

Radiology Case Reports

Volume 4, Issue 3, 2009

Spontaneous Subdural Hematoma and Intracystic Hemorrhage in an Arachnoid Cyst

Amar P. Patel, Patrick J. Oliverio, M.D., Khalid H. Kurtom, M.D., and Fabio Roberti, M.D.

We report the case of 22-year-old man with nontraumatic intracystic hemorrhage into a middle cranial fossa arachnoid cyst associated with a contiguous subacute subdural hematoma. Arachnoid cysts are benign intra-arachnoidal fluid collections frequently detected incidentally during neuroimaging. Rare complications of arachnoid cysts such as intracystic hemorrhage or subdural hematomas and subdural hygromas typically occur after head trauma. Our review of the literature identified fewer than 30 cases of arachnoid cysts with complicating intracystic hemorrhage and ipsilateral subdural hematomas.

Introduction

Arachnoid cysts comprise 1% of intracranial mass lesions. 50 to 60% are located in the middle cranial fossa [1]. Arachnoid cysts more commonly occur on the left side, and males are involved in more than two thirds of cases [2]. Their pathogenesis remains unclear. Patients are usually asymptomatic, but if the cyst is large enough

to interfere with adjacent structures, the presentation may include headache, papilledema, hydrocephalus, or seizures. Arachnoid cysts are generally stable over time, but cases of spontaneous resolution or sudden progressive enlargement have been reported [3-6]. Rare, but known, complications of arachnoid cysts include intracystic, subdural, or subarachnoid hemorrhage. Review of the literature describes fewer than 30 cases of an arachnoid cyst associated with both intracystic hemorrhage and ipsilateral subdural hematomas [4, 5, 7, 8].

Citation: Patel AP, Oliverio PJ, Kurtom KH, Roberti F. Spontaneous Subdural Hematoma and Intracystic Hemorrhage in an Arachnoid Cyst. Radiology Case Reports. [Online] 2009;4:298.

Copyright: © 2009 The Authors. This is an open-access article distributed under the terms of the Creative Commons Attribution-NonCommercial-NoDerivs 2.5 License, which permits reproduction and distribution, provided the original work is properly cited. Commercial use and derivative works are not permitted.

Abbreviations: CT, computed tomography; MRI, magnetic resonance imaging

Amar P. Patel (Email: amarppatel@gmail.com), is at the Virginia Commonwealth University School of Medicine – INOVA Campus, Falls Church, VA, United States of America.

Patrick J. Oliverio, M.D. (Email: patrickoliverio@gmail.com), is in the Department of Radiology, INOVA Fairfax Hospital, Falls Church, VA, United States of America.

Khalid H. Kurtom, M.D., and Fabio Roberti, M.D., are in the Department of Neurosurgery, George Washington University Hospital, Washington, DC, United States of America.

Published: July 18, 2009

DOI: 10.2484/rccr.v4i3.298

Case Report

A 22-year-old male presented with a 3 day history of headache, nausea, and vomiting. Upon careful questioning there was no antecedent head trauma. Initial non-contrast head CT (Fig. 1A) showed a left sided isoattenuating extra-axial collection consistent with an early subacute subdural hematoma. There was mass effect upon the left cerebral hemisphere with 8 mm of midline shift to the right. A lobulated mass-like appearance of extra-axial hemorrhage within the anterior aspect of the left middle cranial fossa was also noted (Fig. 1B). There

Spontaneous Subdural Hematoma and Intracystic Hemorrhage in an Arachnoid Cyst

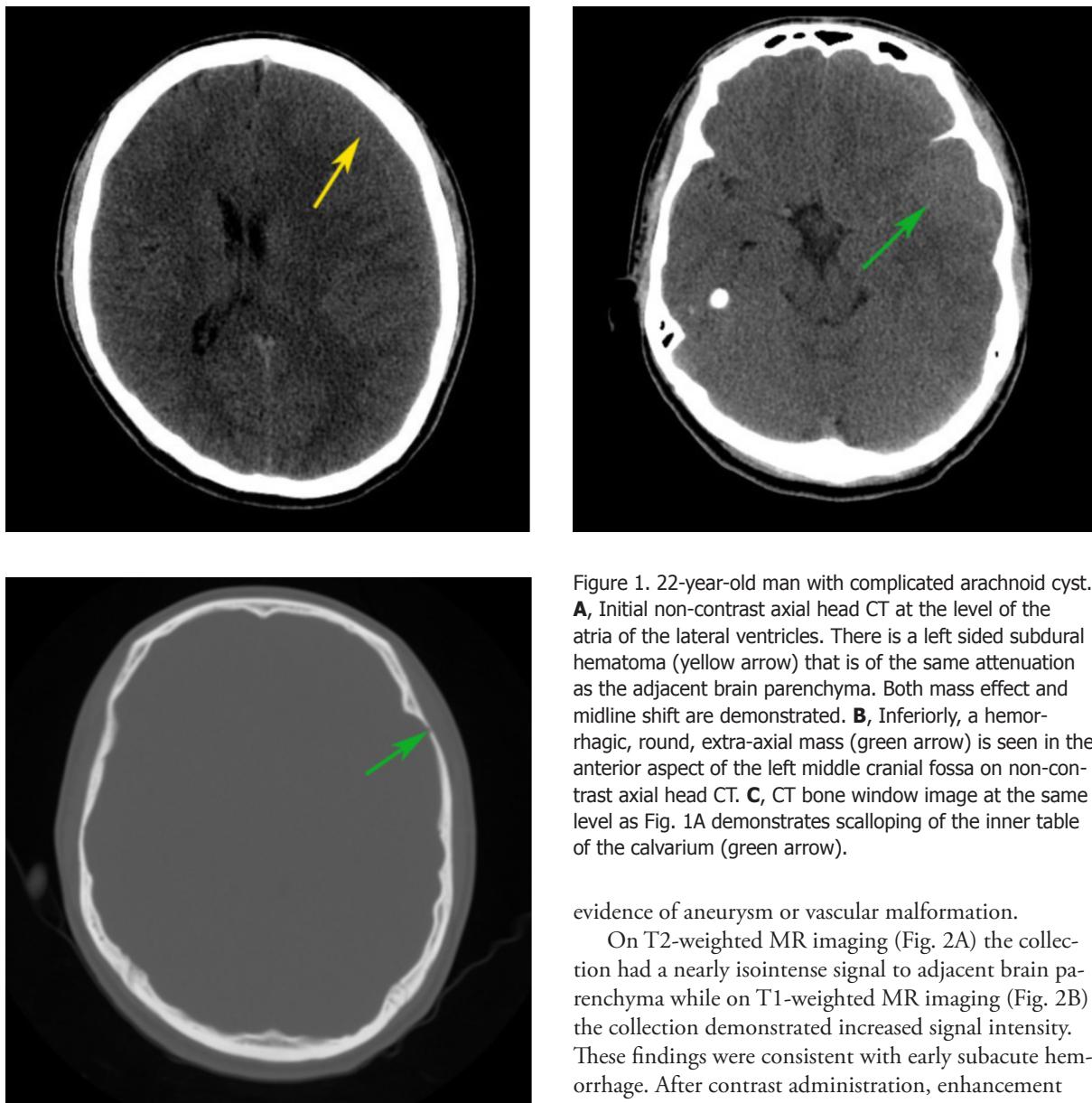


Figure 1. 22-year-old man with complicated arachnoid cyst. **A**, Initial non-contrast axial head CT at the level of the atria of the lateral ventricles. There is a left sided subdural hematoma (yellow arrow) that is of the same attenuation as the adjacent brain parenchyma. Both mass effect and midline shift are demonstrated. **B**, Inferiorly, a hemorrhagic, round, extra-axial mass (green arrow) is seen in the anterior aspect of the left middle cranial fossa on non-contrast axial head CT. **C**, CT bone window image at the same level as Fig. 1A demonstrates scalloping of the inner table of the calvarium (green arrow).

was focal thinning with periosteal scalloping of both the squamous portion of the left temporal bone and of the adjacent left parietal bone (Fig. 1C). Because of the concern for an associated extra-axial mass, a contrast enhanced CT of the head was obtained. There was no abnormal enhancement of either the subdural collection or the extra-axial middle cranial fossa mass. A complete cerebral arteriogram was also performed which demonstrated normal arterial and venous anatomy without

evidence of aneurysm or vascular malformation.

On T2-weighted MR imaging (Fig. 2A) the collection had a nearly isointense signal to adjacent brain parenchyma while on T1-weighted MR imaging (Fig. 2B) the collection demonstrated increased signal intensity. These findings were consistent with early subacute hemorrhage. After contrast administration, enhancement of only the outer dural membrane but not the internal cyst structure was found on MRI (Fig. 2C). There was no MRI evidence subarachnoid hemorrhage. A fine linear septation, representing the arachnoid membrane, divided hemorrhage in the subdural space from hemorrhage in what was thought to be an arachnoid cyst in the middle cranial fossa (Fig. 2D).

A frontotemporal craniotomy with subdural hematoma evacuation and arachnoid cyst fenestration was performed. At surgery paper thin dura and temporal

Spontaneous Subdural Hematoma and Intracystic Hemorrhage in an Arachnoid Cyst

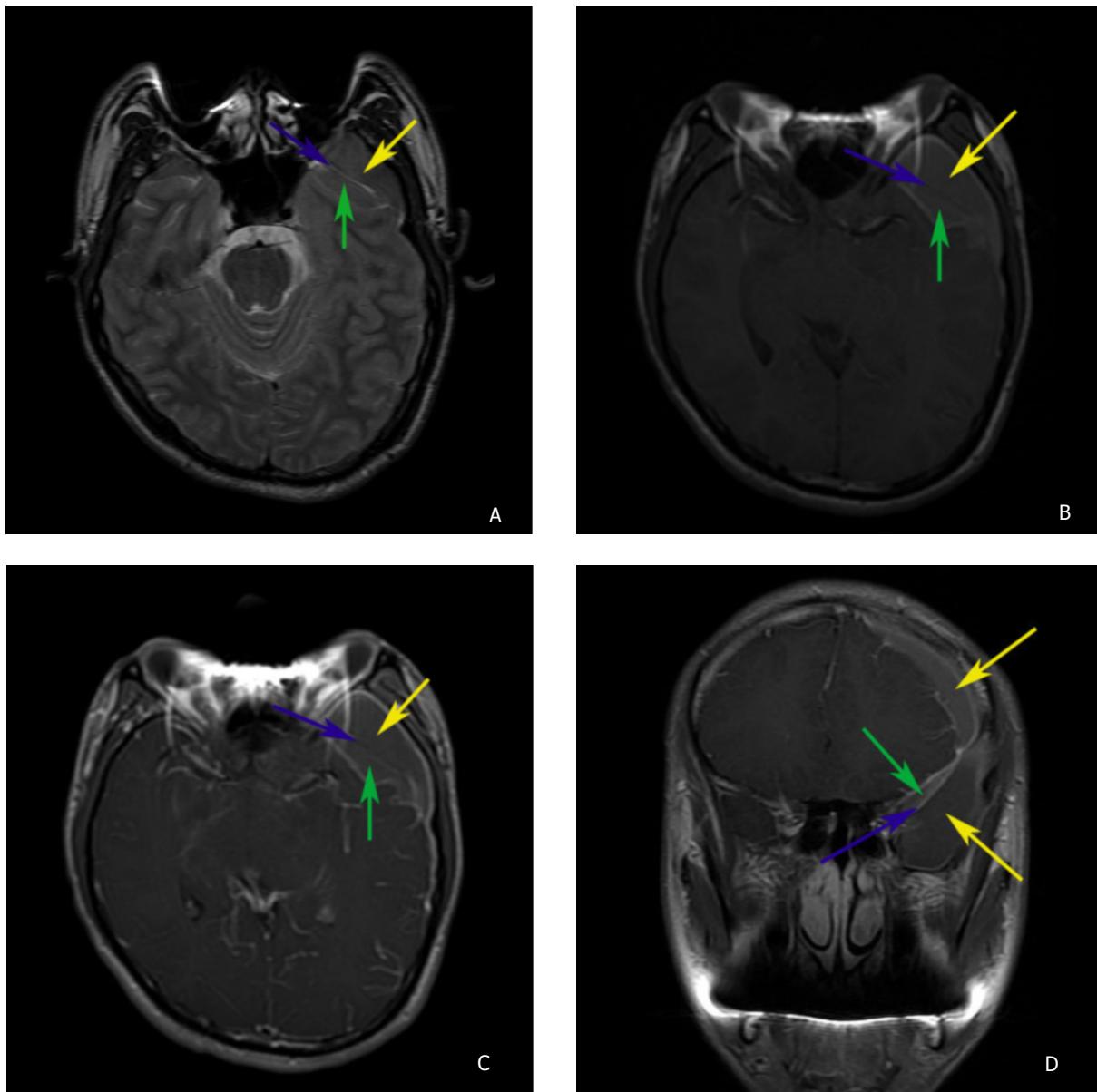


Figure 2. 22-year-old man with complicated arachnoid cyst. **A**, Axial T2-weighted MR image. The lesion is transected in the middle by the arachnoid membrane (blue arrow). Both segments (green and yellow arrows) demonstrate signal that is isointense to the adjacent brain parenchyma. **B**, Axial T1-weighted MR imaging better demonstrates the lesion's complex nature. The lesion represents an arachnoid cyst (green arrow) which shows evidence of hemorrhage as demonstrated by the presence of T1 shortening. The surrounding subdural hematoma (yellow arrow) shows

well demarcated prominent T1 shortening indicative of hemorrhage. **C**, Contrast enhanced axial T1-weighted MR imaging shows enhancement of the dural membrane but does not show enhancement within the arachnoid cyst (green arrow). The arachnoid membrane (blue arrow) separates hemorrhage in the subdural compartment (yellow arrow) from hemorrhage inside the arachnoid cyst (green arrow). **D**, Coronal contrast enhanced T1-weighted MR imaging shows the arachnoid cyst (green arrow), arachnoid membrane (blue arrow), and subdural hematoma (yellow arrows).

Spontaneous Subdural Hematoma and Intracystic Hemorrhage in an Arachnoid Cyst

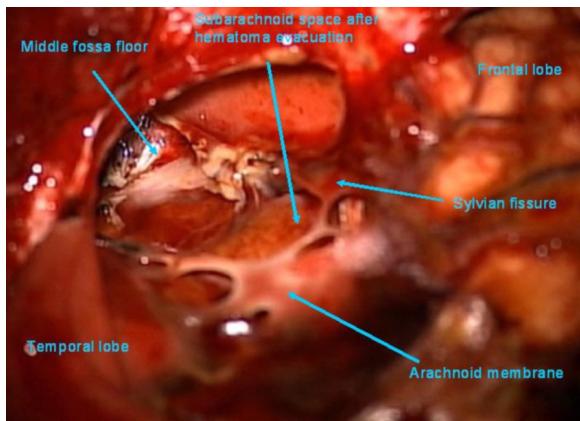


Figure 3. 22-year-old man with complicated arachnoid cyst. Intraoperative visualization of the subarachnoid space, arachnoid membrane, and sylvian fissure after evacuation of the subdural hematoma.

bone was found surrounding a highly vascular subdural hematoma membrane. After evacuation of the hematoma the arachnoid cyst was visualized and fenestrated (Fig. 3). Biopsy of the cyst wall confirmed the presumptive radiologic diagnosis. A decrease in extra-axial fluid and a reduction in mass effect were seen on postoperative CT (Fig. 4). Postoperative recovery was uneventful and the patient was discharged without neurologic deficit.

Discussion

The widespread use of neuroimaging has increased incidental detection of arachnoid cysts. Most are discovered during the first two decades of life. Arachnoid cysts constitute approximately 1% of all intracranial space-occupying lesions [1]. Common locations include the middle cranial fossa, cerebral convexity, perisellar, retrocerebellar, cerebellopontine angle, and quadrigeminal plate cisterns. While some arachnoid cysts arise from post-inflammatory changes after trauma, intracranial hemorrhage, or infection, most are thought to be congenital. It is theorized that these cysts form from an aberration in arachnoid development which results in splitting or duplication of the membrane, from a defect in condensation of the mesenchyme, or from abnormalities of CSF flow [2, 9]. The exact means of arachnoid cyst genesis remains unclear.

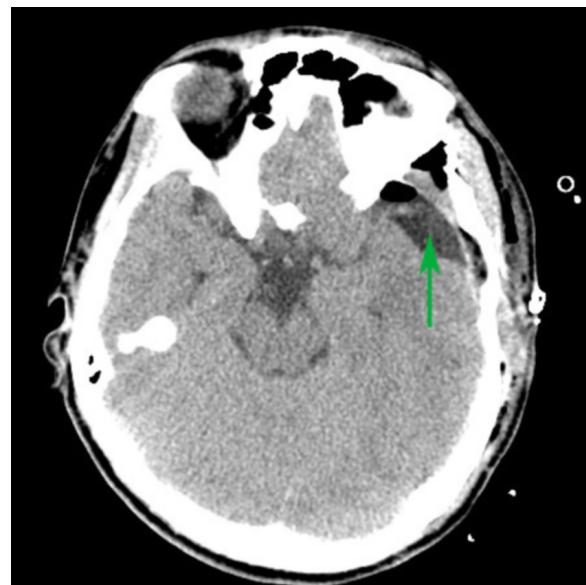


Figure 4. 22-year-old man with complicated arachnoid cyst. Postoperative non-contrast axial head CT. The hypoattenuation in the anterior aspect of the left middle cranial fossa represents the fenestrated arachnoid cyst (green arrow). Air within the cyst reflects communication between the structure and the drained subdural hematoma.

On both CT and MRI scans arachnoid cysts are non-enhancing well-circumscribed extra-axial lesions with the same attenuation (on CT) or signal (on all MRI pulse sequences) as that of CSF. They do not communicate with the ventricular system and have no identifiable internal architecture. Bony erosion and remodeling, features suggestive of a longstanding process, are commonly associated with arachnoid cysts. These findings are seen in nearly half of cases and are thought to be secondary to chronic fluid accumulation with transmitted pulsations [10]. Adjacent deformity or even hypoplasia of the subjacent brain may be present depending on the size and location of the cyst.

Etiologies of subdural hematomas include trauma, aneurysm, vascular malformation, and coagulopathy. Certain cystic and solid mass lesions are uncommonly associated with intracranial hemorrhage. Meningiomas with subdural hemorrhage have been reported in fewer than 20 cases [11]. Meningiomas are usually iso to slightly hypointense to cortex on T1-weighted MRI and vigorously enhance after contrast administration. Hyperostosis of the adjacent bone is often associated

Spontaneous Subdural Hematoma and Intracystic Hemorrhage in an Arachnoid Cyst

with meningiomas.

A hemorrhagic epidermoid or porencephalic cyst may mimic an arachnoid cyst with intracystic hemorrhage. Most epidermoid cysts are isointense or slightly hyperintense to CSF on both T1- and T2-weighted MR imaging. Epidermoid cysts are associated with the restricted diffusion of water and thus show high signal intensity on diffusion-weighted imaging. Porencephalic cysts usually communicate with the lateral ventricles. They are smooth-walled cavities within brain parenchyma and isointense to CSF on T1-weighted MRI. Adjacent white matter typically shows hyperintensity on T2-weighted and FLAIR images.

Although most arachnoid cysts are asymptomatic, symptoms may arise from an increase of intracystic fluid or more rarely hemorrhage into the cyst itself and/or adjacent subdural space. Such hemorrhagic events may be post-traumatic or spontaneous. Rupture of the outer arachnoid cyst wall and surrounding fragile veins allows blood to accumulate within the cyst and/or subdural compartment [5, 12]. Intracystic hemorrhage can also be due to interruption of the highly vascular arachnoid cyst membrane or of the bridging veins traversing the cyst cavity [13]. Fluid production by flat arachnoid cells lining the cyst walls may explain spontaneous cyst enlargement and hemorrhage if sufficient intracystic pressure is attained to breach the wall and disrupt the vasculature [12].

The management of an arachnoid cyst is determined by clinical presentation along with consideration for cyst size and location. Asymptomatic patients may be conservatively observed while symptomatic patients are candidates for surgery. Surgical decompression may be indicated for complicating early subdural hematomas. The annual risk for hemorrhage in patients with a middle cranial fossa arachnoid cyst probably remains below 0.1% [5]. Although the surgical procedure of choice is still under debate, both cyst peritoneal shunting and cyst fenestration have been frequently used with good outcomes [14, 15].

Conclusion

In the evaluation of patients with symptoms of increased intracranial pressure and imaging findings suggestive of a subacute intracranial hemorrhage of unclear etiology, it is important to recognize that rare subdural

and intracystic hemorrhage may spontaneously complicate typically inconsequential arachnoid cysts.

References

1. Osborn AG, Preece MT. Intracranial cysts: radiologic-pathologic correlation and imaging approach. *Radiology*. 2006 Jun;239(3):650-64. [PubMed]
2. Gosalakkal JA. Intracranial arachnoid cysts in children: a review of pathogenesis, clinical features, and management. *Pediatr Neurol*. 2002 Feb;26(2):93-8. [PubMed]
3. Sener RN. Arachnoid cysts associated with post-traumatic and spontaneous rupture into the subdural space. *Comput Med Imaging Graph*. 1997 Nov-Dec;21(6):341-4. [PubMed]
4. Hong J-C, Kim M-S, Chang C-H, Kim S-H. Arachnoid cyst with spontaneous intracystic hemorrhage and chronic subdural hematoma. *J Korean Neurosurg Soc*. 2008 Jan;43(1):54-6. [PubMed]
5. Iaconetta G, Esposito M, Maiuri F, Cappabianca P. Arachnoid cyst with intracystic haemorrhage and subdural haematoma: case report and literature review. *Neurol Sci*. 2006 Feb;26(6):451-5. [PubMed]
6. Rakier A, Feinsod M. Gradual resolution of an arachnoid cyst after spontaneous rupture into the subdural space. *J Neurosurg*. 1995 Dec;83(6):1085-6. [PubMed]
7. Tsitsopoulos PP, Pantazis GC, Syrmou EC, Tsitsopoulos PD. Intracranial arachnoid cyst associated with traumatic intracystic hemorrhage and subdural haematoma. *Hippokratia*. 2008 Jan;12(1):53-5. [PubMed]
8. Wester K, Helland CA. How often do chronic extra-cerebral haematomas occur in patients with intracranial arachnoid cysts? *J Neurol Neurosurg Psychiatry*. 2008 Jan;79(1):72-5. [PubMed]
9. Rengachary SS, Watanabe I, Brackett CE. Pathogenesis of intracranial arachnoid cysts. *Surg Neurol*. 1978 Feb;9(2):139-44. [PubMed]

Spontaneous Subdural Hematoma and Intracystic Hemorrhage in an Arachnoid Cyst

10. Parsch CS, Krauss J, Hofmann E, Meixensberger J, Roosen K. Arachnoid cysts associated with subdural hematomas and hygromas: analysis of 16 cases, long-term follow-up, and review of the literature. *Neurosurgery*. 1997 Mar;40(3):483-90. [PubMed]
11. Di Rocco F, Mannino S, Puca A, Lauriola L, Pompucci A. Intracranial meningiomas associated with non-traumatic chronic subdural hematoma. *Acta Neurochir.* 2006 Oct; 148(10):1097-102. [PubMed]
12. Huang D, Abe T, Kojima K, et al. Intracystic hemorrhage of the middle fossa arachnoid cyst and subdural hematoma caused by ruptured middle cerebral artery aneurysm. *Am J Neuroradiol.* 1999; 20:1284-6. [PubMed]
13. Eustace S, Toland J, Stack J. CT and MRI of arachnoid cyst with complicating intracystic and subdural haemorrhage. *J Comput Assist Tomogr.* 1992 Nov-Dec;16(6):995-7. [PubMed]
14. Arai H, Sato K, Wachi A, Okuda O, Takeda N. Arachnoid cysts of the middle cranial fossa: experience with 77 patients who were treated with cystoperitoneal shunting. *Neurosurgery.* 1996 Dec;39(6):1108-12. [PubMed]
15. Galassi E, Piazza G, Gaist G, Frank F. Arachnoid cysts of the middle cranial fossa: a clinical and radiological study of 25 cases treated surgically. *Surg Neurol.* 1980 Sep;14(3):211-9. [PubMed]