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Case Report

Kernohan's notch syndrome in acute subdural hematoma: significance of coronal views of computed tomography scan imaging for emergent preoperative diagnosis

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ABSTRACT

Kernohan's notch has been well studied clinically and pathologically, although radiographic investigation has been rare. Here, we reported a case in which computed tomography scan imaging performed as an important tool for emergent preoperative diagnosis related to unusual neurological deficits appearance (Kernohan's notch syndrome) and evaluation of the treatment outcomes. Acute spontaneus subdural hematoma may rarely cause Kernohan Notch syndrome. The investigation of cerebral peduncles via emergent preoperative head computed tomography scan is useful and could provide an important contribution in preoperative diagnosis related to unusual neurological deficits appearance (Kernohan's notch syndrome) and evaluation of the treatment and outcome in such cases.

Keywords: Kernohan's notch syndrome, Spontaneous acute subdural hematoma, Computed tomography scan

INTRODUCTION

Kernohan's notch syndrome is defined as compression of the cerebral peduncle by the tentorial edge.[1] This may due to a contralateral supratentorial mass, which produces ipsilateral hemiparesis or hemiplegia. This phenomenon is usually reported secondary to advance-stage brain neoplasma or severe brain injury.[1] This syndrome describe initially by Kernohan and Woltman in 1929, they reported a case of ipsilateral hemiplegia accompanying expanding supratentorial brain tumor.[2,6] They demonstrated grooving of the cerebral peduncle on the side opposite to brain lesion.[2] Currently, computed tomography and magnetic resonance imaging have been used to show compression and anatomical injury of the cerebral peduncle contralateral to a supratentorial lesion.[3]

The magnetic resonance imaging was considerably more sophisticated to detect abnormal findings such as pathological lesions and transtentorial herniation in the brainstem. But, sometime magnetic resonance imaging studies are difficult to perform emergently, because this syndrome could happen in emergency case such as acute traumatic epidural hematomas or subdural hematomas, and in a rare case of spontaneous expanding subdural hematoma in this present case.[4] For such cases the computed tomography imaging with emphasized on coronal images study will be the important tools to definitively diagnose the Kernohan's notch syndrome as complication of an expanding supratentorial mass lesion.[1,5]

CASE REPORT

A 30-year-old female was consulted to our department with history of cesarean section surgery because of eclampsia on the previous day. She was fully alert at first admission in the hospital, but soon after cesarean section procedure she gradually became unconscious. The

neurological examination showed a Glasgow coma scale of 7 (E1V2M4) with unequal pupil dilatated on right side, showing no light reflex and hemiparesis at the same side. She was then immediately intubated and mannitol was given as well as phenytoin intravenously. Emergent head computed tomography scan demonstrated a dense lesion at the right cerebral hemisphere, which later diagnosed as a right spontaneous acute subdural hematoma with significance midline shift to the left side (Figure 1).

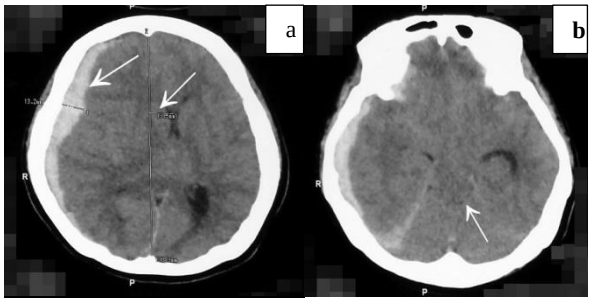

Figure 1: 30-year-old female with history of eclampsia and became unconscious was consulted to our department, and the radiological examination showed; (a) axial head computed tomography scan demonstrated an acute right hemispheric supratentorial subdural hematoma with marked mass effect to left side; (b) remarkable deviation of midline structures and effacement of the basal cisterns indicate a transtentorial herniation.

The clinical picture of hemiparesis ipsilateral to the supratentorial acute subdural hematoma was thought as a Kernohan's notch syndrome. For the purpose to diagnose the Kernohan's notch syndrome emergently, despite the routine axial view we emphasized to distinctly evaluate the coronal images of head computed tomography scan (Figure 2).

Figure 2: 30-year-old female with history of eclampsia and became unconscious was consulted to our department. Radiologic examination was performed in emergency setting. Coronal head computed tomography scan showed a narrow distance between left cerebral peduncle and tentorial edge on contralateral side to subdural hematoma. Abnormal hipodensity area on the left midbrain adjacent to tentorial hiatus showed compression of brainstem against the free edge of tentorium.

An emergent operation for evacuation of the right subdural hematoma was performed. After three days postoperatively in ICU, her coma scale (GCS) was gradually increased but hemiparesis still persist. Two weeks later the hemiparesis markedly improved and she can walk by herself. She was discharged home uneventful and routinely had a rehabilitation program in out-patient clinic.

DISCUSSION

Kernohan's notch is well known as a cause of a false localizing sign, and has been studied clinically and pathologically.[2,3] The Kernohan's notch syndrome is a rare but well described phenomenon which the cerebral peduncle opposite to the side of supratentorial mass lesion is forced against the edge of the tentorium, leading to hemiparesis ipsilateral to the side of the supratentorial mass. It was in 1929, Kernohan and Woltman first demonstrated compression of the cerebral peduncle against the free edge of the tentorium.[1-3] They studied the gross and microscopic appearance of 276 brains with tumor and showed 34 (12%) with various "degrees of notching" of the cerebral peduncle.[3] Also, they reported a case of patient with left supratentorial brain tumor with left hemiparesis.[3] At autopsy, they found compression of the right cerebral peduncle against the free edge of the tentorium.[3] Later, many investigators have reported more cases of this syndrome. The supratentorial pathology could be a neoplasma or a hematoma but most often is a hematoma.[2]

Nowadays, despite the clinical findings, modern imaging modalities such as computed tomography and magnetic resonance imaging have been used to studied the compression or anatomical damage of the cerebral peduncle contralateral to a supratentorial mass lesion, providing a radiological correlate to Kernohan's notch syndrome.[6]

Magnetic resonance imaging has been reported giving more sophisticated image compare with computed tomography scan for demonstrating a detail lesion in a difficult location, for example the Kernohan's notch. Several reports of Kernohan's notch syndrome were diagnosed by magnetic resonance imaging.[4,7]

Several study by Kernohan and Woltman in 1929 described that any supratentorial mass may produce a significant compression to the contralateral cerebral peduncles where anatomically is adjacent to the tentorial edge.[1] It has also been reported that the compression that caused injury of corticospinal tracts in the contralateral cerebral peduncles may cause the ipsilateral weakness, in the course of Kernohan's notch syndrome.[2] However, there is no comprehensive clinical trial which elaborate the incidence of Kernohan's notch syndrome. Furthermore, the number of Kernohan's notch syndrome case secondary to spontaneous subdural hematoma is limited.

The gold standard in diagnosing Kernohan's notch syndrome should be performed primarily by clinical evaluation. Although, presence of lateralization findings and the lesion at the same side and non-existence of another accompanying pathology that may lead to Kernohan's notch syndrome are efficient for diagnosis, it is very important to investigate the signal changes through the cerebral peduncles by radiological investigations.[1] In our case, the coronal views of computed tomography scan showed an abnormal density of the midbrain against the tentorium edge. This is definitely a compression against the tentorium edge, a pathology that significant to Kernohan's notch syndrome following the existing clinical findings in this case.

Moon et al have reported that the signal changes in magnetic resonance imaging through cerebral peduncles and recovery of neurological deficits occurring in the course of Kernohan's notch syndrome is significantly correlated.[8] Particular cases without any signal change showed a much faster and stronger recovery.[8] Itoyoma et al have evaluated the cerebral peduncles in case with acute spontaneous subdural hematoma pre- and post-operatively using magnetic resonance imaging and reported that hemiparesis of the patient recovered secondary to the improvement of the compression in the cerebral peduncles during the postoperative period.[6] Previously, most reported case of Kernohan's notch syndrome diagnosed using magnetic resonance imaging, and all the cases related with traumatic chronic subdural hematoma.[1,4,6,7] In our present case, we are dealing with acute case of spontaneous subdural hematoma with signs of herniation. Radiologic examination in emergency suit using coronal views of computed tomography scan imaging clearly demonstrated a compression of midbrain against tentorial edge.

CONCLUSION

Acute spontaneous subdural hematoma may rarely cause Kernohan notch syndrome. The investigation of cerebral peduncles via emergent preoperative head computed tomography scan is useful and could provide an important contribution in preoperative diagnosis related to unusual neurological deficits appearance (Kernohan's notch syndrome) and evaluation of the treatment and outcome in such cases.

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