher's exact tests for categorical variables to compare the PD cohort to the control cohort.
*Statistically significant: $p \leq 0.05$.

Unadjusted Myelopathy Outcomes

Results

Twenty-one matched pairs were included. PD patients experienced poorer improvement in Nurick (0.0 vs. -1.0, $p<0.01$) and mJOA (0.9 vs. 2.5, $p<0.01$) composite scores. Additionally, only 29% of PD patients achieved an mJOA MCID at LFU compared to 57% of controls ($p=0.12$). However, no significant changes in absolute improvement in the upper extremity motor, sensory, or sphincter mJOA components were observed. Multivariable linear regression identified PD as a predictor of decreased improvement in mJOA (ß=-0.89, $p<0.01$) and failure to achieve an MCID in mJOA (OR 0.18, $p=0.03$).

Table 2

Table 2. Change in Myelopathy Multivariable Regression Analysis

Outcome Variable	Covariate	β Coefficient (t statistic)	*p*-value
Δ mJOA	Preoperative mJOA	-0.45 (-3.15)	< 0.01*
	Time to LFU (months)	-0.01 (-0.20)	0.84
	Parkinson's Disease	-0.89 (-3.91)	< 0.01*
	Preoperative Bowel/Bladder Dysfunction	0.40 (1.43)	0.16
Outcome Variable	**Covariate**	**OR (95% CI)**	***p*-value**
mJOA MCID	Preoperative mJOA	0.51 [0.27, 0.83]	< 0.01*
	Time to LFU (months)	1.01 [0.97, 1.06]	0.77
	Parkinson's Disease	0.18 [0.03, 0.86]	0.03*
	Preoperative Neck Pain	4.98 [0.97, 35.6]	0.06

mJOA, modified Japanese Orthopaedic Association; LFU, last follow-up; OR, odds ratio; CI, confidence interval; MCID, minimal clinically important difference.
*Statistically significant: $p \leq 0.05$.

Change in Myelopathy Multivariable Regression Analysis

Conclusions

This study is the first to characterize outcomes following cervical decompression in patients with PD and CSM. PD patients experienced symptomatic improvement, but less overall improvement in myelopathy compared to controls. However, PD patients demonstrated improvement in upper extremity motor, upper extremity sensory, and sphincter symptoms no worse than control patients.

References

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