Lumbar puncture in subarachnoid haemorrhage: a necessary evil?

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INTRODUCTION

Aneurysmal subarachnoid haemorrhage carries a poor prognosis. The mortality rate in the first 2 days is 28%, with most deaths occurring as a result of the initial bleed and with outcome proportional to the amount of blood released. Patients who survive the primary event remain at risk of further deterioration and death, with 45% of all cases dead by 30 days (Broderick et al, 1994).

CASE REPORT 1

A 70-year-old lady was admitted following the sudden onset of a severe, throbbing headache 7 days previously. The headache was occipital in location, with radiation to the back of the neck and both shoulders. The patient had vomited twice at the onset of the pain but, although initially severe, the headache had gradually resolved without further complication. The patient had a history of hypertension, controlled on bendrofluazide 2.5 mg once daily. A mastectomy had been performed in 1992 for carcinoma of the breast.

Clinical examination revealed a sinus tachycardia 120 beats per minute and systolic hypertension 170/80 mmHg. Examination was otherwise unremarkable. Investigations included a normal full blood count, liver function tests, bone profile, random glucose, and electrocardiogram. Computed tomography scan of the head was normal. The only abnormality was the finding of a low sodium 132 mmol/litre, attributed to the diuretic, and serum electrolytes were otherwise unremarkable. The patient was discharged as she was asymptomatic and the sinus tachycardia had settled.

Unfortunately, the patient was re-admitted the following day complaining of numbness on the right side of the face, together with low back pain. Clinical examination revealed mild cerebellar ataxia. A lumbar puncture was performed with the isolated finding of xanthochromia. A cell count was not performed on the cerebrospinal fluid (CSF). Subsequent cerebral angiography documented a right posterior communicating artery aneurysm, which was clipped 3 days later. The patient was discharged 10 days later with no neurological deficit.

CASE REPORT 2

A 37-year-old lady was admitted following the sudden onset of a severe occipital headache 5 days previously. The headache had failed to resolve on simple analgesics. She had vomited twice and had developed mild photophobia. There were no apparent precipitants for the pain and there was no other relevant history.

Clinical examination was unremarkable, except for the finding of mild neck stiffness and photophobia. The patient had an elevated white cell count (14.9 x 10^9/litre) but full blood count, serum electrolytes and glucose were otherwise normal. The initial report of the computed tomography scan of the head was normal, although a later review raised the possibility of hydrocephalus.

A lumbar puncture was performed with the finding of xanthochromia, CSF red blood cells 25 000 and CSF white cell count 200 (90% polymorphs). No organisms were seen. CSF opening pressure was 12 cm. The patient was transferred to the tertiary centre and she underwent cerebral angiography which documented a left posterior cerebral artery aneurysm. This was embolized at surgery 5 days later. Postoperative recovery was complicated by communicating hydrocephalus with a CSF pressure of 40 cm, which responded well to lumbar puncture. The patient was discharged 10 days later with no neurological deficit.

The major cause of death in patients who survive aneurysm rupture is recurrent haemorrhage (Kassell and Drake, 1982). Early diagnosis is important to ensure appropriate surgical treatment to reduce the risk of rebleeding. It is common for patients to undergo computed tomography (CT) as the first diagnostic investigation.

However, CT does not detect all cases of subarachnoid haemorrhage and recent guidelines of the Society of British Neurological Surgeons have re-emphasized the importance of lumbar puncture in suspected cases with normal scans. We describe three patients who were admitted over a 7-day period to a district general hospital on general medical take to illustrate the diagnostic utility of lumbar puncture.

DISCUSSION

Subarachnoid haemorrhage should be suspected in all cases of severe headache of sudden onset. CT scanning of the head is the first diagnostic study in the evaluation of such a patient. If the CT scan is normal, a lumbar puncture should be performed when the history is suggestive of subarachnoid haemorrhage.

Clinical presentation may be non-specific, with no evidence of headache or meningeal signs in up to 10% patients with subarachnoid haemorrhage (Adams et al, 1983). Patients in whom the diagnosis is most likely to be missed are those who present to an

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CASE REPORT 3

A 31-year-old lady was admitted following the sudden onset of headache 4 hours before admission. The headache was generalized, sharp in nature and associated with two episodes of vomiting. There was no neck stiffness and no photophobia. There were no other relevant features on the history.

Clinical examination revealed a stable pulse rate of 72 beats per minute, blood pressure 130/76 mmHg and mild neck stiffness but no other focal deficit. The patient had an elevated white cell count (16.4 x 10^9/litre) but full blood count, serum electrolytes, and glucose were otherwise normal. Computed tomography scan of the head was normal. Lumbar puncture was performed, with the finding of 101 000 red cells, 125 white cells (60% polymorphonuclear leucocytes; 40% lymphocytes) but no xanthochromia. The patient was transferred to the tertiary neurosurgical centre, where she underwent cerebral angiography. This documented an aneurysm arising from the left internal carotid artery, with a proximal daughter aneurysm. These were clipped at surgery and the patient was discharged 10 days later with no neurological deficit.

ambulatory care facility in a good clinical condition, yet these patients stand to gain most from intervention (diPierro et al, 1996).

Sensitivity of CT scanning in subarachnoid haemorrhage is related to the interval from the onset of symptoms to the time of the investigation. However, a scan may still be negative early in the course of a haemorrhage. In a prospective study of 1 412 patients, CT scans were normal when performed within 24 hours in 4.7% patients who were subsequently found to have subarachnoid haemorrhage. This sensitivity decreased with time, such that evidence of haemorrhage was absent in 26.2% scans performed 3 days after the event (Adams et al, 1983).

The accuracy of CT is also related to the patients' condition on admission, since a false negative result is more likely when patients have normal orientation. Despite improvements in scanning technology since 1983, timing remains an important element in the diagnostic accuracy of CT.

In a prospective series of 181 patients with suspected subarachnoid haemorrhage, sensitivity of CT fell from 93.1% if performed within 12 hours of onset of symptoms to 83.8% if performed after 12 hours (Sames et al, 1996). Even if performed within 12 hours in patients with sudden onset headache and normal neurological examination, CT may be normal in the presence of subarachnoid haemorrhage in 2% of cases (van der Wee et al, 1995).

Sensitivity of CT is partly related to the quantity of blood present in the subarachnoid space and falls because of clearance of the extravasated blood. Hence, the CT scans were normal in the first two cases reported, presumably because of the delay between the onset of symptoms and the time of the scan. Even though CT is more likely to miss smaller bleeds in patients who are otherwise well, confirmation of the diagnosis with lumbar puncture is vital since treatment of the aneurysm will reduce the risk of rebleeding.

Lumbar puncture should be performed when CT is normal and where there is sufficient clinical suspicion of subarachnoid haemorrhage. Lumbar puncture is therefore necessary but is it an 'evil'? The most serious complication of lumbar puncture is the possibility of aggravating a pre-existing brain herniation syndrome, associated with intracranial hypertension. This hazard is the reason for considering papilloedema to be a contraindication to the procedure. However, the risk of neurological deterioration in the absence of papilloedema may be small.

In a retrospective review, 91 patients with documented subarachnoid haemorrhage underwent lumbar puncture without adverse effect (Patel and Clarke, 1986). In this series, lumbar puncture was not performed in the presence of a focal neurological deficit, impaired consciousness, or papilloedema, and where CT had excluded those with mass lesions, hydrocephalus and evidence of raised intracranial pressure. Risks are increased where patients undergo lumbar puncture in the presence of impaired consciousness, as occurred to 7 patients in another series of 55 cases of subarachnoid haemorrhage (Duffy, 1982).

The timing of the lumbar puncture is also important. Whereas the sensitivity of CT in the diagnosis of subarachnoid haemorrhage is greatest in the first 12 hours, lumbar puncture should probably be delayed until 12 hours have passed. Xanthochromia may be present from 6 hours after the onset of symptoms, but is always present from 12 hours up to 2 weeks (Vermuelen and van Gijn, 1990). Hence, in the third case, xanthochromia was absent as the procedure was performed within 6 hours of the onset of symptoms and the patient was referred on the basis of the high red cell content. **HM**

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