



Case report

Magnetic resonance imaging findings of Kernohan–Woltman notch in acute subdural hematoma

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Abstract

Objective and importance: We report the case of a 73-year-old patient who presented a right motor deficit caused by an ipsilateral acute subdural hematoma. A magnetic resonance imaging (MRI) demonstration of Kernohan–Woltman notch phenomenon was obtained. *Clinical presentation:* The woman sustained a major head injury at home, followed by loss of consciousness. On admission to the emergency room, she was comatose, anisochoric (left > right), and showed a reaction to pain with decerebrating movements of left limbs (Glasgow Coma Scale (GCS) 4/15). A right severe hemiparesis was observed. Cerebral computed tomography scan showed a large right hemispheric subdural hematoma. *Intervention and post-operative course:* A wide right craniotomy was performed and the subdural hematoma evacuated. During the post-operative period, the level of consciousness gradually improved. A MRI performed about 2 weeks after operation showed a small area of abnormal signal intensity in the left cerebral peduncle. On discharge, the woman was able to communicate with others, but her right hemiparesis was still severe. © 1999 Elsevier Science B.V. All rights reserved.

Keywords: Acute subdural hematoma; Ipsilateral hemiparesis; Kernohan–Woltman notch; Magnetic resonance imaging; Major head injury

1. Introduction

The compression of a contralateral cerebral peduncle against the edge of the tentorium caused by a supratentorial mass, with ipsilateral motor deficit, was first described by Kernohan and Woltman [1], who observed this phenomenon in a patient suffering from a right fronto-temporal brain tumor. Subsequently, several observations have been reported in patients with major head injury and brain tumors [2–8]. We describe a case of Kernohan–Woltman notch phenomenon (KWNP) secondary to acute post-traumatic subdural hematoma, in which the damage of contralateral cerebral peduncle has been verified by post-operative cerebral magnetic resonance imaging (MRI).

2. Case report

On going down the staircase in her home, a 73-year-old woman slipped along steps and sustained a severe head injury, immediately followed by loss of consciousness. On first neurological examination in the emergency room, she appeared to be comatose, with a Glasgow Coma Scale (GCS) of 4/15. Pupils were anisochoric (left > right) and a decerebrating reaction with left limbs was observed. A severe motor deficit on right hemisoma was also present. Cerebral computed tomography (CT) scan urgently performed showed a large right hemispheric subdural hematoma and shift to the left of midline structures and ventricles (Fig. 1). A wide right craniotomy was performed and an about 2 cm thick subdural hematoma was evacuated. Intracranial pressure monitoring was obtained with a subdural device and the increase of values observed during the first days after operation were easily controlled with hyperventilation and osmotics. The level of conscious-

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ness gradually improved and anisochoria disappeared a few days after surgery, whereas the severity of right motor deficit remained unchanged. A MRI performed about 2 weeks after the operation (Fig. 2) showed a small roundish area in the left cerebral peduncle, hypointense on T1-weighted images and hyperintense on T2. On discharge, the woman was able to communicate with others with easy sentences and to understand commands, but her right motor deficit was still very severe.

3. Discussion

KWNP can be the cause of false localizing motor sign. The large right acute subdural hematoma observed in our patient produced an ipsilateral transtentorial uncus herniation and a compression of contralateral cerebral peduncle against the edge of the tentorium, with severe damage of the left corticospinal tract and a transient lesion of the Edinger–Westphal nucleus of the left third cranial nerve. The MRI performed 2 weeks after the operation confirmed this interpretation, revealing a small roundish area, hypointense on T1- and hyperintense on T2-weighted images, in correspondence of the left cerebral peduncle (Fig. 2). The poor quality of the urgent cerebral CT scan and the superiority of MRI in the detection of traumatic lesions [3,9,10], especially those of brain stem, may explain the lack of demonstration of this lesion on first CT scan.

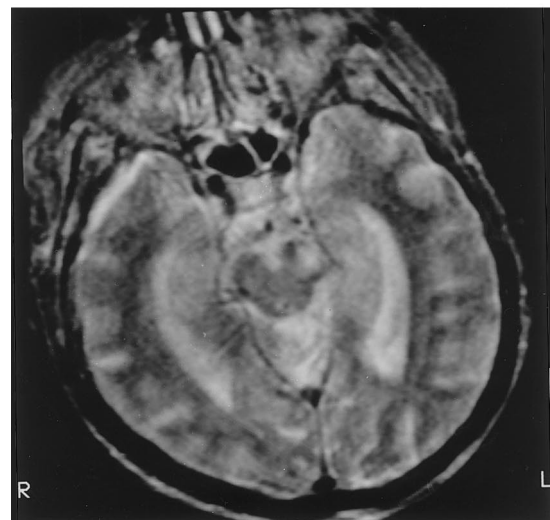
Cohen and Wilson [2] first described the MRI findings of KWNP in a young patient with left acute post-traumatic extradural hematoma. The cerebral



Fig. 1. CT scan urgently performed. Large right subdural hematoma and left shift of midline structures and ventricles.



(a)



(b)

Fig. 2. Post-operative cerebral MRI. Small roundish area, (a) hypointense on T1- and (b) hyperintense on T2-weighted images, in correspondence of the left cerebral peduncle.

MRI performed 1 week after operation showed a small roundish area of hyperintensity in the right cerebral peduncle in T2-weighted images. These findings are overlapping with those of our case and of other reports [4,6–8]. In the case described by Itoyama et al. [3], in which the KWNP was observed in a patient with chronic subdural hematoma, the pre-operative MRI showed a deformity of crus cerebri; the MRI performed 9 days after surgery revealed a marked reduction of deformity of the cerebral peduncle, with improvement of hemiparesis. Reich et al. [11] analyzed MRI images in the sagittal planes and correlated them with clinical changes in patients with transtentorial and foramen magnum brain herniation. In acute illnesses, MRI abnormalities anticipated or confirmed clinical signs of brain herniation, whereas in chronic cases, clinical and

MRI correlated less well: MRI evidence of herniation anticipated the clinical manifestations or identified patients with reversible clinical deficits (which would correlate with improvement of clinical findings) [11].

Therefore, the mass effect quickly produced by acute extradural or subdural hematomas can seldom produce severe and irreversible ischemic damage of contralateral cerebral peduncle, presumably caused by stretching and occlusion of small perforating arteries or by their compression at the site of the tentorial notch.

In accordance with Zafonte and Lee [8], little is known about the functional outcome of patients with post-traumatic KWNP. MRI confirmation of the clinical suspect adds useful prognostic information. Therefore, even if MRI cannot be considered a routine examination in major head trauma patients, it should be always performed in cases in which neurological signs are not clearly explained with the usual physiopathological mechanisms and cerebral CT scan.

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