

# Quality of Life Outcomes Following Surgical Resection of Adult Intramedullary Spinal Cord Tumors

Roy Xiao BA; Jacob A. Miller BS; Kalil G. Abdullah MD; Daniel Lubelski; Michael P. Steinmetz MD; John H. Shin MD; Ajit A. Krishnaney MD, FAANS; Thomas E. Mroz MD; Edward C. Benzel MD

Cleveland Clinic Center for Spine Health, Cleveland Clinic, Cleveland, Ohio 44195

Cleveland Clinic

### Introduction

Intramedullary spinal cord tumors (IMSCT) are rare but clinically significant entities. Resection is critical to prevent permanent neurological deficits. No studies have investigated the quality of life (QOL) benefit of resection. Our objective was to investigate QOL outcomes following IMSCT resection.

### Methods

A consecutive retrospective review of all patients who underwent IMSCT resection at a single tertiary-care institution from 01/2008-12/2013 was conducted. Clinical, operative, and pathologic data of all IMSCT patients were reviewed. QOL was measured by the EuroQol 5-Dimensions (EQ-5D), Pain Disability Questionnaire (PDQ), and Patient Health Questionaire-9 (PHQ-9). Multivariable regression was used to identify independent predictors of favorable or unfavorable QOL outcomes.

Table 1				
Characteristic	Statistic			
Ν	45			
Age (years)	49 [36 – 60]			
Male	27 (60)			
Time to Last Follow-up (months)	22 [8 - 41]			
Tumor Location				
Cervical	15 (33)			
Cervicothoracic	8 (18)			
Thoracic	18 (40)			
Conus	4 (9)			
Plane of Dissection	31 (69)			
Gross Total Resection	31 (69)			
Ependymoma	27 (60)			
Surgical Site Infection	10 (22)			
Syrinx	7 (16)			
CSF Leak	5 (11)			
Length of Hospital Stay (days)	5 [3 - 8]			

Patient and Operative Characteristics. Values are presented as median [interquartile range] or number (%). N, Number; CSF, Cerebrospinal Fluid.

## Results

Among the 45 patients included, the most common tumor pathology was ependymoma (60%), and the median age was 49 years. Plane of dissection (POD) and Gross total resection (GTR) were both achieved in 69% of patients. Patients were followed for a median of 22 months following IMSCT resection. No significant changes between preoperative and postoperative last follow-up QOL were observed following resection when measured by the EuroQol 5-Dimensions (EQ-5D), Pain Disability Questionnaire (PDQ), or Patient Health Questionnaire-9 (PHQ-9). However, QOL improvements exceeding the minimal clinically important difference (MCID) occurred in 28% of patients in EQ-5D, 28% in PDQ, and 16% in PHQ-9. Multivariable logistic regression revealed that preoperative QOL is a significant predictor in change in postoperative QOL.

Table 2						
HSM Questionnaire	Preoperative	Postoperative	p-value			
EQ-5D						
Mobility	$1.75 \pm 0.53$	$1.91 \pm 0.47$	0.13			
Self Care	$1.42 \pm 0.58$	$1.55 \pm 0.66$	0.35			
Usual Activities	$1.98 \pm 0.69$	$1.98 \pm 0.58$	1.00			
Pain/Discomfort	$2.11 \pm 0.61$	$2.07 \pm 0.54$	0.72			
Anxiety/Depression	$1.53 \pm 0.59$	$1.67 \pm 0.60$	0.29			
Index	0.627 ± 0.255	0.608 ± 0.260	0.73			
Missed Work Days	8 ± 12	7 ± 10	0.65			
PDQ						
Functional Component	44.38 ± 28.47	47.83 ± 23.09	0.55			
Psychosocial Component	27.72 ± 16.95	27.71 ± 14.86	0.99			
Total	72.10 ± 43.30	74.73 ± 35.15	0.76			
PHQ-9	7.76 ± 6.40	$7.11 \pm 5.90$	0.60			
MCID Achieved						
EQ-5D		13 (28)				
PDQ	13 (28)					
PHQ-9		7 (16)				

Quality of Life Outcomes. Values are
presented as mean ± standard deviation or
number (percent). HSM, Health Status
Measure; EQ-5D, EuroQol 5-Dimensions;
PDQ, Pain Disability Questionnaire; PHQ9, Patient Health Questionnaire 9; MCID,
Minimum Clinically Important Difference.

### Results

Regression also revealed that worse preoperative neurological status measured by the Modified McCormick Scale (MMS) predicted worsened EQ-5D (B=-0.09, p=0.04) and PDQ ( $\beta=20.77$ , p<0.01), while ependymomas predicted QOL improvement exceeding the MCID in EQ-5D (OR 43.52, p=0.06) and PDQ (OR 14.98, p=0.04). Conversely, cervical tumors predicted worsened PDQ ( $\beta$ =18.32, p<0.01) and failure to achieve EQ-5D MCID (OR <0.01, 95% CI <0.01-0.65, p=0.02). Postoperative complications, such as syrinx formation ( $\beta$ =-0.09, p=0.04) and CSF leak (B=13.85, p=0.04), predicted diminished improvement in EQ-5D and PDQ, respectively. Finally, increased length of stay contributed to worsened EQ-5D exceeding the MCID (OR 0.41, p=0.01).

Table 3					
Outcome	Covariate	β Coefficient	p-value		
ΔEQ-5D	Preoperative EQ-5D	-0.67	< 0.01		
	Preoperative MMS	-0.09	0.04		
	Plane of Dissection	-0.05	0.14		
	Postoperative Syrinx	-0.09	0.04		
	Duration of Follow-Up (months)	< 0.01	0.06		
	Follow-Up Neurological Status*		0.01		
	Improved	0.13			
	Worsened	-0.04			
ΔPDQ	Preoperative PDQ	-0.81	< 0.01		
-	Preoperative MMS	20.77	<0.01		
	Age (years)	0.69	0.02		
	Postoperative CSF Leak	13.85	0.04		
	Follow-Up Neurological Status*		0.02		
	Improved	-17.50			
	Worsened	12.33			
	Tumor Location**		<0.01		
	Cervical	18.32			
	Cervicothoracic	11.10			
	Thoracic	-11.93			
ΔPHQ-9	Preoperative PHQ-9	-0.45	< 0.01		
	Length of Hospital Stay (days)	0.36	0.04		

QOL Multivariable Regression Analysis. \*Reference is unchanged neurological status. \*\*Reference is conus. EQ-5D, EuroQol 5-Dimensions; PDQ, Pain Disability Questionnaire; PHQ-9, Patient Health Questionnaire 9; MMS, Modified McCormick Scale; CSF, Cerebrospinal Fluid.

## Results

Table 4					
Outcome	Covariate	OR [95% CI]	p-value		
$\Delta EQ-5D > MCID$	Preoperative EQ-5D	<0.01 [<0.01 - <0.01]	< 0.01		
	Preoperative MMS	0.09 [<0.01 - 0.76]	0.02		
	Tumor Location*		0.02		
	Cervical	<0.01 [<0.01 - 0.65]			
	Tumor Pathology**		0.06		
	Ependymoma	43.52 [0.84 - 200.90]			
	Length of Hospital Stay (days)	0.41 [0.03 - 2.43]	0.01		
$\Delta PDQ > MCID$	Preoperative PDQ	0.93 [0.87 - 0.96]	< 0.01		
-	Tumor Pathology**		0.04		
	Ependymoma	14.98 [1.13 - 687.19]			

MCID Multivariable Regression Analysis. \*Reference is conus tumor. \*\*Reference is non-ependymoma. EQ-5D, EuroQol 5-Dimensions; PDQ, Pain Disability Questionnaire; MCID, Minimum Clinically Important Difference; MMS, Modified McCormick Scale.

### Conclusions

The present study is the first to characterize these QOL outcomes and identify predictive characteristics for longterm QOL improvement. While resection did not significantly improve pooled QOL, resection is likely necessary to arrest progressive QOL deterioration. Certain patients with favorable clinical and pathologic characteristics may achieve clinically relevant QOL improvements. These characteristics include better preoperative neurologic status and ependymoma pathology, among others

#### References

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