

Subdural Effusions in the Posterior Fossa Associated with Spontaneous Intracranial Hypotension

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ABSTRACT: Background: Misdiagnosis of spontaneous intracranial hypotension remains a problem, despite increasing recognition. **Methods:** Three patients with spontaneous intracranial hypotension presented with typical findings on lumbar puncture, magnetic resonance (MR) imaging, and radioisotope cisternography. All patients showed subdural effusions in the posterior fossa on axial T2-weighted MR imaging. Axial MR images of 112 patients with other conditions were also screened for this finding. **Results:** One of three patients had typical orthostatic headache, and the other two had continuous headache. The finding of subdural effusions in the posterior fossa on axial T2-weighted MR imaging disappeared after treatment. Similar findings were found in 14 of 112 patients with other conditions. Most of the patients were over 60 years old or had dementia or previous radiation therapy. **Conclusions:** Subdural effusions in the posterior fossa can be identified by T2-weighted axial MR imaging, and are useful for the diagnosis of spontaneous intracranial hypotension and for verifying the effectiveness of treatment.

RÉSUMÉ: Épanchements sous-duraux de la fosse cérébrale postérieure associés à l'hypotension intracrânienne spontanée. **Contexte:** Bien que l'hypotension intra-crânienne spontanée soit diagnostiquée correctement de plus en plus fréquemment, cette pathologie est demeurée souvent mal diagnostiquée. **Méthodes:** Chez trois patients atteints d'hypotension intracrânienne spontanée la ponction lombaire, l'imagerie par résonance magnétique (IRM) et la cisternographie radio-isotopique montraient des signes typique de cette pathologie. Tous les patients avaient un épanchement dans la fosse cérébrale postérieure à l'IRM axiale pondérée en T2. L'IRM axiale de 112 patients atteints d'autres pathologies a également été examinée à cet effet. **Résultats:** Un des trois patients atteints d'hypotension intracrânienne spontanée avait une céphalée orthostatique typique et les deux autres avaient une céphalée continue. Les signes d'épanchement sous-dural de la fosse cérébrale postérieure à l'IRM axiale pondérée en T2 sont disparus sous traitement. 14 des 112 patients témoins présentaient des signes de cette pathologie à l'IRM. La plupart avaient plus de 60 ans, étaient atteints de démence ou avaient été traités par radiothérapie. **Conclusions:** Les épanchements sous-duraux de la fosse cérébrale postérieure peuvent être identifiés par l'IRM axiale pondérée en T2, un examen utile pour le diagnostic de l'hypotension intracrânienne spontanée ainsi que pour vérifier l'efficacité du traitement.

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Intracranial hypotension is characterized by diffuse gadolinium enhancement of the dura on magnetic resonance imaging (MRI).¹ Awareness of the significance of dural enhancement has led to increased recognition of spontaneous intracranial hypotension.² However, failure to diagnose this condition is still a problem and may have serious consequences.^{3,4} The clinical manifestations are varied^{2,3,5} and the diagnosis of spontaneous intracranial hypotension may not be obvious in patients with headache.

We treated three patients with spontaneous intracranial hypotension, two of whom were referred to our hospital with incorrect diagnoses. All three patients had subdural fluid

collections in the posterior fossa on T2-weighted MRI. To assess the specificity of this finding, we screened the MR scans of a large group of patients with other conditions.

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MATERIALS AND METHODS

Patient 1

A 43-year-old man was referred to our clinical practice with a diagnosis of subarachnoid hemorrhage. He complained of continuous fluctuating headache. Magnetic resonance (MR) imaging demonstrated pachymeningeal enhancement, tonsillar herniation, supratentorial subdural effusion (Figure 1 A, B), and subdural effusion in the posterior fossa (Figure 2 A). Radioisotope cisternography showed rapid transit of tracer to the kidneys and bladder, and cerebrospinal fluid (CSF) leakage in the lumbar region. Conservative therapy was instituted but the headache did not improve. An autologous epidural blood patch (EBP) was performed in the lumbar region and his headache resolved within a couple of days. The abnormal MR imaging findings also disappeared, including the subdural fluid collection in the posterior fossa (Figure 1 C, D, Figure 2 B).

Patient 2

A 63-year-old woman was referred to our hospital with a diagnosis of chronic subdural hematoma. She complained of

blurred vision, headache, and dizziness. Her headache was not orthostatic. Magnetic resonance imaging demonstrated bilateral supratentorial subdural fluid collections with diffuse pachymeningeal enhancement, descent of the brain, and subdural fluid collection in the posterior fossa. Radioisotope cisternography revealed rapid excretion of tracer into the urine, and CSF leakage in the lumbar region. She was diagnosed with spontaneous intracranial hypotension and conservative treatment did not reduce her symptoms. An autologous EBP was performed in the lumbar region and her headache and blurred vision resolved. The MR imaging taken one month after the treatment demonstrated the disappearance of the findings of intracranial hypotension, including the subdural fluid collection in the posterior fossa.

Patient 3

A 34-year-old woman was referred to our hospital with a diagnosis of intracranial hypotension. She complained of orthostatic headache. The MR imaging demonstrated typical findings of intracranial hypotension, and subdural fluid collection in the posterior fossa. Radioisotope cisternography

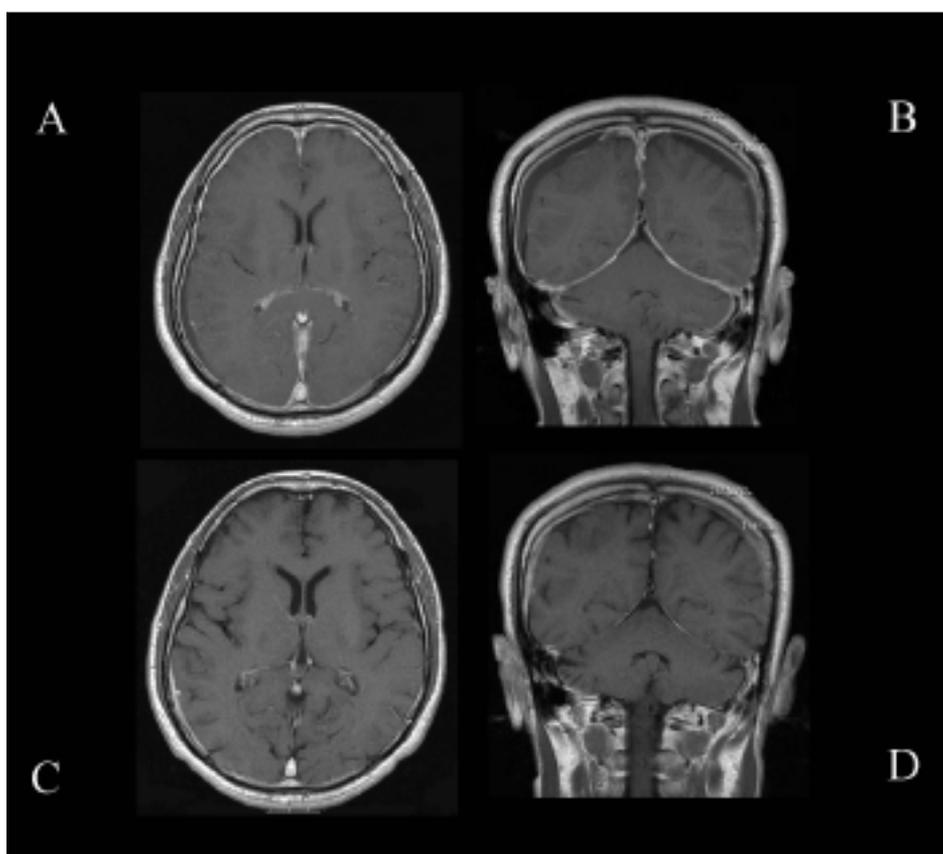


Figure 1: Axial (A) and coronal (B) post-gadolinium enhancement T1-weighted (repetition time/echo time[TR/TE]=560/12 ms) magnetic resonance images from Patient 1. Pretreatment images (A, B) demonstrating pachymeningeal enhancement and supratentorial subdural effusions. Post-treatment images (C, D) demonstrated resolution of these findings.

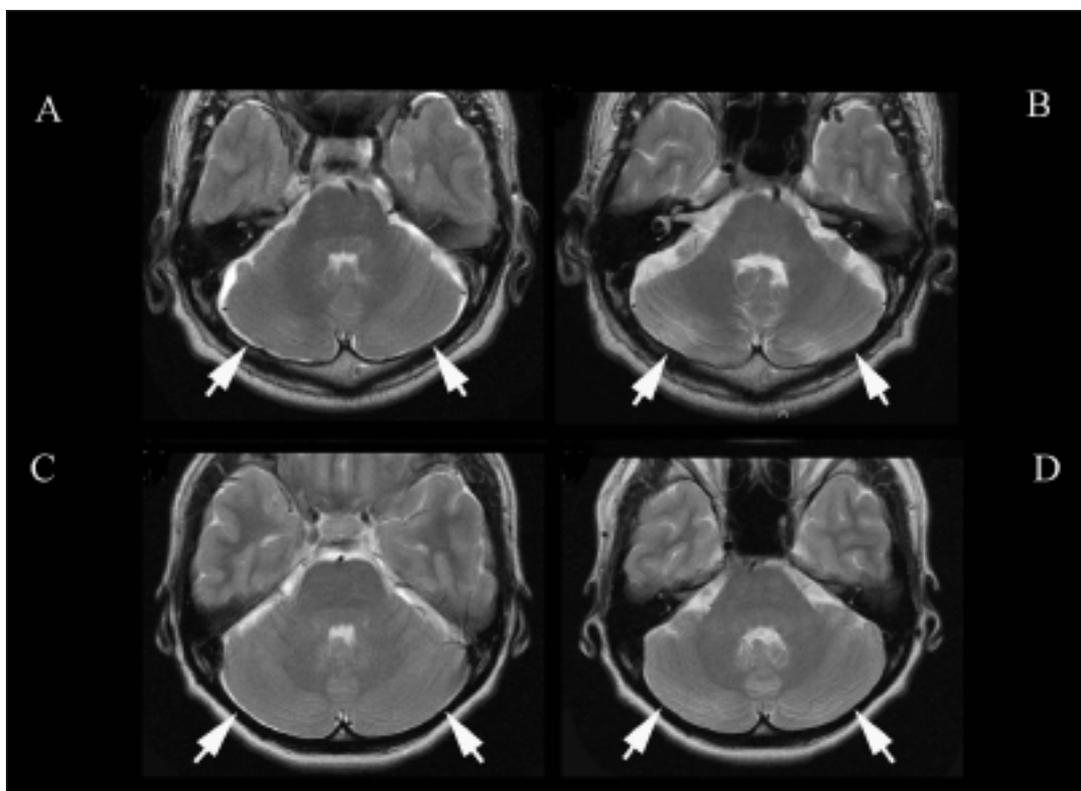


Figure 2: Axial T2-weighted (TR/TE=3500/104) magnetic resonance images without enhancement demonstrating subdural fluid collections (arrows) in the posterior fossa (A,C) which disappeared after treatment (B, D).

showed rapid transit of tracer to the kidneys and bladder and CSF leakage in the lumbar region. Conservative treatment was ineffective. Autologous EBP was performed in the lumbar region and her headache disappeared. Magnetic resonance imaging taken one month after EBP demonstrated the disappearance of the subdural fluid collection in the posterior fossa and as well as other findings of intracranial hypotension (Figure 2 C, D).

General Patient Population

Magnetic resonance images of 112 consecutive patients with conditions other than intracranial hypotension who were admitted or visited our institutes from January 31, 2004 to February 25, 2004, were reviewed. Patients whose ages were less than 14 years or with lesions in the posterior fossa were excluded. Axial T2-weighted MR imaging of 90 patients, 50 men and 40 women, aged from 17 to 96 years (mean 57.1 years), were screened for subdural effusions in the posterior fossa, which was defined as bilateral linear high intensity rims around the cerebellar convexity. Reasons for undergoing MR imaging in this population were: brain tumor in 29, cerebral infarction in 13, check up for headache or vertigo in 24, unruptured cerebral aneurysm in 8, nasal tumor or sinusitis in 3, Parkinsons disease, brain contusion, arteriovenous malformation (AVM) in 2 each

and moyamoya disease, intracranial hemorrhage, epilepsy, leukoencephalopathy syndrome, dementia, idiopathic diabetes insipidus, and ACTH insufficiency in 1 each.

RESULTS

All three patients with spontaneous intracranial hypotension showed the finding of subdural effusion in the posterior fossa on axial T2-weighted MR imaging. These findings disappeared after treatment with resolution of the symptoms.

Subdural effusion in the posterior fossa was also found in 14 patients, 10 men and 4 women aged 45 to 96 years (mean 67.4 years), with various conditions summarized in the Table. Four of the 14 patients had received radiation therapy, including the youngest patient at 45-years old. There were only two other patients under the age of 62 years, including one patient with dementia.

DISCUSSION

Brain MR imaging of patients with spontaneous intracranial hypotension usually demonstrates diffuse pachymeningeal enhancement without leptomeningeal involvement, descent of the cerebellar tonsils, reduced size of the prepontine and

Table: Conditions associated with subdural fluid collection in the posterior fossa

Case No	Age	Sex	Conditions
1	63	m	Negative study of suspected infarction
2	64	m	Negative study of suspected aneurysm
3	65	f	Nasal neuroblastoma
4	74	f	Pituitary tumor
5	55	m	Transient ischemic attack
6	63	m	Metastatic brain tumor (post-radiation state)
7	45	m	Glioma (post-radiation state)
8	68	m	Spinocerebellar degeneration
9	59	f	Dementia
10	82	m	Metastatic brain tumor (post-radiation state)
11	72	m	Cerebral infarction
12	96	m	Paranasal tumor
13	62	f	Lymphoma of brain (post-radiation state)
14	76	m	Cerebral infarction

perichiasmatic cisterns, inferior displacement of the optic chiasm, crowding of the posterior fossa, pituitary enlargement, and engorged cerebral venous sinuses.^{2,6-8} Subdural fluid collections may be present bilaterally or unilaterally, and are often (but not always) thin, measuring only 2-7 mm in maximum thickness without compression or effacement of the underlying sulci. Decreased size of the ventricles is often subtle, and noted only in retrospect when post- and pre-recovery MR images are compared.

Most MRI signs of intracranial hypotension require gadolinium enhancement or sagittal imaging. On the other hand, our experience with three patients with spontaneous intracranial hypotension suggests that axial T2-weighted MRI may show subtle posterior fossa subdural effusions, which resolve after treatment. We also identified this finding in 13% of patients with other conditions but most of these patients either had previous radiation therapy or dementia or were over 60-years old. Our results suggest that, in the appropriate clinical context, detection of posterior fossa subdural effusions provides support for the diagnosis of spontaneous intracranial hypotension, and resolution of the effusions on MRI is useful for verifying the effectiveness of treatment.

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