Neurophysiology in neuropsychiatry

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Case

- 22yo acute neck pain and right arm paraesthesia
- CT brain + angiogram
- MRI cervical spine normal
- Developed effortful breathing, right leg paraesthesia, right arm and leg weakness, right hand incoordination, gait instability and urinary retention
Case – further history

• Only recent trauma was fall during soccer game 2 weeks prior
• Mother recently diagnosed with metastatic breast ca – took on a caring role, no other relevant family history
Examination findings

- Normal cranial nerve examination
- Normal tone, no clonus
- Variable right-sided effort-related weakness and incoordination
- Reflexes ++ bilaterally, plantars flexor
- Subjectively decreased pinprick sensation right arm and leg
- No saddle anaesthesia, PR examination normal
- Hoover’s sign positive
Hoover’s sign

A

"Push down with your right heel"
No effect

B

"Lift your leg" (against resistance)
Right hip extends
Initial impression & recommendations

• Variable and inconsistent examination with positive findings for a functional neurological syndrome, no obvious trigger

• More caudal spinal pathology not excluded (urinary retention) – possibility of focal pathology with functional overlay

• Recommended MRI remainder of spine
Progress

• MRI whole spine normal
• Normal findings discussed with patient
• Recommended trial of void – passed
• Physiotherapy – ongoing gait instability and symptoms (days)
• Neurophysiology tests performed (function vs structure)
Somatosensory evoked potentials - SSEPs
Motor evoked potentials - MEPs
Left
Right
What now?

• Recommended MRI brain – also normal
• Typically, evoked potentials are normal in functional neurological syndromes and malingering reflecting absence of structural pathology

• Can brain activation be abnormal in some functional disorders?
Functional neuroimaging

• PET rCBF study: preparation to move and attempted movement of ‘paralysed’ leg – activation of DLPFC, anterior cingulate and orbitofrontal cortex but **no activation of contralateral pre-motor or primary sensorimotor cortex** [Marshall et al 1997]

• PET rCBF in patients with unilateral functional weakness vs controls feigning weakness – **left prefrontal hypofunction in those with functional weakness** when attempting to move affected limb irrespective of symptom lateralisation [Spence et al 2000]

• **Decreased activity in the supplementary motor area** and increased activity in limbic regions has been demonstrated in patients with functional motor symptoms compared with healthy volunteers [Voon et al 2011]
Neurophysiology

• Multiple studies have reported abnormal cortical SEPs including an early study of functional ‘anaesthesia’ [Hernandez-Peon et al 1963]

• Cortical responses on SSEP have been found to be diminished in a case of unilateral functional sensory loss but not in a patient feigning sensory loss [Lorenz et al 1998]

• MEPs have been used to demonstrate intact corticospinal excitability in functional paralysis and after resolution of symptoms (but may also reflect ‘inhibition of motor execution’) [Liepert et al 2011]
Follow up testing

• Returned for follow up SSEPs and MEPs 6 weeks later
• Gradual improvement since leaving hospital, felt he was ‘back to normal’ for the past 2 weeks
• Walked into clinic, normal neurological examination
• Happy for EPs to be repeated and his case to be presented
SSEPs – lower limbs
Previous study
MEPs - right
Previous study
Conclusions

• Evoked potentials can be used to demonstrate the integrity of sensory and motor pathways and can be helpful for ‘paralysed’ patients

• Evoked potentials may offer some insight into cortical activation (i.e. functional disorders vs malingering)
References


Box 1: DSM-5 criteria for conversion disorder (functional neurological symptom disorder)

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<td>1</td>
<td>One or more symptoms of altered voluntary motor or sensory function</td>
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<td>2</td>
<td>Clinical findings provide evidence of incompatibility between the symptom and recognised neurological or medical conditions</td>
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<td>3</td>
<td>The symptom or deficit is not better explained by another medical or mental disorder</td>
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<td>4</td>
<td>The symptom or deficit causes clinically significant distress or impairment in social, occupational, or other important areas of functioning or warrants medical evaluation</td>
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