Intracranial Aneurysm and Arachnoid Cyst

By Harpreet Singh, MD [2]

Case history: A 90-year-old patient with history of headache for one month. NCCT scan was performed.
**Figures 1 - 3:** Two rounded hyperdense lesions located extraxially measuring 20 mm and 10 mm near anterior cerebral artery origin and ACOM.
Figures 4, 5 and 6: A fluid density cystic extra axial lesion measuring 5.8 x 2.0 cms in frontal region right sides/o arachnoid cyst.
**Diagnosis:** Arachnoid cyst right front region, with possibility of unruptered aneurysm at origin of ACA and ACOM

**Discussion:** Intracranial aneurysms and arachnoid cysts are cerebral disorders of a high prevalence. However, association between both malformations is a rare finding that can present with signs and symptoms related to aneurysm rupture, or with mass effect and seizures related to the cyst. The aneurysmal hemorrhage may be atypical, since it can be into the subarachnoid space, into the arachnoid cyst, or into the subdural space. Arachnoid cysts are relatively common benign lesions occurring in association with the central nervous system, both within the intracranial compartment (most common) as well as within the spinal canal. They are usually located within the subarachnoid space and contain CSF. The majority of arachnoid cysts are small and asymptomatic. When symptoms occur they are usually the result of gradual enlargement resulting in mass effect. This results in either direct neurological
dysfunction, or distortion of normal CSF pathways resulting in obstructive hydrocephalus. Arachnoid cysts are thought to arise due to congenital splitting of the arachnoid layer with accumulation of CSF within this potential space. The cyst wall is comprised of flattened arachnoid cells forming a thin translucent membrane. There is no solid component and no epithelial lining. Most frequently (50 percent to 60 percent) arachnoid cysts are located in the middle cranial fossa, where they invaginate into and widen the sylvian fissure. There is even a classification system for middle cranial fossa arachnoid cysts, although I doubt it is of much use if a good description is provided (see Galassi classification).

They can occur anywhere, including:

- interhemispheric fissure
- cerebral convexity
- posterior fossa
  - cisterna magna (main ddx: mega cisterna magna)
  - cerebellopontine angle (main ddx: epidermoid cyst)
- quadrigeminal cistern
- spinal canal (see spinal arachnoid cysts)
- ventricles (see intraventricular arachnoid cyst)
- suprasellar cistern (see suprasellar arachnoid cyst)

Arachnoid cysts are extremely well circumscribed, with an imperceptible wall, and displace adjacent structures. When large, and over time, they can exert a remodelling effect on the bone. CT cisternography (introduction of contrast into the subarachnoid space) demonstrates communication of the cyst with the subarachnoid space. As this communication is slow, the cyst often fills later, and contrast may be seen to pool with it, outlining its dependent portion. As they are filled with CSF if is not surprising that they follow CSF on all sequences, including FLAIR and DWI. This enables them to be distinguished from epidermoid cysts for example. As their wall is very thin it only occasionally can be seen, and their presence is implied by displacement of surrounding structures. As there is no solid component, no enhancement can be identified. Phase contrast imaging can also be employed not only to determine if the cyst communicates with the subarachnoid space, but also to identify the location of this communication.

Arachnoid cysts are benign and the vast majority remain asymptomatic throughout life. If they are deemed to be causing symptoms then surgery can be contemplated. This can either take the form of a craniotomy (fenestration or excision) or placement of a cystoperitoneal shunt.

**Differential diagnosis:**

- enlarged CSF space : e.g. mega cisterna magna
- epidermoid cyst
- subdural hygroma / chronic subdural haemorrhage
- cystic tumours : often will have a solid / enhancing component and be intra-axial
  - pilocytic astrocytoma
  - haemangioblastoma

- non-neoplastic cysts
  - neurenteric cyst
  - neuroglial cyst
  - porencephalic cyst
    - neurocysticercosis: small cyst, usually multiple when in the subarachnoid space

Cerebral aneurysms are pathologic focal dilatations of the cerebrovasculature that are prone to rupture. These vascular abnormalities are classified by presumed pathogenesis. Saccular, berry, or congenital aneurysms constitute 90 percent of all cerebral aneurysms and are located at the major branch points of large arteries. Dolichoectatic, fusiform, or arteriosclerotic aneurysms are elongated outpouchings of proximal arteries that account for 7 percent of all cerebral aneurysms. Infectious or mycotic aneurysms are situated peripherally and comprise 0.5 percent of all cerebral aneurysms. Other peripheral lesions include neoplastic aneurysms, rare sequelae of embolized tumor fragments, and traumatic aneurysms.
Traumatic injury also may result in dissecting aneurysms in proximal vessels. Microaneurysms of small perforating vessels may result from hypertension.

- Saccular aneurysms are situated in the anterior circulation in 85 percent to 95 percent of cases, whereas dolichoectatic aneurysms affect predominantly the vertebrobasilar system. The location of saccular aneurysms at specific arterial segments varies in frequency because of differences in reported study populations. Multiple saccular aneurysms are noted in 20-30% of patients with cerebral aneurysms.
- Saccular aneurysms frequently rupture into the subarachnoid space, accounting for 70 percent to 80 percent of spontaneous subarachnoid hemorrhages (SAH). Aneurysmal rupture also may result in intraparenchymal, intraventricular, or subdural hemorrhage. Giant saccular aneurysms, defined as greater than 25 mm in diameter, represent 3 percent to 5 percent of all intracranial aneurysms. Although giant aneurysms may cause SAH, these lesions frequently produce mass effects and result in distal thromboembolism.
- Aneurysmal SAH is a catastrophic condition, affecting 30,000 individuals in the United States every year. Most of these individuals (60 percent) either die or suffer permanent disability; 50 percent of survivors with favorable outcomes experience considerable neuropsychological dysfunction. Cerebral vasospasm (ie, narrowing of proximal arterial segments) complicates 20 percent to 50 percent of cases and is the major cause of death and disability associated with aneurysmal SAH.

References:
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