NEURO-IMAGE

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The father of magnetick philosophy

William Feindel, m.d.

William Gilbert (1544-1603) studied medecine at Cambridge University and took up practice in London, eventually becoming President of the Royal College of Physicians and the Physician to Queen Elizabeth I.

After some twenty years of systematic experimental observations, Gilbert in 1600 published a book on the magnet in which he gathered all the knowledge at that time as well as his own observations concerning magnetic phenomena. He correctly viewed the earth as a giant magnet and by making a **terella** or small earth from naturally occurring magetic stone (lode stone) he was able to test in practice his theories of « magnetick vigour » and the « orbe of virtue » or the limit of the magnetic field around a lode stone. He showed that many substances — gold, silver, lead, glass had no magnetic properties and he disproved the long standing myth that garlic and diamonds neutralized a magnet's power to attract iron by making « an experiment with 70 excellent diamonds, in the presence of many witnesses ». In another observation, he examined the variations from the meridian which the navigators had noted and the deflection from the horizontal known as declination. His instructions for this experiment were quite specific. « Fix a slender iron wire of 3 digits length through a round cork, so that the cork may support the iron in water. Let this water be in a good sized glass vase or bowl ». The idea was to allow the wire to float in the middle of the liquid and freely point to indicate the magnetic field. He futher argued that this « magnetic cocktail » could be used to determine latitude and magnetic variation.

1. William Gilbert (1544-1603)

Gilbert was fully aware of the importance of understanding magnetism in every day commerce and navigation. He was the first in England to support the Copernican idea of the planetary system. He clearly distinguished magnetism from the phenomenon of static electricity. His works served as a significant base from which all later scientific research on magnetism could be advanced. He made these extensive observations over the years

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Intra-arterial BCNU therapy

The tip of the small balloon catheter is seen in the lumen of the right middle cerebral artery.

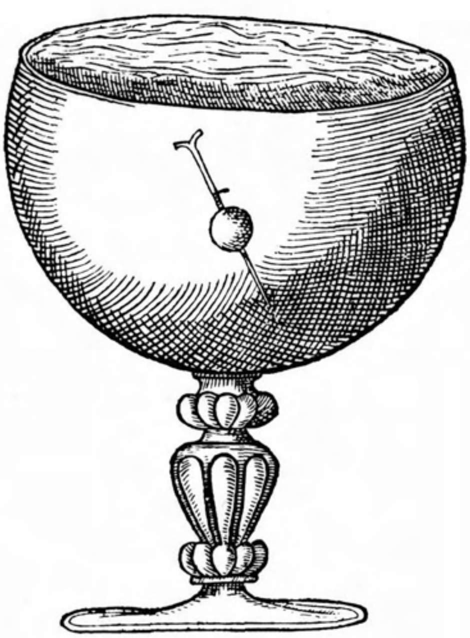
In January 1984, a protocol for the treatment of high grade gliomas with intra-arterial administration of BCNU (*) was proposed to patients having had histological confirmation of their tumour and subsequent radiotherapy. After an initial group of 4 patients, the protocol was modified to use a different catheter as well as a prophylactic antiplatelet agent (A.S.A.) for 48 hours prior to the treatment. Rather than administering the BCNU by injection over a period of 20-30 minutes, it was infused over a period of 3 hours.

Over the past 20 months, there were 19 patients who underwent superselective arterial catheterization of cerebral arteries and infusion of BCNU. There were 35 catheterization procedures for 30 treatments; some patients had 3 treatments. There was one episode of transient ischemia resulting from spasm at the time of catheter placement and one instance of unilateral blindness related to catheter dislodgement below the ophthalmic artery. There were 2 cases of cerebral toxicity related to BCNU, which prompted us to lower the dosage from 150 mg/m2 to 150 mg total.

The response rate, characterized as improvement or stabilization of the tumour volume on C.T. scan done 3-4 weeks after treatment, has been over 80 %. The survival time has not been analized as yet. Superselective arterial chemotherapy of high grade gliomas with BCNU appears more effective than the intravenous administration. Our present goal is to define the most effective and safest dosage, and the best schedule of treatment.

Jean-Guy Villemure, m.d.

(*) NeuroImage, September 1984



2. Gilbert's experiment to examine magnetic declination.

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when he was a busy physician consulted by many of the English nobility in London.

Today the application of magnetism and electrical (radio) wave tuned to the resonance of certain atoms, provides us with a remarkable means of diagnostic imaging and noninvasive chemical sampling of the organs and tissues of the body.

Gilbert has recently been viewed as one of the first experimental scientists in England. He was highly critical of vague theories not supported by experimental observation and one of his statements remains as a healthy caution for us, « But let the investigators of natural phenomena take heed that they are not the more deceived by their own badly observed experiments, and disturb the commonwealth of letters with their errors and stupidities ». So as we use this modern magnetic resonance system with its powerful « orbe of virtue » for neurodiagnosis and spectroscopy, we would do well to keep William Gilbert's words in mind.

The endovascular treatment of intracranial aneurysms

Fig. 1

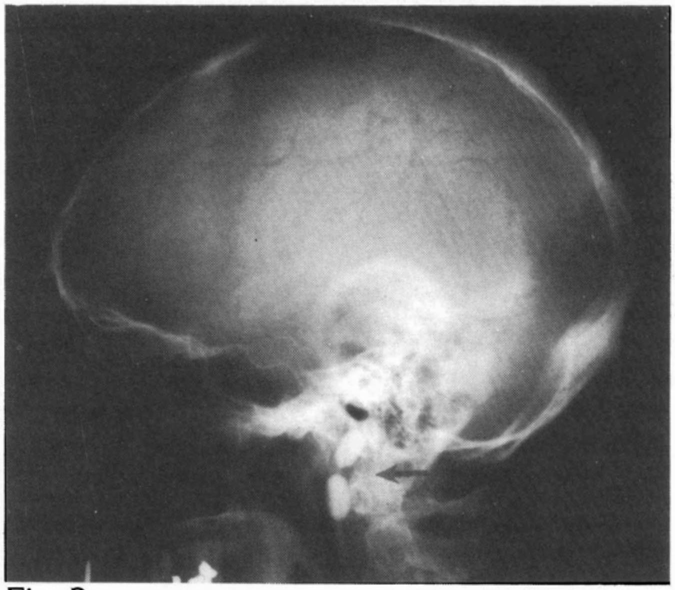

Fig. 2

Fig. 3

Jean Raymond, M.D.

The development of the detachable balloon techniques has offered an alternative approach to difficult neurosurgical problems: aneurysms of giant size or of inaccessible location. The endovascular application of an old neurosurgical principle, balloon occlusion of the internal carotid artery, has emerged as a safe, effective and simple therapeutic modality for intracavernous aneurysms (1-2).

A seventy-nine year old (79) gentleman presented with left orbital pain, proptosis and ophthalmoplegia; a large aneurysm of the cavernous segment of the internal carotid artery was demonstrated (fig. 1). The clinical tolerance to acute occlusion of the internal carotid artery was determined following fifteen (15) minutes of temporary occlusion using a balloon catheter introduced via a right transfemoral route under local anesthesia. Two balloons were then detached in the cervical segment of the left internal carotid artery (fig. 2). The pain disappeared, and the proptosis and ophthalmoplegia were still improving at the time of follow-up aortic arch angiography three months later. (fig. 3)

These techniques have progressed rapidly. Exclusion from the intracranial circulation of saccular aneurysms of all sizes, at all sites, with preservation of the parent artery, appears possible (3). The value of endovascular interventions in the management of unclippable aneurysms is now established, but its precise role regarding the more usual saccular variety within the circle of Willis remains to be determined. Because it is a logical approach, we believe it will find further and wider recognition in clinical practice.

REFERENCES

1. Berenstein A, et al. Transvascular treatment of giant aneurysms of the carotid and vertebral arteries. Functional investigation and embolization. Surg Neurol 1984:21:3-12.
2. Debrun G., et al. Unclippable aneurysms: Treatment with detachable balloons. AJNR 1981:2:167-173.
3. Romodanov AP, et al. Intravascular occlusion of saccular aneurysms of the cerebral arteries by means of detachable balloon catheter: Advances and technical standards in Neurosurgery 1983:9:25-49.

Fig. 1
Large aneurysm of the cavernous segment of the left carotid artery.

Fig. 2
Presence of two large detached balloons in the high cervical segment of the carotid artery.

Fig. 3
An arch angiogram shows no left internal carotid artery in the neck. The aneurysm does not opacify but the distal segment of the carotid fills from above ( ).

Magnetic Resonance Imaging

Lorraine Absar R.T.

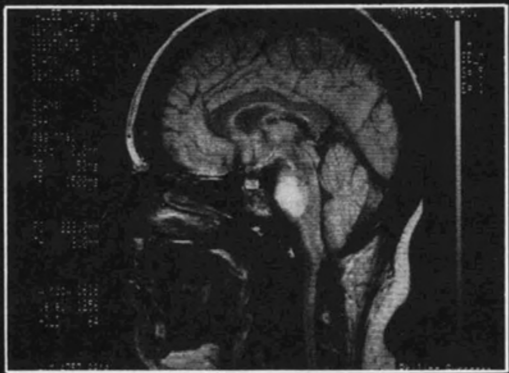

IMAGE 2A

Pulse sequence: spin echo/1st echo
Repetition time: 1500 msec.
Echo time: 50 msec.
Signal: hyperintense (long T2)

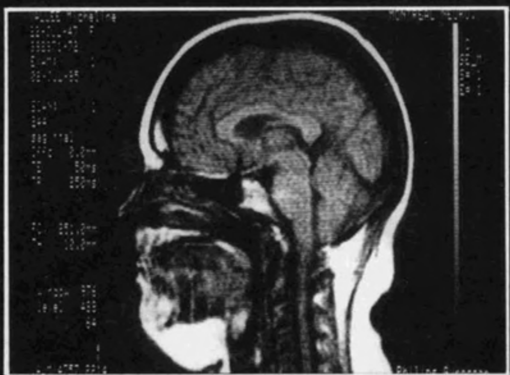

IMAGE 2B

Pulse sequence: spin echo/1st echo
Repetition time: 250 msec.
Echo time: 50 msec.
Signal: isointense (short T1)

Diagnosis: pontine glioma

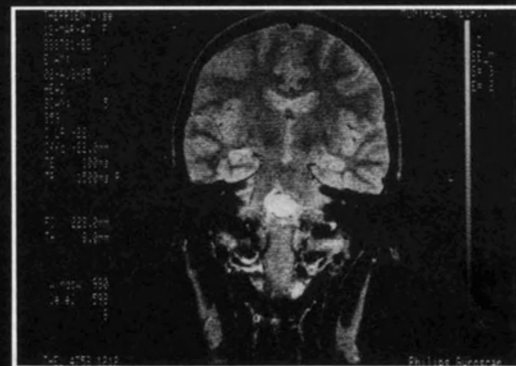

IMAGE 1A

Pulse sequence: spin echo/2nd echo
Repetition time: 1500 msec.
Echo time: 100 msec.
Signal: hyperintense (long T2)

IMAGE 1B

Pulse sequence: spin echo/1st echo
Repetition time: 250 msec.
Echo time: 30 msec.
Signal: hyperintense (short T1)

Diagnosis: hemorrhage (probably from telangiectasia)

Intracranial aneurysms - Site and frequency

M. Thibodeau, M.D., R. Kuzniecky, M.D.
R. Leblanc, M.D.,

A recent case of multiple aneuryms prompted a review of the location of intracranial aneurysms.

A 45 year old hypertensive male presented to hospital with sudden onset of throbbing headache after sexual intercourse. His grandfather had died suddenly at the age of 46 and his father suffered a stroke in his mid 40's. CT was normal. An angiogram was performed and demonstrated 2 aneurysms at uncommon sites. The first measured 10 mm and involved the distal pericallosal artery (ACeA), at the body of the corpus callosum, on the left (Fig.1.2). The other was 5 mm and was located at the origin of the right superior cerebellar artery (SCA) (Fig. 3).

These locations are unusual. In a large study by Fox, 94.6 % of all single adult intracranial berry aneurysms occurred, in order of frequency, on one of the five major vessels, i.e. the ICA, ACA and ACoA, MCA, BA and VA. The frequent aneurysms according to specific site are those occurring on the ACoA (25 %) and the PCoA-ICA (20 %). According to different studies, ACA aneurysms distally situated constitute 2.5 to 9.8 % of all intracranial aneurysms. The most common location of distal ACeAA is adjacent to the genu of the corpus callosum or at the main pericallosal artery bifurcation, the body of the corpus callosum being a rare site (2,3).

The statistics vary slightly if the aneurysms are multiple (two or more). Again, the five major vessels account for 97 % of multiple aneurysms. The main difference resides in the increased frequency of MCAA and the decreased frequency of posterior circulation and ACoA — ACeA aneurysms (1). The incidence of multiple aneurysms varies between 10 — 20 % of adults with aneurysms. The most common combinations of double aneurysms are double ICAA, double MCAA, ICAA — MCAA and ICAA — ACoAA.

At the Montreal Neurological Institute, over a recent period of three years, 87 patients with ruptured aneurysms were reviewed. In Table I, the relative incidence according to site is given and compared to the review of Fox (1). Both results are almost identical.

Conclusion

We have reviewed briefly the incidence of intracranial berry aneurysms in the adult. The present

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Fig. 1

Fig. 2

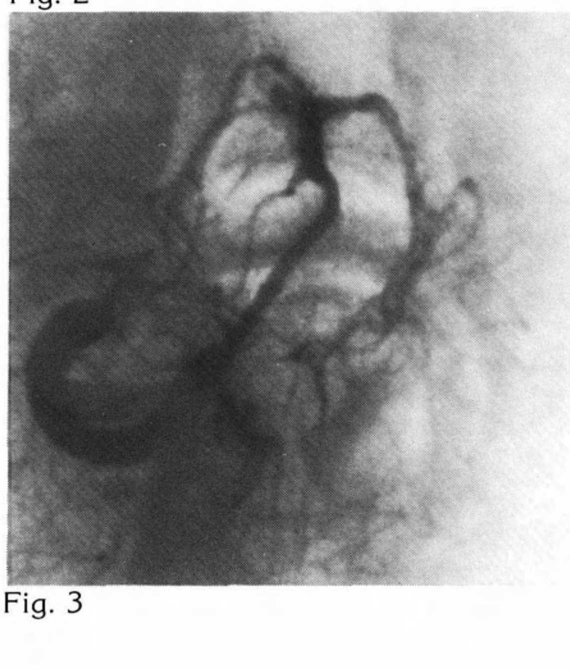

Fig. 3

Meningiomas Associated with Cyst Formation

Curtis Worthington, m.d.
Jean-Louis Caron, m.d.

Cyst formation in association with meningiomas occurs rarely. Only 17 cases are reported in the literature since the introduction of CT scanning, and a large percentage of these have been misdiagnosed radiologically. This is largely because of the erroneous interpretation of an enhancing lesion surrounded by a low-density area as a malignant glioma or metastasis.

The second largest series to date of cystic meningiomas has been recently reported from the Montreal Neurological and Montreal General Hospitals. These 6 cases included 4 males and 2 females aged 33 to 62 years. Presenting symptoms included focal neurological deficit (4 cases), seizures (3 cases), headache (3 cases) and personality changes (2 cases). CT scanning revealed a cystic enhancing supratentorial lesion in 5 cases (Fig. 1 and 2). Calcifications were seen in 1 case only. Angiographic changes characteristic of meningioma were observed in only 3 cases. These included an enlarged middle meningeal artery in 1 case and an external carotid arterial blush in 2 cases. A pre-operative diagnosis of malignant glioma was made in 3 of the cases. The correct diagnosis of meningioma was made in 3, including 1 case which was a cystic recurrence of a previously resected solid tumor.

Histologically, all lesions were syncitial meningiomas and in every case the cyst fluid was xanthochromic, acellular and highly proteinaceous. In 2 cases a complete biochemical analysis was obtained of the cyst fluid which showed the characteristics of an exudate, similar to a malignant effusion. No cells or blood breakdown products were observed.

A variety of anatomical configurations in these cystic lesions have been observed in the MNI series as well as in those cases previously reported. First, the cyst may be located centrally, completely contained within a macroscopic tumor mass. This type was initially described by Cushing and Eisenhardt (1), and by Penfield (6). Second, the cyst may be found within tumor mass, but located peripherally and surrounded by a thin rim of attenuated meningioma cells. Such cases were reported by Lake **et al**. (4) and Henry **et al.**. (3). Third, the cyst wall may be composed of fibrous tissue and rests of tumoral cells. This type has been the most extensively documented. Finally, the cyst may be a loculation of the subarachnoid space, formed as the tumor grows inward toward the brain. This type is described in the large series (8 cases) of Dell **et al.** (2).

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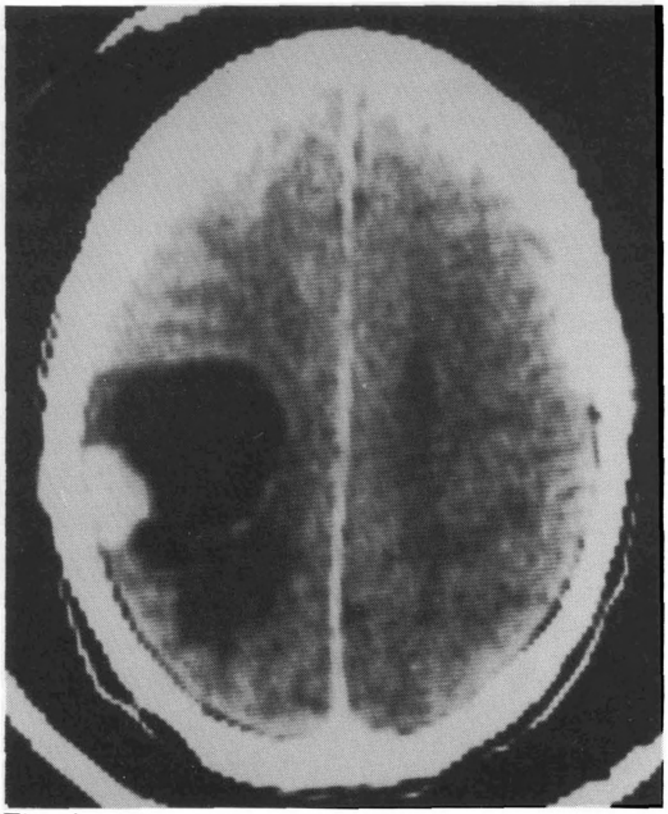

Fig. 1

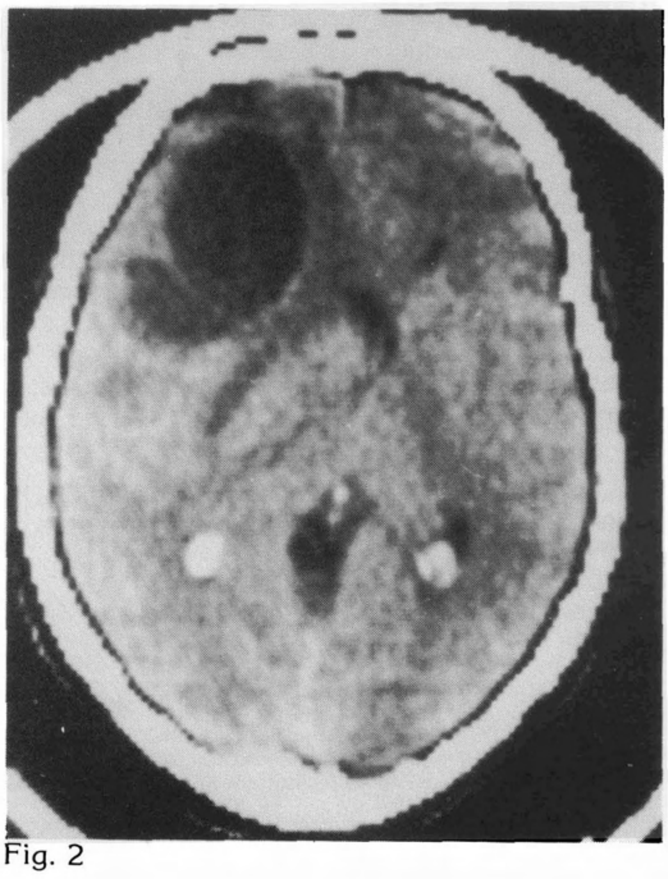

Fig. 2

Fonds de recherche McRae Institut Neurologique de Montréal

Les collègues et amis qui ont connu Donald L. McRae peuvent, en faisant un don, témoigner de leur reconnaissance pour son influence et son enseignement dans le domaine de la Neuroradiologie.

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These descriptive configurations have suggested several pathophysiological mechanisms in the formation of meningioma cysts: (1) ischemic cerebral necrosis and cystic degeneration; (2) active secretion of fluid by functional tumor cells; (3) glial pnliferation as a response to the presence of tumor with glial elaboration of fluid; (4) a combination of effects of the above; (5) evolution of cerebral edema to form peritumoral cystic cavities; (6) loculation of CSF.

The interpretation of the CT scan in the case of a meningioma associated with a cyst can raise diagnostic problems. An enhancing nodule in close association with a meningeal structure may suggest a meningioma. The absence of an external carotid supply to the lesion does not rule out the diagnosis as was demonstrated in the MNI series. The fact that these lesions are commonly misdiagnosed preoperatively as malignant gliomas or metastatic tumors, emphasizes the need to obtain tissue analysis of all cystic, enhancing lesions of the brain.

CUSHING, H.; Eisenhardt, L. **Meningiomas: their classification, regional behavior, life history and surgical end results.** Springfield, Ill., C.C. Thomas, p. 785, 1983.

DELL, S.; GANTI, S.R.; STEINBERGER, A.; McMURTY, J. "Cystic meningiomas: a clinicoradiological study." **J. Neurosurg., 57**: 8-13, 1982.

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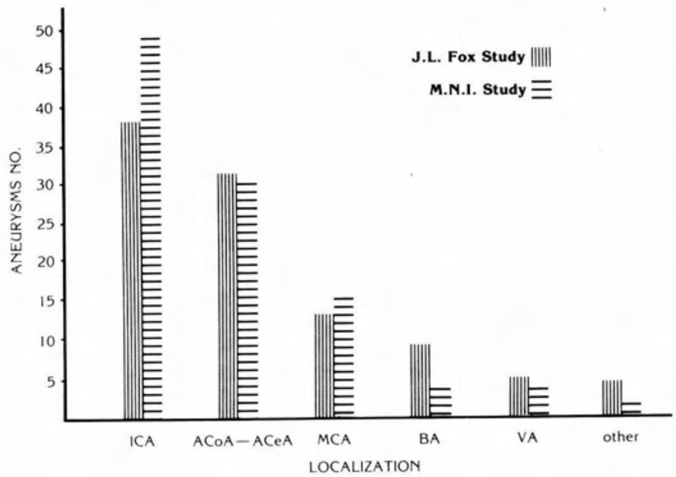

Table I. Intracranial aneurysms
(from Table 3.22, p. 37, John L. Fox)

case of double aneurysms at two uncommon sites accounts for an incidence less than 1% of all aneurysms.

REFERENCES

1. **Intracranial aneurysms.**
JL Fox, Springer Verlag, 1983.
2. **Introduction to cerebral angiography.**
AG Osborne, Harper & Row, 1980.
3. **Distal anterior cerebral artery aneurysm.**
DH Becker, Newton TH, **Neurosurgery** 6: 595-503, 1979.
4. **Traumatic intracranial aneurysm.**
D Parkinson, M. West, **J. Neurosurg.** 52: 11-20, 1980.
5. **Surgical treatment of distal anterior cerebral artery aneurysm.**
T Yoshimoto, K Uchida, **J. Neurosurg.** 50: 40-44, 1979.

HENRY, J.M.; SCHWARTZ, F.T.; SARTAW, M.A. **et al**. "Cystic meningiomas simulating astrocytomas. Report of three cases." **J. Neurosurg., 40**: 647-650, 1974.

LAKE, P.; HEIDEN, J.S.; MINCKLER, J. "Cystic meningioma: case report." **J. Neurosurg., 38**: 638-641, 1973.

NAUTA, H.J.W.; TUCKER, W.S.; HORSEY, W.S.; BILBAO, J.M.; GONSALVES, C. "Xanthochromic cysts associated with meningiomas." **J. Neurol. Neurosurg. Psych., 42**: 529-535, 1979.

PENFIELD, W. "Tumors of the sheaths of the nervous system." In: **Cytology and Cellular Pathology of the Nervous System**, Vol. 3, Penfield W. Ed., New York, Paul B. Hoeber, 955-990, 1932.

RENGACHARY, S.; BATNITZKY, S.; KOPES, J.; MORANTZ, R.A.; O'BOYNICK, P.; WATANABE, I. "Cystic lesions associated with intracranial meningiomas." **Neurosurg., 4** (2): 107-114, 1979.

WORTHINGTON, C.; CARON, J.L.; MELANÇON, D.; LEBLANC, R. "Meningioma cysts." **Neurology**, in press.

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