

Diagnostic Value of Intraoperative Electrophysiological Neuromonitoring During Resection of Intradural Extramedullary Spinal Tumors: Single-Center Retrospective Cohort

Joshua Casaos BS; Wataru Ishida MD; Arun Chandra BS; Adam D'sa BS; Seba Ramhmdani M.D.; Alexander Perdomo-Pantoja MD; Nicholas Theodore MD; Ziya L. Gokaslan MD; Jean-Paul Wolinsky MD; Daniel M. Sciubba MD; Ali Bydon MD; Timothy F. Witham BS MD; Sheng-fu Larry Lo MD, MHSc



Introduction

With the advent of intraoperative electrophysiological monitoring (IONM), surgical outcomes of various neurosurgical pathologies have improved such as brain tumors and spinal deformities. However, its diagnostic value in resecting intradural extramedullary (ID -EM) spinal tumors has not been well-documented in the literature. Thus, we aim to summarize our case series of IONM in patients with ID-EM spinal tumors.

Methods

Retrospective database review from 2010 to 2015 identified 103 patients with ID-EM spinal tumors who underwent tumor resection with IONM (motor evoked potentials and somatosensory evoked potentials). They were classified into (A) patients without any new neurological deficits at 6-month follow-up (n=86) and (B) patients with new deficits (n=17). Clinical outcomes such as baseline characteristics and IONM findings were collected and

statistically analyzed. P

Results

No intergroup differences were discovered between the groups in baseline characteristics and operative data (Tables 1 and 2). In multivariate analysis, significant IONM changes (p<0.0001, Table 3) and location of tumors (thoracic versus the others, p=0.018) were associated with new neurological deficits at 6month follow-up. In predicting them (Table 4), IONM yielded sensitivity of 82.4%, specificity of 90.7% positive predictive value of 63.6%, negative predictive value of 96.3%, and area under the curve (AUC) of 0.893. The diagnostic value slightly decreased in patients with schwannomas (AUC=0.875) and thoracic tumors (AUC=0.842).

Conclusions

IONM for resecting ID-EM spinal tumors was an excellent modality to predict new postoperative neurological deficits at 6month follow-up. Future prospective studies are warranted to further elucidate its utility.

	(A) No New Deficit (n=86)			(B) New Deficit (n=17)			P Value	
Age [year]	51.0	±	15.8	51.3	±	15.2	0.934	
Sex (Female, %)		50.0			52.9		1	
Follow-up Period [month]	25.9	±	24.6	21.6	±	15.8	0.495	
Smoking (%)		19.8			17.6		1	
Anti-Platelet Drugs (%)		11.6			7.1		1	
Diabetes Mellitus (%)		17.4			5.9		0.456	
Location (%)								
Cervical		7.0			11.8		0.181	
Cervico-thoracic		25.6			17.6			
Thoracic		23.3			52.9			
Thoraco-lumbar		5.8			5.9			
Lumbarsacral		38.4			11.8			
Pathological Diagnosis (%)								
Schwannoma	48.8 35.3							
Meningioma	29.1 35.3 3.5 0.0			35.3		0.040		
Metastasis				0.640				
Others		18.6			29.4			
Preoperative Symptoms (%)								
Radicular Pain		50.0			47.1			
Motor Deificit		43.5			47.1		1	
Sensory Deficit		54.1			58.8		0.796	
Baldder/Bowel Dysfunction		19.7			23.5		0.794	
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Baseline characteristic of patients with intradural-extramedullary spinal tumors in this stud

Learning Objectives

By the conclusion of this session, participants should be able to: 1) Describe the importance of IONM in treating patients with ID-EM spinal tumors, 2) Discuss, in small groups, its diagnostic value in predicting 6-month postoperative neurological deficits and how to further optimize surgical treatment.

Table 3							
	Estimate	Std Error	P Value	R2 Value			
Model 1							
IONM Significant Changes	2.12	0.45	<u><.0001</u>				
Thoracic Tumor	1.03	0.44	0.018	0.509			
Tumor Volume [mm3]	1.79 x 10 ⁻⁴	1.42 x 10 ⁻⁴	0.098	1			
Model 2							
IONM Significant Changes	2.13	0.48	<u><.0001</u>				
Thoracic Tumor	1.17	0.48	0.015]			
Tumor Volume [mm ³]	2.78 x 10 ⁻⁴	1.56 x 10 ⁻⁴	0.076	0.513			
GTR	-0.08	0.71	0.910	1			
Numbeer of Operated Levels	0.21	0.38	0.577	1			

Multivariate linear regression models to predict new neurological deficits at six months postoperatively

Table 2

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	(A) No N	icit (n=86)	(B) New Deficit (n=17)			P Value	
Number of Operated Levels	2.4	±	1.6	2.4	±	1.2	0.989
Tumor Volume [mm3]	2063.8	±	2358.9	3109.1	±	2677.2	0.149
IONM Significant Changes (%)		9.3			82.4		< 0.001
EBL [ml]	163.7	±	295.6	135.3	±	171.7	0.591
Operative Time [min]	282.5	±	125.2	273.4	±	103.2	0.752
GTR achieved (%)		93.0			82.4		0.127
Length of Stay	6.5	±	4.3	5.8	±	2.0	0.308
Length of ICU Stay	1.5	±	0.9	1.5	±	0.7	0.235
Surgical Site Infection (%)		0.0			0.0		1
Wound Dehiscence (%)		2.3			0.0		1
Local Recurrence (%)		8.1			11.8		0.641
Unplanned Reoperation (%)		7.0			11.8		0.616
Preoperative mMS	1.9	±	0.7	2.1	±	0.8	0.366
	1.7	+	0.7	2.7	±	0.7	< 0.001

EBL: estimated blood loss GTR: gross total resection ICU: intensive care unit mMS: modified McCormick scale

Operative data of patients with intradural-extramedullary spinal tumors



intraoperative electrophysiological monitoring to predict neurological deficits at six months postoperatively