CASE REPORT

An overlooked cause of subdural effusions

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Accepted 20 July 2017

SUMMARY

A middle-aged man presented with progressive confusion. Initial brain CT was misinterpreted to have 'cerebral atrophy and bilateral subdural effusions' by the emergency physician, and the patient was admitted to a medical ward for further investigation. Two days later, the patient experienced acute neurological deterioration, and burr hole drainage was performed to relieve the effusions. It was later confirmed that the effusions were caused by intracranial hypotension secondary to spinal cerebrospinal fluid leakage. The patient improved on conservative treatment with no lasting neurological sequela.

BACKGROUND

Intracranial hypotension is an uncommon disorder characterised by reduced intracranial pressure. We report a case presenting with bilateral subdural effusions where initial diagnosis was delayed due to lack of awareness of the condition and misinterpretation of the brain CT scan.

CASE PRESENTATION

A 46-year-old man presented to the emergency department for progressive and fluctuating courses of confusion of 1 month's duration. His past health was unremarkable. He denied history of head injury. He has no fever nor other symptoms and signs suggestive of central nervous system infection.

Physical examination showed that the patient was disorientated to time and place. Both pupils measured 3 mm in size and were reactive to light. Power was full and symmetrical and no long tract sign was elicited.

INVESTIGATIONS

Brain CT (figure 1) was performed and passed as unremarkable apart from 'cerebral atrophy and bilateral subdural effusions' by the emergency physician. No radiology report was issued as the scan was performed in after-hours, a rather common practice in our locality. The patient was admitted to a medical ward for further investigation.

Two days after admission, the patient's level of consciousness deteriorated. He was only able to open his eyes to pain and uttered inappropriate words. Bilateral brisk jerks and upgoing plantars were noted. Both pupils became dilated to 5 mm in size with sluggish reactions to light. Urgent neurosurgical opinion was sought, and emergency bilateral burr hole drainage was performed to relieve the subdural effusions.

Retrospective review of the brain CT scan showed that the bilateral subdural effusions had disproportionate mass effect on the brain parenchyma,

leading to sulcal effacement and obliteration of the basal cisterns. The brain assumed a 'sagging' appearance. The possibility of subdural effusions secondary to intracranial hypotension was raised.

Further investigations were performed. On lumbar puncture, the opening pressure was low, measuring 6 cm H₂O (10–20 cm H₂O). Magnetic resonance examination of the spine was obtained, which showed extradural pooling of cerebrospinal fluid (CSF) in the lower cervical and anterior aspect of the upper thoracic spinal canal, with extension to the T1 nerve root (figure 2). The diagnosis of intracranial hypotension due to spinal CSF leakage was made.

DIFFERENTIAL DIAGNOSIS

Differential diagnoses of bilateral subdural effusions include previous central nervous system infection, previous traumatic arachnoid tear or subdural haematoma, CSF overshunting and intracranial hypotension. In infants, external hydrocephalus has to be considered.

Differential diagnoses of spinal CSF leakage include previous trauma, surgery, lumbar puncture, degenerative dural tears, dehiscence of perineural cysts, primary dural defects and connective tissue disorders including Marfan and Ehler-Danlos syndromes.

OUTCOME AND FOLLOW-UP

The patient was treated conservatively with bed rest with good neurological improvement. On 1-year follow-up, he had no lasting neurological deficit, and interval imaging confirmed resolution of the subdural effusions.

DISCUSSION

Brain CT scans are increasingly used at the emergency department and inpatients for investigation of neurological complaints. An immediate radiologist report is not available in our locality, and clinicians are required to interpret the images on their own. The accuracy of interpretation has been the subject of various studies. A moderate degree of discordance (12.9%–14.8%) in reading was consistently reported. Among these discrepancies, a sizeable proportion (41%) was of significant though not immediate clinical consequence. Most of the discordant findings reported were related to trauma, stroke and tumours. Intracranial hypotension was not included probably because of its rarity.^{1–3}

The external validity of these studies is questionable as the clinicians participating often possessed specialist qualification and may not reflect the actual

To cite: Li Y-L, Tsang CS. *BMJ Case Rep* Published Online First: [please include Day Month Year]. doi:10.1136/bcr-2017-221098

Figure 1 Non-enhanced brain CT on axial plane shows a 1 cm hypodense subdural collection over bifrontal convexities, associated with sulcal effacement, obliteration of basal cisterns and 'sagging' appearance of the brain.

performance of an emergency department staffed predominantly by trainees. In our locality, many radiology departments have ceased to report brain CT scans due to manpower constraint unless a request was made by the clinical team. In these instances, any missed abnormality could only be picked up when the patient reattends or the scan is subsequently reviewed by other clinicians (eg, neurosurgeons and neurologists). Adverse clinical outcome and medicolegal consequences could ensue. Potential remedies to the current state of practice include improving training for emergency physicians and a more accessible radiology service. Next-day reporting by an experienced radiologist is a practical solution.

Intracranial hypotension is an uncommon entity with estimated incidence of 5 in 100 000.⁴ It is caused by CSF leakage in the spine, leading to low CSF pressure and downward displacement (ie, sagging) of the brain. Sagging of the brain can lead to shearing of cerebral veins and meningeal vessels resulting in subdural haematomas and effusions. Subdural fluid collections are not uncommon in intracranial hypotension and may be present in up to half of the affected patients. 60% of the subdural fluid collections are effusions, while 40% are subacute to chronic haematomata. Most of these resolve spontaneously after treatment of the primary cause.⁵

Classically, patients present with postural headache that improves on bed rest. Unusually, patients can present with dramatic neurological symptoms similar to 'coning', when the brain is compressed against bony structures during its downward

displacement. Diagnosis can be suspected on clinical grounds or picked up on neuroimaging. Myelography, cisternography, MRI and lumbar puncture can add further weight to the diagnosis. Spinal CSF leaks can resolve spontaneously or could be sealed with epidural blood patch.^{6,7}

Surgical evacuation for subdural fluid collections prior to recognition of intracranial hypotension is not uncommon. In a study, up to 8% of patients presented in such manner.⁵ In our case, the initial misdiagnoses of cerebral atrophy and resultant subdural space dilatation could be avoided with improved awareness on the condition and better proficiency in interpretation of brain CT scans. Radiologically, distinguishing cerebral atrophy and subdural collections in intracranial hypotension is feasible. In cerebral atrophy, there is compensatory dilatation of the ventricles and opening of the cerebral sulci and basal cisterns, leading to increased CSF spaces in both convexities. In our case, the ventricles and basal cisterns were obliterated and cerebral sulci were effaced by the compressive effect of the subdural collections and the negative CSF pressure. The diagnosis of bilateral subdural effusions with mass effect should be evident.

Another useful sign to differentiate between cerebral atrophy and subdural effusions is the 'cortical vein sign'; that is, if cortical veins were visualised within the CSF fluid collection, the diagnosis of cerebral atrophy is favoured over subdural effusions.⁸

Our case highlights the importance of proficiency in interpreting neuroimaging for clinicians and the importance of timely radiological expertise in order to achieve satisfactory patient outcomes.

Figure 2 T2-weighted MRIs of the spine on axial and sagittal acquisitions show extradural pooling of cerebrospinal fluid at C6–7 and T1 levels with extension to the right T1 nerve root, suggestive of leakage.

Learning points

- ▶ Significant misses are common in non-radiologist interpretation of brain CT scans. Improving training for clinicians and expanding radiology coverage are potential remedies.
- ▶ Subdural effusions can indicate significant underlying secondary pathology such as intracranial hypotension.
- ▶ The clinical presentation of intracranial hypotension can range from postural headache to significant neurological deficits.
- ▶ Spinal CSF leaks are the most common cause of intracranial hypotension and can resolve spontaneously or require sealing by an epidural blood patch.

Contributors Both Y-LL and CST were involved in preparing the manuscript and caring for the patient.

Competing interests None declared.

Patient consent Obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

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