Perimesencephalic non-aneurysmal subarachnoid haemorrhage (PNSAH)
Published on 16.05.2019

ISSN: 1563-4086
Section: Neuroradiology
Area of Interest: Neuroradiology brain Vascular Case
Type: Clinical Cases
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Patient: 55 years, male

Clinical History:
A 55-year-old man with no prior medical history presented to the emergency department with sudden onset of severe headache at the occipital region, which he described as ‘the worst headache he had ever had’. On arrival, the vital signs were all within normal limits and clinical examinations revealed no neurological deficit.

Imaging Findings:
Plain Computed Tomography (CT) was performed on the same day which showed acute subarachnoid haemorrhage (SAH) at the prepontine and perimesencephalic cisterns with no extension to the suprasellar cistern or Sylvian fissures (Fig. 1). In view of the concern of possible aneurysmal bleed, cerebral Digital Subtraction Angiography (DSA) was performed subsequently which revealed no intracranial aneurysm or vascular anomaly.

He was then admitted to the neurosurgical ward for observation and supportive treatment. Cervical and brain Magnetic Resonance Imaging (MRI) was done during the same admission which could not identify any cause to explain the SAH. He was then discharged 5 days later after repeated brain CT that showed resolved SAH (Fig. 2).

On follow-up, the patient was asymptomatic with no neurological deficit. DSA cerebral was repeated 4 months after his discharge which showed no abnormality.

Discussion:
Background
PNSAH is a rare condition with annual incidence of 0.5 per 100,000 persons over 18 years of age. It is a unique subset of SAH which was first reported by van Gijn et al. in the year 1985. They described a series of patients who had SAH confined to the cisterns surrounding the midbrain and pons and normal angiograms. [1] Since then, many studies had been done attempting to identify the cause for PNSAH - which is likely venous in origin, but the exact aetiology is still unknown to date.

A number of studies proposed a link between abnormal drainage of the basal veins of Rosenthal and PNSAH. [2, 3, 4] Basal veins of Rosenthal are paired paramedian veins which are formed primarily by the union of anterior cerebral veins and deep middle cerebral veins. The veins are formed at the medial surface of the temporal lobe, course posteriorly lateral to the midbrain through the ambient cisterns and drain into the vein of Galen normally. (Fig. 3) However, in some individuals, the basal veins of Rosenthal drain directly into the dural venous sinuses. The direct communication with the venous sinuses may predispose the basal veins to sudden increase in venous pressure, causing engorgement and rupture. [2,4]
Clinical Perspective & Imaging Perspective

Patients usually present with sudden headache, meningism and vomiting which are similar to patients with aneurysmal bleed. CT or MRI, if performed within the first 3 days of presentation, will typically show SAH confined anterior to the midbrain or pons and may sometimes involve the interpeduncular, ambient and quadrigeminal cisterns. Redistribution of the bleed to other cisterns may occur if the imaging is performed late. [5] Despite its classical SAH pattern, CT angiogram or cerebral DSA is still mandatory in the management of these patients in order to rule out aneurysmal bleed which requires further neurosurgical or endovascular intervention.

Outcome

Treatment of PNSAH is usually supportive with bed rest and analgesics. In addition to that, antifibrinolytics, antihypertensive drugs are sometimes recommended in certain groups of patients. It usually has a benign course of events and has a very good prognosis as shown in our patient. [6]

Take Home Message/Teaching Points

PNSAH is a rare condition with very good prognosis and clinical outcomes. It is important for the clinician and radiologist to be aware of this condition and its characteristic imaging findings, so that prompt diagnosis can be made.

Written informed patient consent for publication has been obtained.

Differential Diagnosis List: Perimesencephalic non-aneurysmal subarachnoid haemorrhage, Aneurysmal subarachnoid haemorrhage, Traumatic subarachnoid haemorrhage

Final Diagnosis: Perimesencephalic non-aneurysmal subarachnoid haemorrhage

References:

Description: CT and MRI T2 FLAIR sequence show subarachnoid haemorrhage confined to prepontine cistern (red arrow). Origin: Department of Radiology, Sarawak General Hospital, Malaysia, 2017
Figure 2

**Description:** CT brain 5 days later shows resolution of the prepontine subarachnoid haemorrhage without surgical intervention (red arrow). **Origin:** Department of Radiology Sarawak General Hospital, Malaysia, 2017
**Description:** Image of the inferior aspect of the brain shows basal vein of Rosenthal (short straight arrow) formed primarily by union of anterior medial vein (dotted arrow) and deep middle cerebral vein (curved arrow). The basal vein of Rosenthal will drain into vein of Galen (long straight arrow). **Origin:** Netter’s Atlas of Human Anatomy, Sixth Edition