www.jcimcr.org

JCIMCR OPEN ACCESS Journal of Clinical Images and Medical Case Reports

ISSN 2766-7820

Clinical Image

Open Access, Volume 3

Kernohan's notch phenomenon: A paradoxical neurological finding

Adeel Ilyas[1]; Mariel Szapiel[2]; Paul M Foreman[2]*

[1]Department of Neurosurgery, University of Alabama at Birmingham, Birmingham, AL, USA.

[2]Department of Neurosurgery, Orlando Health Neuroscience and Rehabilitation Institute, Orlando, FL, USA.

***Corresponding Author: Paul M Foreman**

Department of Neurosurgery, Orlando Health Neuroscience and Rehabilitation Institute, 89 W. Copeland Dr., 2nd Floor, MP 163, Orlando, FL 32806, USA.

Phone: (321) 841-7550;

Email: paul.foreman@orlandohealth.com

Received: Jun 01, 2022

Accepted: Jul 04, 2022

Published: Jul 11, 2022

Archived: www.jcimcr.org

DOI: www.doi.org/10.52768/2766-7820/1939

Abstract

False localization signs or paradoxical neurological findings are a manifestation of indirect dysfunction at a neurological structure remote from the location of expected anatomical pathology. We present a case of an acute subdural hematoma that caused unexpected ipsilateral hemiparesis secondary to injury of the contralateral cerebral peduncle as a result of brain shift from this mass lesion. This phenomenon is termed Kernohan's notch. We delve further into the pathophysiology of these and pathognomonic imaging features identified in our case report.

Keywords: Kernohan's notch; MRI; CT; False localization sign.

Case description

A 68-year-old female presented to the emergency department after a ground-level fall. Examination demonstrated a Glasgow Coma Scale score of 6t with left-sided hemiparesis. CT revealed an acute, left-sided (ipsilateral to the deficit) Subdural Hematoma (SDH) with compression of the right cerebral peduncle against the free edge of the tentorium (Figure 1). The patient was taken for emergent left-sided craniotomy for evacuation of SDH. Follow-up MRI 6 days postoperative confirmed injury to the right cerebral peduncle (Figure 2) and diagnosis of "Kernohan's notch phenomenon". This pathophysiology accounts for many cases of ipsilateral hemiparesis, a common false localization sign [1].

Discussion

False localization signs or paradoxical neurological findings are a manifestation of indirect dysfunction at a neurological structure remote from the location of expected anatomical pathology. False localization signs can occur secondary to cranial or spinal pathology. In addition to ipsilateral hemiparesis, also termed homolateral, direct, and paradoxical hemiparesis, examples of cranial false localization signs include sixth nerve palsy in the setting of raised intracranial pressure, fifth and seventh nerve dysfunction in the setting of brainstem distortion, and frontal ataxia [2]. In our case, the acute left-sided subdural hematoma would be expected to cause contralateral hemiparesis as a result of cortical injury, without ipsilateral hemiparesis. The unexpected finding of ipsilateral hemiparesis was secondary to injury of the contralateral cerebral peduncle as a result of left-to right brain shift from this mass lesion. This phenomenon of compression of the cerebral peduncle against the free edge of the tentorium is termed the Kernohan-Woltman or Kernohan's notch phenomenon as it was independently described by American neuropathologist James W Kernohan and neurologist Henry W Woltman [3]. In the era before routine CT imaging, the Kernohan's notch phenomenon disconcerted many clinicians and frequently resulted in wrong-sided exploratory surgery. Although neuroradiologic evidence of Kernohan's notch is rare, MRI typically demonstrates a spheroid lesion within the affected cerebral peduncle that is T1 hypo- or isointense and T2 and FLAIR in the setting of cytotoxic edema [4]. Furthermore,

there may be evidence of hemosiderin deposition on the gradient-echo sequence, which may correspond to petechial hemorrhage around the periphery of the lesion [5]. Although the case of Kernohan's notch phenomenon was a rapidly expanding supratentorial mass in this case, slow-growing supra-and infratentorial lesions (e.g. meningiomas or epidermoid tumors) may also cause contralateral compression of the cerebral peduncle against the incisura resulting in ipsilateral hemiparesis [1]. Predisposing factors to the development of Kernohan's notch including a higher degree and duration of compression, a more rapid growth rate of the mass lesion, narrow tentorial incisura, and tenuous vascular supply caused compression of the internal carotid artery against the skull base have been proposed; however, none of these factors have been sufficiently tested [1,5,6].

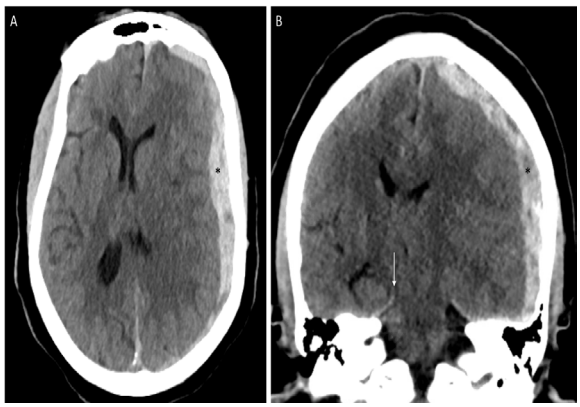

Figure 1: Axial (A) and coronal (B) CT of the head demonstrates an acute left-sided subdural hematoma (asterisk) with midline shift and compression of the contralateral cerebral peduncle against the free edge of the tentorium (arrow).

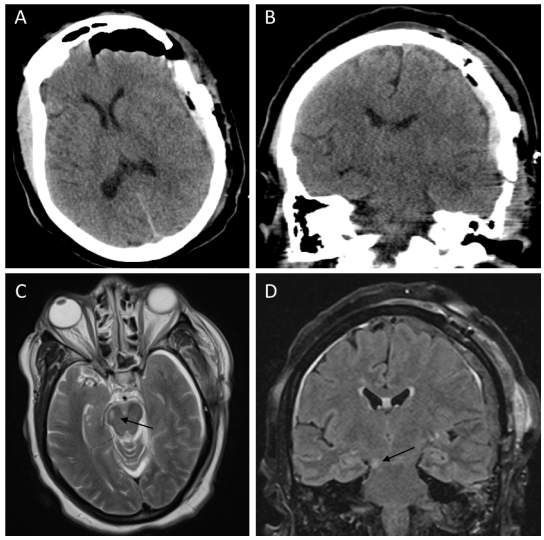

Figure 2: Axial (A) and coronal (B) CT of the head following left-sided craniotomy for evacuation of SDH. Axial T2-weighted (C) and coronal FLAIR (D) MRI obtained 6 days after injury demonstrates hyperintensity within the right cerebral peduncle (arrow).

Declarations

Author contributions: Conception and design: Foreman, Szapiel. Acquisition of Data: Foreman, Szapiel. Analysis and Interpretation of Data: Ilyas, Foreman. Drafting the Article: Ilyas, Foreman. Critically Revising the Article: All authors.

Study funding: None.

Disclosure: None.

References

1. Carrasco Moro R, Castro Dufourny I, Millán JSMS, et al. Ipsilateral hemiparesis: The forgotten history of this paradoxical neurological sign. Neurosurg Focus. 2019; 47: 4.
2. Larner AJ. False localising signs. J Neurol Neurosurg Psychiatry. 2003; 74: 415–418.
3. Kernohan Jw. Incisura Of The Crus Due To Contralateral Brain Tumor. Arch Neurol Psychiatry. 1929; 21: 274.
4. Cohen AR, Wilson J. Magnetic resonance imaging of Kernohan?? notch. Neurosurgery. 1990; 205.
5. Carrasco R, Pascual JM, Navas M, et al. Kernohan Woltman notch phenomenon caused by an acute subdural hematoma. J Clin Neurosci. 2009; 16: 1628–1631.
6. Adler DE, Milhorat TH. The tentorial notch: Anatomical variation, morphometric analysis, and classification in 100 human autopsy cases. J Neurosurg. 2002; 96: 1103–1112.