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Pontine bleeding following drainage of subdural hematoma in craniospinal hypotension

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ABSTRACT

Craniospinal hypotension is the syndrome of orthostatic headache associated with low cerebrospinal fluid pressure. Imaging findings are usually explained by Monro-Kellie hypothesis stating that the craniospinal compartment is incompressible and any increase in volume of one of the craniospinal constituents (blood, cerebrospinal fluid, and parenchyma) must be compensated by a decrease in volume of another constituent or vice versa. We report a case of craniospinal hypotension in whom drainage of subdural hematoma upon clinical impairments resulted in pontine hemorrhage, supporting Monro-Kellie hypothesis.

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Introduction

Craniospinal hypotension (CSH) is the syndrome of low pressure headache associated with low cerebrospinal fluid (CSF) pressure (<60 mm H₂O) in the absence of a known dural puncture. In case of dural puncture, it is called iatrogenic CSH. It is an uncommon syndrome known as Schaltenbrand syndrome or spontaneous aliquorrhea [1]. The great majority of patients are in the fifth or sixth decade of life, and the mean age is the early

40s [2]. The classic clinical hallmark of CSH is a postural or orthostatic headache that is exacerbated by standing and is relieved in the recumbent position. Patients may also present with diplopia, tinnitus, vertigo, dizziness, stiff neck, nausea, vomiting, hyperacusis, deafness, and visual loss [1,3]. Imaging studies, especially magnetic resonance imaging (MRI), are helpful in confirming the diagnosis and ruling out other entities. Imaging findings can be normal or include caudal displacement of cerebrum below tentorium, diffuse intense pachymeningeal enhancement, dural sinus distention, subdural effusion or

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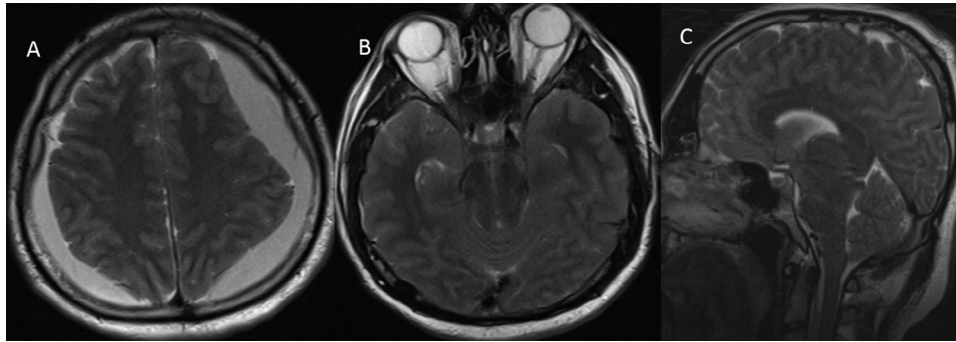


Fig. 1 – (A-C) Axial T2W (A) images show bilateral cerebral subdural effusion or hematoma. Axial (B) and sagittal (C) T2W images demonstrate cerebellar tonsils at the level of foramen magnum with inferior displacement of brainstem and obliteration of perimesencephalic and suprasellar cistern and increase in anterior-posterior diameter of mesencephalon due to compression.

hematomas, cerebellar tonsillar herniation, enlarged edematous pituitary gland, obliteration of suprasellar and perimesencephalic cistern, dural sinus thrombosis due to long standing dural sinus distention, and spinal epidural congestion [1,4,5]. Imaging findings are easily explained by Monro-Kellie hypothesis, which states that the craniospinal and its constituents (blood, CSF, and parenchyma) create a state of volume equilibrium, such that any decrease in volume of one of the cranial constituents must be compensated by an increase in volume of another constituent or vice versa [6]. We are reporting a case of iatrogenic CSH in whom drainage of subdural hematoma upon clinical impairments before treatment of spinal leakage resulted in pontine hemorrhage, supporting Monro-Kellie hypothesis.

Case report

A 37-year-old man was admitted to our hospital with complaints of headache for 3 weeks, dizziness, and loss of orientation in short periods of time with no history of head trauma. His headache was aggravated by standing. He was hospitalized with a diagnosis of CSH. Cranial MRI revealed bilateral subdural effusions (Fig. 1). After a few days, his clinical situation became worse and his Glasgow Coma Scale score decreased. Follow-up brain MRI demonstrated increased subdural hematoma with fluid layering showing ongoing bleeding (Fig. 2). Because of decreasing Glasgow Coma Scale score and increasing subdural effusion, subdural hematomas were evacuated bilaterally with parietal approach, and hemorrhagic fluid was aspirated via burr hole. In postoperative period within 12 hours, the patient was confused and a newly developed left hemiparesis was added to his clinical situation. Diffusion MRI and unenhanced cranial computed tomography scan were performed. There was pontine hemorrhage (Fig. 3). Routine cervical and thoracic spinal MRI was performed. Epidural congestion was noted (Fig. 4). MR cisternography was performed through L4-L5 interspinous space. The contrast material was injected into subarachnoid distance after observing CSF flow coming out of the needle. The opening CSF pressure was low (50 mm H₂O). MR cisternography demonstrated intense epidural contrast extravasation from subarachnoid

space throughout cervical and upper thoracic level (from C3 to T8) (Fig. 5). Epidural leakage was probably secondary to dural tear. On pre- and postinjection MRI, there was no epidural congestion nor subdural or epidural contrast extravasation in lumbal region that was the contrast injection site for MR cisternography. Epidural blood patch was performed 3 times. At the end of the 3 sessions, significant improvement of the patient's clinical situation with resolution of spinal epidural leakage and reduction in brain subdural effusions was noted.

Discussion

CSH is an underrecognized cause of headache, resulting from persistent CSF leak. Diagnosis hinges on the history of orthostatic headache, low CSF opening pressure, and characteristic

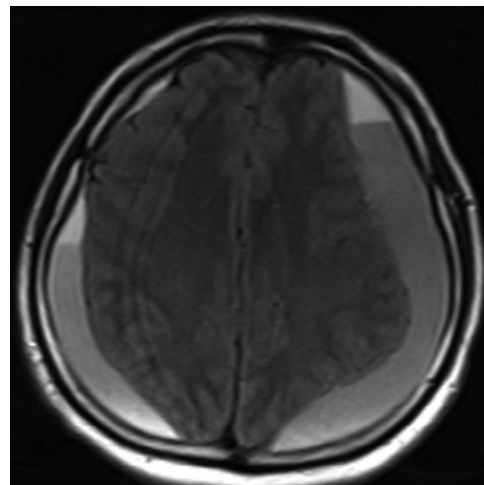


Fig. 2 – On control cranial MRI performed in a few days because of clinical worsening and decrease in Glasgow Coma Scale, axial T2W images show an increase in subdural hematomas with fluid-fluid levels due to ongoing bleeding. Subdural hematoma was drained to relieve pressure on brainstem.

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