Case report

Eight-and-a-half syndrome: video evidence and updated literature review

Marco A Cárdenas-Rodríguez, Sergio A Castillo-Torres, Beatriz Chávez-Luévanos, Laura De León-Flores

Servicio de Neurología, Hospital Universitario "Dr José E. González", Universidad Autónoma de Nuevo León, Monterrey, NL, Mexico

Correspondence to
Dr Sergio A Castillo-Torres; sergio.castillotr@uanl.edu.mx

Accepted 3 April 2020

To cite:
Cárdenas-Rodríguez MA, Castillo-Torres SA, Chávez-Luévanos B, *et al*. *BMJ Case Rep* 2020;**13**:e234075. doi:10.1136/bcr-2019-234075

SUMMARY

The eight-and-a-half syndrome (EHS)—defined by the combination of a seventh cranial nerve palsy and an ipsilateral one-and-a-half syndrome—is a rare brainstem syndrome, which localises to the caudal tegmental region of the pons. We present a case of the EHS secondary to an inflammatory lesion on a previously healthy 26-year-old woman, with a literature review emphasising the relevance of aetiological assessment.

BACKGROUND

The brainstem is a complex structure that includes cranial nerves and nuclei, ascending and descending tracts, that enables the brain to control the body through the spinal cord. All tightly arranged in less than 3% of the whole brain volume.[1] In this anatomical structure, small lesions can produce complex clinical syndromes that have fascinated neurologists for many generations. Besides being designated through numerous eponymous terms, brainstem syndromes have also been denominated arithmetically: by summation of the cranial nerves involved. Thus, the combination of facial palsy and a one-and-a-half syndrome because of a lesion on the caudal tegmental pons has been denominated the eight-and-a-half syndrome (EHS).[2]

CASE PRESENTATION

A previously healthy 26-year-old woman presented to our neurology service because of facial palsy and diplopia. Three weeks prior, she had presented sudden-onset vertigo with mild improvement with over-the-counter antiemetics. One week later, she developed horizontal diplopia and a left facial palsy, for which she was prescribed a short course of oral steroids. But after a lack of improvement, she was referred to our neurology service. On examination, we found normal mental status and higher cortical functions. Cranial nerve examination revealed a left horizontal gaze palsy with contralateral internuclear ophthalmoplegia: the one-and-a-half syndrome (video 1) and a subtle left facial palsy of lower motor neuron pattern (figure 1), the rest of the cranial nerve examination was unremarkable, consistent with an EHS. We found no hemiparesis or hemisensory deficit and deep tendon reflexes were normal bilaterally. She was admitted to the neurology ward for aetiological assessment.

INVESTIGATIONS

Complete blood count, renal, liver and thyroid function were unrevealing. A contrast-enhanced MRI of the brain and spinal cord revealed a non-enhancing lesion on the caudal tegmentum of the pons (figure 2), with two subcortical white matter lesions (one right frontal juxtacortical and one left parietal periventricular), without any other abnormalities.

A lumbar puncture was performed to rule out an infectious aetiology and revealed an acellular cerebrospinal fluid with an elevated protein count, and PCRs for common bacterial, viral and fungal agents were negative. Oligoclonal bands and anti-aquaporin 4 antibodies were absent in both cerebrospinal fluid and serum. Acute phase reactants (C-reactive protein and erythrocyte sedimentation rate) and autoantibodies (antinuclear, anti-Ro and anti-La antibodies) were absent. Visual-evoked potentials ruled out subclinical optic nerve involvement.

DIFFERENTIAL DIAGNOSIS

The differential diagnosis was oriented towards inflammatory causes like multiple sclerosis (MS) because of the patient's age and presentation. The presence of only one definite lesion and lack of dissemination in time and space ruled out MS. The lack of appropriate clinical picture and the absent autoantibodies (antinuclear, anti-Ro and anti-La antibodies) ruled out other inflammatory disorders like systemic lupus erythematosus and Sjögren's syndrome. The clinical presentation and the absence of autoantibodies ruled out neuromyelitis optica spectrum disorders (NMOSD), acute disseminated encephalomyelitis and myelin oligodendrocyte glycoprotein IgG-associated encephalomyelitis. Given the patient's age, absent risk factors and imaging findings inconsistent with

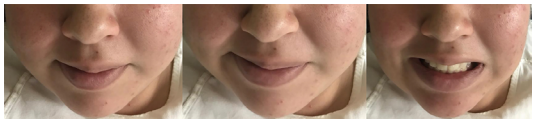
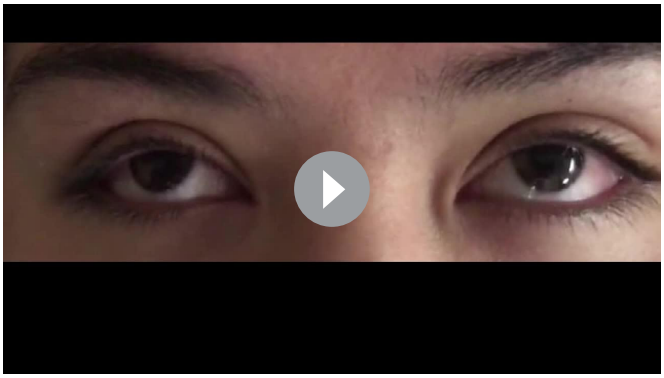


Figure 1 Left facial palsy. A mild left facial palsy is demonstrated on asking the patient to smile (middle image) and close her eyes (right image).



Video 1 Oculomotor examination. Primary gaze reveals mild right exotropia (0:00–0:03), then left eye horizontal gaze palsy is demonstrated as the patient is asked to look left (0:04–0:09), and right internuclear opthalmoplegia (0:10–0:14), with normal vertical gaze (0:15–0:19). A mild gaze-evoked nystagmus can be seen on the right eye (0:23–0:29).

a vascular aetiology (diffusion-weighted-negative lesion, not compatible with a defined vascular territory), we did not consider cerebrovascular disease a likely aetiology; however, we ruled out antiphospholipid syndrome (negative lupus anticoagulant, anti-cardiolipin and β2-glycoprotein antibodies). Therefore, a clinically isolated syndrome suggestive of multiple sclerosis was considered the most likely diagnosis.

TREATMENT

The patient was prescribed methylprednisolone 1000 mg/day during 5 days and was started on early physical rehabilitation with mild improvement noted after the third day. After completion of high-dose steroid pulses, she was discharged.

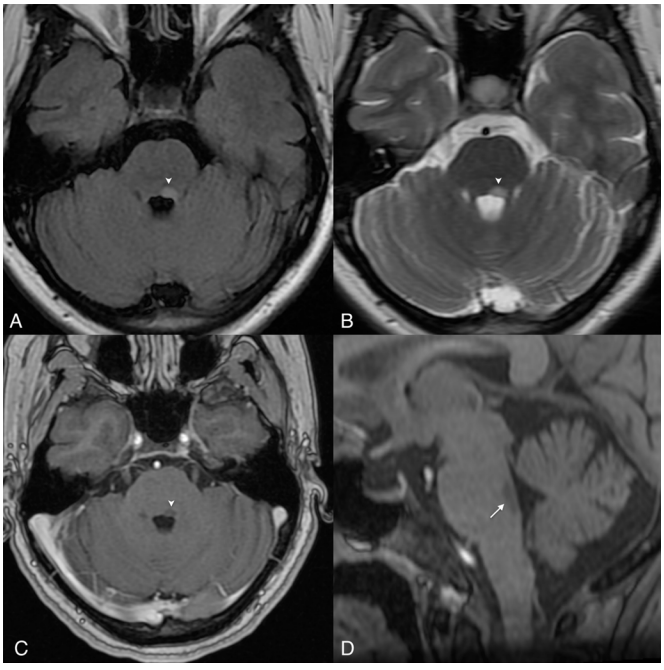


Figure 2 A contrast-enhanced MRI reveals a non-contrast enhancing Fluid-Attenuated Inversion Recovery (FLAIR) and T2 hyperintense (A, B) and T1 hypointense (C, D) lesion on the facial colliculus (arrowheads).

OUTCOME AND FOLLOW-UP

At follow-up after 3 months, the patient noticed an improvement of oculomotor function with minimal diplopia.

DISCUSSION

The combination of one-and-a-half and seventh cranial nerve palsy has a highly localising value to the dorsal tegmentum of the pons and was given the name of 'eight-and-a-half' syndrome in 1998 by Eggenberger, who reported three cases secondary to ischaemic stroke.[2] We reviewed the literature for published cases of EHS and found 27 cases. Cerebrovascular disease was the most frequent underlying aetiology with 17 cases and a mean age of 65 years at presentation.[2–17] Stroke was the most frequent cause in 14 patients, including a case of giant cell arteritis[2] and another one after a coronary angioplasty.[3] In the remaining three cases, it presented after capillary telangiectasia,[13] a cavernoma and intracerebral haemorrhage.[16] Although hypercoagulable states have not been reported, we consider that these should be ruled out when the clinical picture and imaging are compatible with a vascular injury, and its characteristics (arterial or venous) should drive the assessment. For example, in young patients, arterial strokes should lead to consider antiphospholipid antibody syndrome, cerebral venous thrombosis to rule out deficiencies of protein C, protein S and factor V Leiden, and structural heart disease (patent foramen ovale) through an transesophageal echocardiogram.

The second most common aetiology was demyelinating disease in nine cases (33%) with a mean age of 30 years, including five confirmed MS cases and one case of NMOSD.[16 18–22] We found only one infectious disease case, a paediatric patient with a tuberculoma.[23] Additional four cases reported as EHS were considered as 'EHS plus' after review, because of hemiparesis in three and hemiataxia in one.[24–27] Therapy was driven in all cases by the underlying aetiology. We found a highly variable outcome because of the lack of consistency in outcome reporting. Partial recovery with oculomotor sequelae was reported in 14 cases (52%) and complete recovery in 8 (30%). Of those who recovered, one had a relapse 3 years later, and another one developed hemifacial spasm 18 months later.[15 18] The outcome was not reported in five cases (18%). The patients over 40 years with cardiovascular risk factors should be assessed for cerebrovascular disease; in younger patients, a demyelinating disorder should be considered the culprit. Recovery tends to be incomplete for those with a vascular-related EHS and almost complete for those of non-vascular aetiology.

Learning points

- Eight-and-a-half syndrome (EHS) consists of the results of the summation of a one-and-a-half syndrome (1.5) and an ipsilateral peripheral-type facial palsy (7).
- EHS has a high localising value to the caudal paramedian tegmentum of the pons.
- Aetiological assessment should consider cerebrovascular disease (those over 40 years with cardiovascular risk factors) and demyelinating disease (younger patients without risk factors).
- Prognosis is good, particularly for demyelinating disease; and secondary prevention is important in cerebrovascular cases.

Contributors MAC-R and SAC-T contributed to the article conception and design, as well as drafting of the manuscript. MAC-R obtained consent from the patient. BC-L and LDL-F contributed with the examination of the patient and significance of clinical findings, and the critical review of the manuscript for intellectually relevant content. All authors agreed on the final version of the manuscript.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None declared.

Patient consent for publication Obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

ORCID iD
Sergio A Castillo-Torres http://orcid.org/0000-0002-4727-2535

REFERENCES

1 Haines DE, Mihailoff GA. *Fundamental neuroscience for basic and clinical applications*. 5th edn. Philadelphia, PA: Elsevier, 2018: 516xi.
2 Eggenberger E. Eight-and-a-half syndrome: one-and-a-half syndrome plus cranial nerve VII palsy. *J Neuroophthalmol* 1998;18:114–6.
3 Anderson CA, Sandberg E, Filley CM, *et al*. One and one-half syndrome with supranuclear facial weakness: magnetic resonance imaging localization. *Arch Neurol* 1999;56:1509–11.
4 Nandhagopal R, Krishnamoorthy SG. Neurological picture. Eight-and-a-half syndrome. *J Neurol Neurosurg Psychiatry* 2006;77:463.
5 Sarwal A, Garewal M, Sahota S, *et al*. Eight-and-a-half syndrome. *J Neuroimaging* 2009;19:288–90.
6 Duffy A, Shen PY, Verro P, *et al*. Eight-and-a-half syndrome. *Neurol Clin Pract* 2014;4:526–7.
7 Bocos-Portillo J, Ruiz Ojeda J, Gomez-Beldarrain M, *et al*. Eight-and-a-Half syndrome. *JAMA Neurol* 2015;72:830.
8 Fernández Menéndez S, Redondo Robles L, Lara Lezama LB, *et al*. Eight and a half syndrome caused by a stroke. *Med Clin* 2015;144:e23.
9 Acevedo P, Hatt K, Cao N. Poster 226 unusual presentation of eight and a half syndrome in a patient with acute pontine medullary stroke: a case report. *Pm R* 2016;8:S234.
10 Kong WY, Tan YQB, Sia CH, *et al*. Adding up cranial nerves to localize the lesion: eight-and-a-half syndrome. *QJM* 2016;109:627–8.
11 Xie W-J, Yu H-Q, Wang Y-H, *et al*. A case report of eight and a half syndrome. *Neurol Sci* 2016;37:821–2.
12 Almutlaq A, Richard A. Eight-and-a-half syndrome: one-and-a-half syndrome with peripheral facial nerve palsy. *CMAJ* 2018;190:E510.
13 Li W, Hou D, Deng Y, *et al*. Eight-and-a-Half syndrome: a combination of intracranial capillary telangiectasia and Hematencephalon. *J Stroke Cerebrovasc Dis* 2018;27:e135–7.
14 Mesina BVQ, Sosuan GMN, Reyes KB. Eight-and-a-half syndrome: a rare potentially life-threatening disease. *GMS Ophthalmol Cases* 2018;8:Doc04.
15 Shin C, Lee D, Ahn T-B, *et al*. Hemifacial spasm after eight-and-a-half syndrome. *Parkinsonism Relat Disord* 2018;54:123–4.
16 Yadegari S, Aghsaei-Fard M, Akbari M, *et al*. "Eight and a half" and "nine syndrome" rare presentation of pontine lesions; case reports and review of literature. *Iran J Neurol* 2018;17:189–91.
17 Kaur J, Paul BS, Singh G. Eight-and-a-half syndrome: a rare neuro-ophthalmologic syndrome of pontine infarction. *Neurol India* 2019;67:611–2.
18 Mortzos P, Nordling MM, Sørensen TL. Eight-and-a-half syndrome as presenting sign of childhood multiple sclerosis. *J Aapos* 2014;18:490–2.
19 Wanono R, Daelman L, Maarouf A, *et al*. [Eight and a half plus syndrome as a first presentation of multiple sclerosis]. *Rev Neurol* 2014;170:553–4.
20 Özden K, Tecellioğlu M, Özcan A. A case of multiple sclerosis presenting as eight and half syndrome. *KÜ Tıp Fak Derg* 2015;17:34–8.
21 Jacob S, Murray A. Rare occurrence of eight-and-a-half syndrome as a clinically isolated syndrome. *BMJ Case Rep* 2018;2018. doi:10.1136/bcr-2017-222057. [Epub ahead of print: 26 Jan 2018].
22 Keskin Guler S, Güneş N, Gokce Cokal B, *et al*. As the first sign of multiple sclerosis, eight-and-a-half syndrome. *Neurol Sci* 2018;39:945–7.
23 van Toorn R, Schoeman JF, Donald PR. Brainstem tuberculoma presenting as eight-and-a-half syndrome. *Eur J Paediatr Neurol* 2006;10:41–4.
24 Kakar P, Brown Z, Banerjee S. Eight-and-a-half syndrome: an unusual presentation of brainstem infarction. *QJM* 2013;106:273–6.
25 Jens W, Ahmed A. Eight and a half syndrome from multiple sclerosis. *J Neurol Stroke* 2015;3:99.
26 Xia N-G, Chen Y-Y, Li J, *et al*. Eight-and-a-half syndrome caused by a pontine haemorrhage: a case report and review of the literature. *Int J Neurosci* 2018;128:746–50.
27 Maier S, Motataianu A, Bajko Z, *et al*. Pontine cavernoma haemorrhage at 24 weeks of pregnancy that resulted in eight-and-a-half syndrome. *Acta Neurol Belg* 2019;119:471–4.