

## Monrad Krohn's Dissociation between emotional and volitional facial paralysis with paradoxical hypermimia: A case report

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### Case Report

This 40-year-old previously healthy man presented with sudden onset of cervical pain, vertigo, oscillopsia, and facial paralysis after swim practice.

On examination, he had a right Horner's syndrome, skew deviation with right eye hypertropia, left beating pure torsional nystagmus, and left supranuclear volitional facial paralysis. During the interview, when his wife made a joke, he showed an excessive contraction of the left side of his face during spontaneous smiling (a dissociation between the volitional paralysis and the emotional facial contraction - Video 1).

Brain computed tomography (CT) scan was within the normal limits. Cervical and intracranial angioCT showed a complete occlusion of the right vertebral artery since its origin. Brain MRI revealed areas of infarction of the right dorsolateral pons

and middle cerebellar peduncle (Image 1). Cervical MRI angiogram revealed a vertebral mural hemathoma, confirming a vertebral artery dissection since its origin. A diagnosis of Wallenberg syndrome due to arterial dissection with embolic stroke was made.

### Discussion

The motor nucleus of the facial nerve receives supranuclear inputs from different areas of the brain that mediate facial muscle contractions in different contexts. The main examples are the corticonuclear fibers that originate in the primary motor cortex, which mediates volitional (voluntary) movements of the face, and limbic pathways, that originate in diverse areas of the cortex such as the medial surface of the prefrontal cortex, the insula, and the cingulate gyrus, that mediate invol-

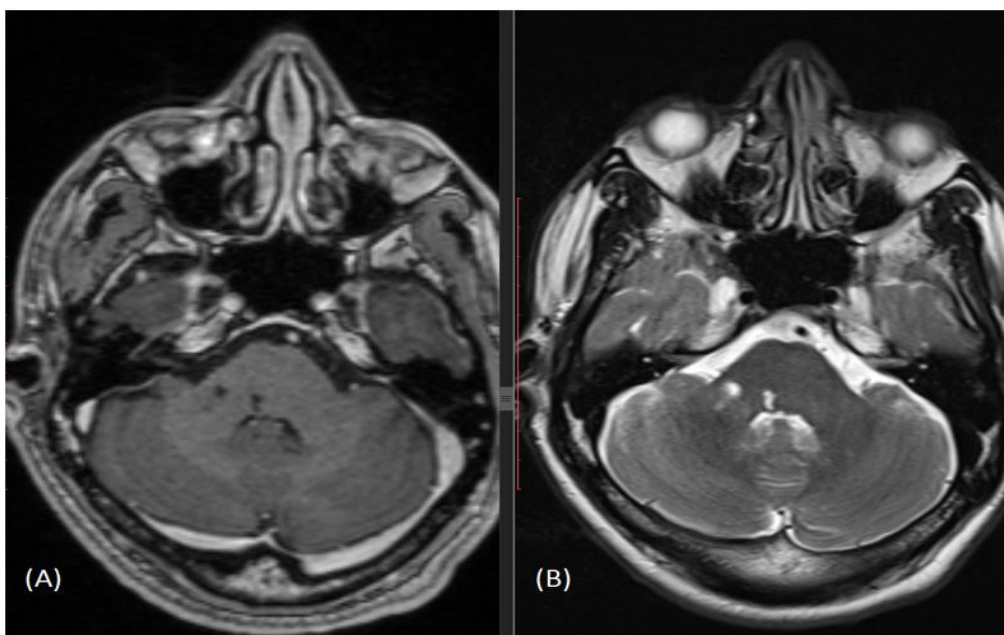


Figure 1: Brain MRI (Case 2). Brain magnetic resonance images performed twenty days after the stroke: A-T1 B-T2 sequences showing infarctions of the right dorsolateral pons and middle cerebellar peduncle (arrows). The images are compatible with embolic brainstem infarctions.

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untary emotional facial expressions [1,2,3].

Lesions of these supranuclear pathways may result in selective impairment of the contraction of facial muscles depending on whether the patient is smiling volitionally (such as when the doctor asks for it) or spontaneously (such as seeing a loved one or hearing a joke). In cases of supranuclear facial palsy, there may be volitional paralysis that spares the emotional smile with lesions affecting only the corticonuclear pathways, emotional paralysis that spares the volitional smile with lesions affecting solely the limbic pathways, or paralysis during both the volitional and emotional smiling with lesions affecting both pathways [4]. Georg Herman Monrad-Krohn (1884-1964) was the first to describe that in some cases of selective volitional paralysis, the emotional movements of the face may not only be spared but may even be accelerated and exaggerated, such as seen in the present case [5]. This phenomenon suggests that when volitional pathways are impaired, emotional ones may become more active – the extreme example is the uncontrolled emotional expressions that patients with bilateral lesions of the corticonuclear pathways can exhibit (called pseudobulbar palsy).

In Wallenberg syndrome, a supranuclear volitional facial palsy may occur with the involvement of Dejerine's aberrant pyramidal tract – corticonuclear fibers of the facial nerve which descend in the contralateral ventromedial medulla, decussate at the level of the upper medulla and then ascend in the dorsolateral medulla to reach the facial nerve motor nucleus [6].

#### **VIDEO 1: Patient's volitive and emotional smiling.**

**Video 1:** First, the patient smiles voluntarily and shows left facial paralysis. Then, when the doctor asks about his daughter, the patient shows an accelerated and exaggerated response on the left side of his face. This is the dissociation between the voluntary and emotional smile with paradoxical hypermimia described by Monrad-Krohn.

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