

NEUROMONITORING IN PATIENTS WITH PROGRAMMABLE NEUROLOGIC STIMULATORS: AN ALTERNATIVE TO TCMEPS USING EPIDURAL D-WAVE MONITORING

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INTRODUCTION

The use of deep brain stimulators (DBS) is increasing for conditions such as Parkinson's disease, movement disorders, psychiatric illness, and epilepsy, with over 5,500 procedures performed annually in the United States. Intraoperative neuromonitoring (IONM) is commonly used during spine surgery. While somatosensory evoked potentials (SSEPs) require low current (30–40 mA), transcranial motor evoked potentials (tcMEPs) use high-voltage stimulation (up to 700 V and 1 A), posing significant risk to intracranial devices and surrounding tissue. Epidural D-wave monitoring, using low-current stimulation (20–50 mA), offers a safer alternative. We report a patient with bilateral DBS who underwent kyphoscoliosis correction using D-wave monitoring and SSEPs without device damage or neurologic complications.

CASE DESCRIPTION

A 68-year-old man with Parkinson's disease treated with carbidopa-levodopa, ropinirole, and bilateral deep brain stimulators (DBS) underwent two-stage correction of kyphoscoliosis. His history included coronary artery disease, obstructive sleep apnea, and hypertension. Stage 1 involved L4–S1 anterior fusion with SSEPs and EMG only; tcMEPs and monopolar cautery were avoided, and bipolar cautery with PlasmaBlade was used. During Stage 2 (T3–S1 posterior fusion), total intravenous anesthesia was administered. TcMEPs were again avoided, and epidural D-wave monitoring was used. An electrode was placed at T1–T2 (image 1), producing stable signals at 5–50 mA (image 2), with unchanged SSEPs/EMG (image 3). The DBS was reactivated without neurologic deficits.

Image 1: Image of Spinal Electrode placed at the T1-T2 interspace

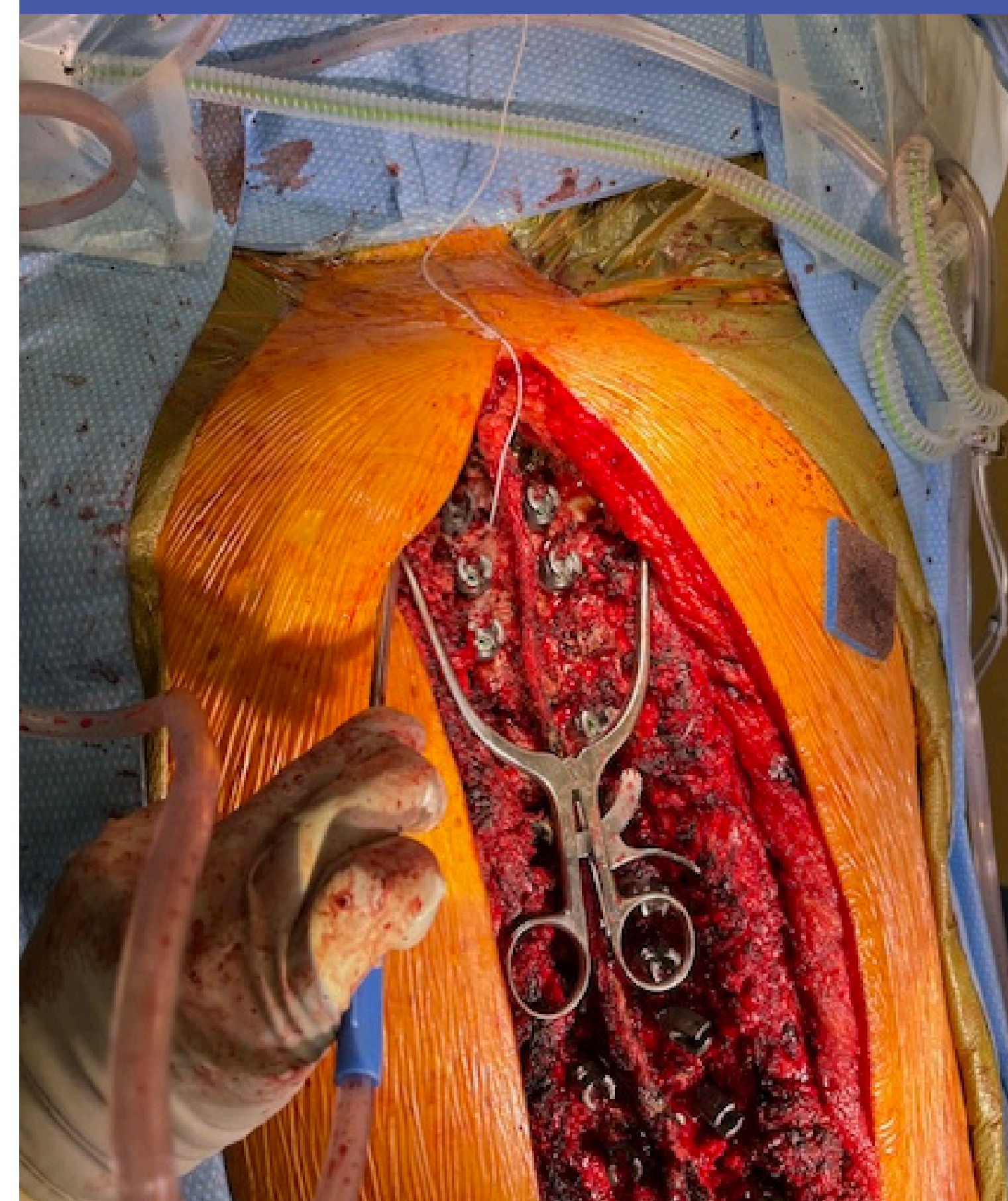
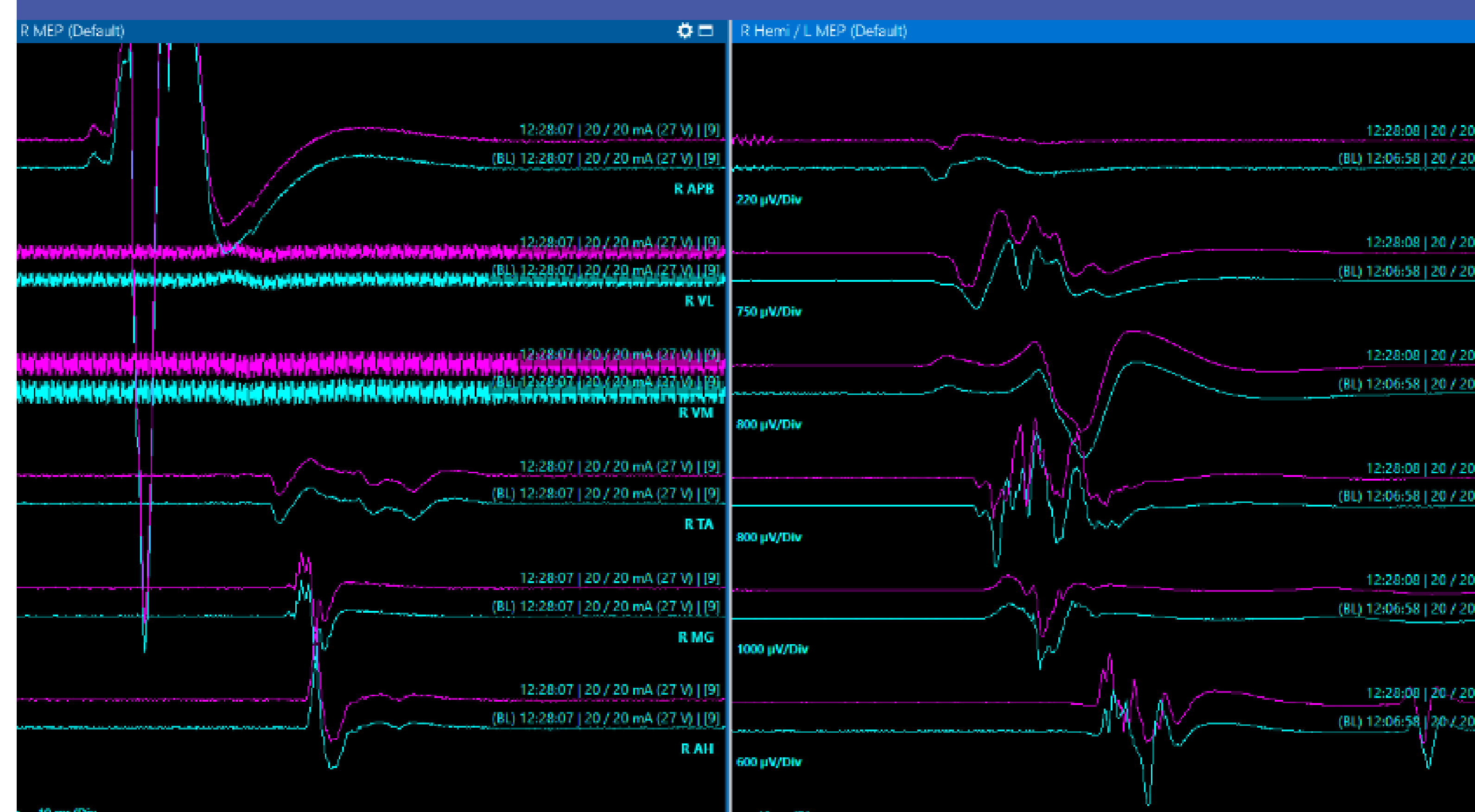


Image 2: Stimulation parameters of the D-wave electrode showing the 20mA Max intensity needed to obtain MEPs

L Hemi / R MEP		R Hemi / L MEP	
LCS	20 / 20 mA (20 V)	LCS	20 / 20 mA (20 V)
Run: 15:03:27		Run: 15:03:26	
20 mA 0 mA LCS 20 mA		20 mA 0 mA LCS 20 mA	
Polarity:	Reverse	Polarity:	Reverse
Biphasic:	☐	Biphasic:	☐
Max intensity (mA):	20	Max intensity (mA):	20
Pulse Count:	5	Pulse Count:	5
ISI (ms):	0.5	ISI (ms):	0.5
Pulse Width (µs):	500	Pulse Width (µs):	500
Sweep (ms/Div):	10	Sweep (ms/Div):	10
Delay (Div):	0	Delay (Div):	0
Notch:	☐	Notch:	☐
Remove EMG stim artifact:	☐	Remove EMG stim artifact:	☐
Stim Artifact Duration (ms):	5	Stim Artifact Duration (ms):	5

Image 3: Bilateral upper and lower extremity D-wave MEPs



Refereneces- Available upon request

DISCUSSION

The use of deep brain stimulators (DBS) is increasing for conditions such as Parkinson's disease, movement disorders, psychiatric illness, and epilepsy, with over 5,500 procedures annually in the United States. Intraoperative neuromonitoring (IONM) is commonly used during spine surgery. While somatosensory evoked potentials (SSEPs) require low current (30–40 mA), transcranial motor evoked potentials (tcMEPs) require high-voltage stimulation (up to 700 V and 1 A), posing significant risk to intracranial devices and tissue, making them unsuitable in DBS patients. Epidural D-wave monitoring uses low-current stimulation (20–50 mA) to safely assess motor pathway integrity. This technique provides stable, reproducible signals and is particularly valuable in complex spinal procedures where traditional motor monitoring is contraindicated, and may be applicable to other implantable neuromodulation devices.

CONCLUSION

In this case, epidural D-wave monitoring combined with SSEPs allowed safe and effective neuromonitoring in a patient with bilateral DBS undergoing kyphoscoliosis correction. This approach preserved device function and avoided neurologic complications. Epidural D-wave monitoring represents a valuable alternative to tcMEPs in patients with intracranial neuromodulation devices and should be considered in similar high-risk surgical scenarios.

Contact

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