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Do the Suprasellar Neurenteric Cyst, the Rathke Cleft Cyst and the Colloid Cyst Constitute a Same Entity?

N. Graziani[1], H. Dufour[1], D. Figarella-Branger[2], A. Donnet[1], P. Bouillot[1], and F. Grisoli[1]

[1] Service de Neurochirurgie and [2] Service de Neuropathologie, Hôpital d'Adultes de la Timone, Marseilles, France

Summary

Two cases of entirely suprasellar cysts are reported. Total surgical removal was performed in both cases. Pathological and immunohistochemical profiles were consistent with neurenteric cysts, Rathke's cleft cysts or colloid cysts and was also in keeping with an endodermal origin. It is now admitted that these three kinds of cysts share similar histological and immunohistological features. We propose an hypothesis of common embryological origin from endodermal remnants.

Keywords: Colloid cyst; neurenteric cyst; Rathke's cleft cyst; suprasellar cyst.

Introduction

Neurenteric cysts (NC) are rare lesions usually observed in the posterior mediastinum[14]. Some intradural spinal NC have been described in the literature[2, 10, 11, 42]. Only 32 intracranial NC have been reported. Most often these cysts occured in the posterior fossa[1, 7, 8, 12, 16–19, 21, 23, 28, 29, 32, 33, 35, 37–39, 41, 44, 50, 53–56, 60, 62]. Palma *et al.* have reported the only case of suprasellar NC[44]. The other suprasellar cysts reported in the literature, with the same histological findings as reported below and that of Palma *et al.*, have always been called "ectopic suprasellar Rathke's cleft cysts"[4, 5, 13, 26, 27, 47, 57, 58, 61].

Case Reports

Case 1: Mrs M....., aged 39 years, was hospitalised in February 1989 for an amnesic syndrome which appeared after a paranasal sinus drainage. Past history showed an oligospaniomenorrhea. She had recently suffered from two (regressive) paroxysmal episodes of a mainly spatial component amnesia. CT brain scan (Fig. 1) showed a suprasellar right lateralised lesion. MRI brain scan using T 1 weighted sequences gave a clearer indication of the site of the lesion. There was no gadolinium enhancement (Fig. 2 a). The T 2 weighted sequence images showed a clear suprasellar right rateral hypersignal (Fig. 2 b) compressing the right part of the chiasma. The cranial base was normal. This patient was operated on using a right fronto-pterional approach. Surgical findings consisted in a non-adherent whitish lesion situated between the carotid artery, the optic nerve and the optic tract. The lesion was completely removed. Postoperatively retrograde amnesia became evident.

Case 2: A 40-year old woman consulted us for the first time in August 1989 because of frontal headache. The plain skull film showed erosion of the dorsum sellae (Fig. 3). Both the CT (Fig. 4) and MRI brain scans (Fig. 5) showed a supra. and retrosellar round lesion situated in the interpeduncular cisterna. Cranial base was normal. The patient was operated upon using a pterional approach. We found a sub-chiasmal whitish and non-adherent lesion. Puncture revealed no fluid. After cutting the capsule we discovered a non particulate, white, soft and slippery tissue. This lesion lay in contact with the pituitary stalk, the mid-brain and the

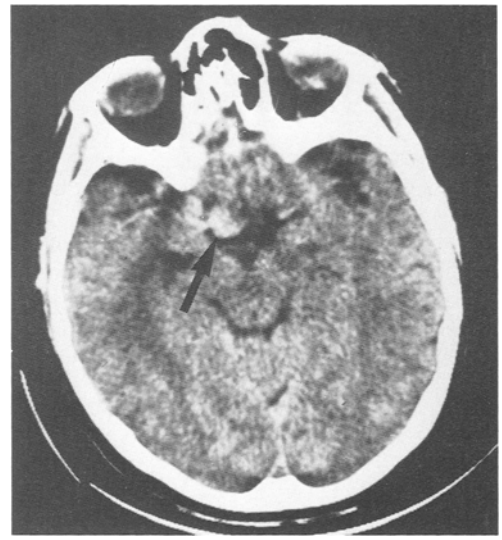
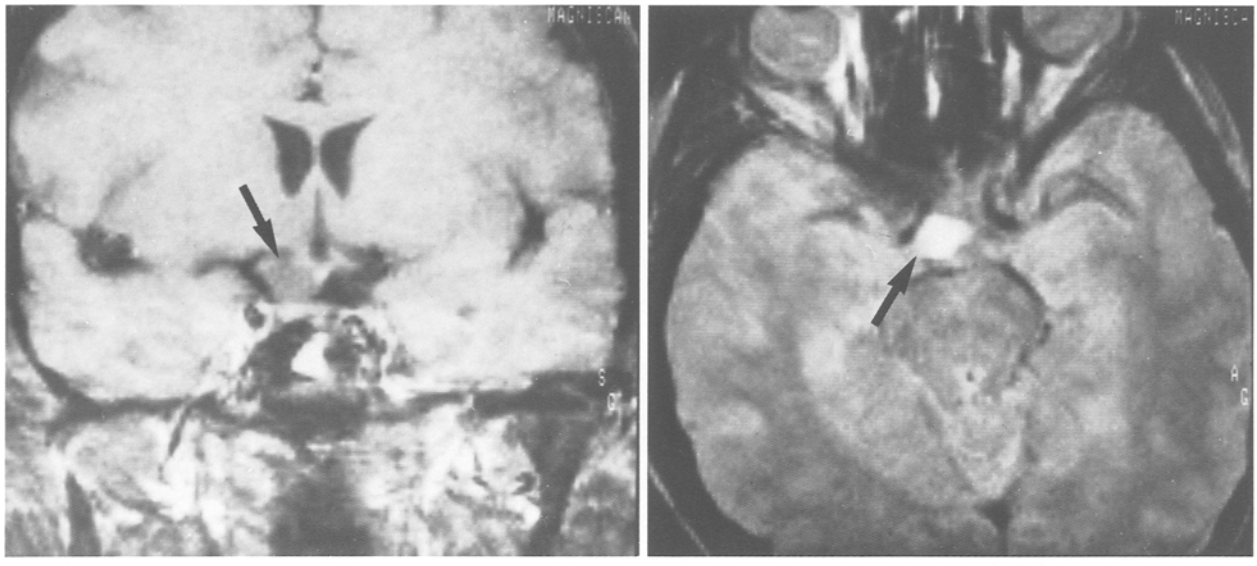


Fig. 1. Case 1: Enhanced CT scan showing a right supero-lateral sellar hyperdensity (black arrow) within the optico-chiasmatic cistern consistent with an aneurysm but proved otherwise after angiography



a b

Fig. 2. Case 1: (a) Gadolinium enhanced T 1 weighted MRI scan depicts a hypo-intense homogenous lesion (arrow) lying medial to the supraclinoid internal carotid artery. It lies within a space bounded by the pituitary stalk, the right border of the optic chiasma and the right optic tract. This lesion does not show any traces of gadolinium enhancement. (b) T 2 weighted sequences show homogeneous hyperintensity of the lesion

basilar artery. The lesion was totally extirpated. Follow-up was uneventful.

Pathological Findings

Material and methods: The cysts measured one and two cm in diameter. They were bluish white, thin-walled and contained clear, amorphous material. The cysts were fixed in 10% buffered formaldehyde and embedded in paraffin. They were stained with Haematoxylin phloxin saffron (HPS), periodic acid Schiff (PAS) and Alcian blue. For immunohistochemistry, the immunoperoxydase technique with avidin biotin perodxydase complex product (Vectastain) was used[22]. The following antigens were searched for: Glial Fibrillary Acidic Protein (GFAP, immunotech., Marseilles, France), Cytokeratin (KL 1, immunotech., Marseilles, France), Epithelial Membrane Antigen (EMA) and Carcino-embryonic Antigen (CEA) [Dakopatts (Versailles, France)]. Appropriate positive and negative controls were also performed.

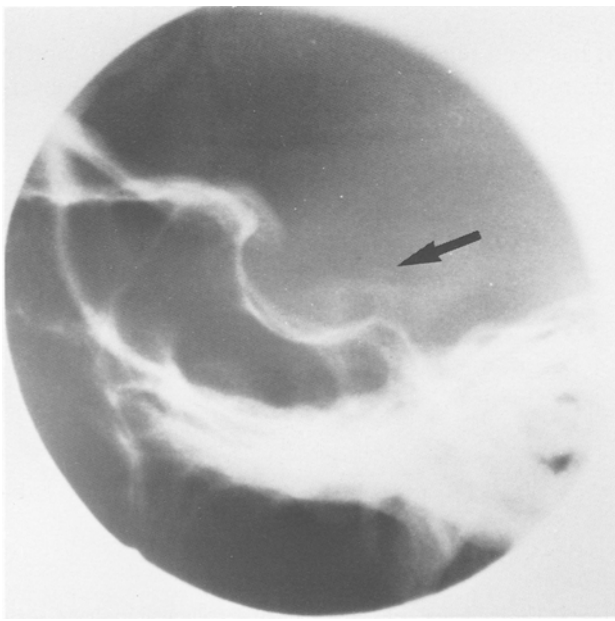
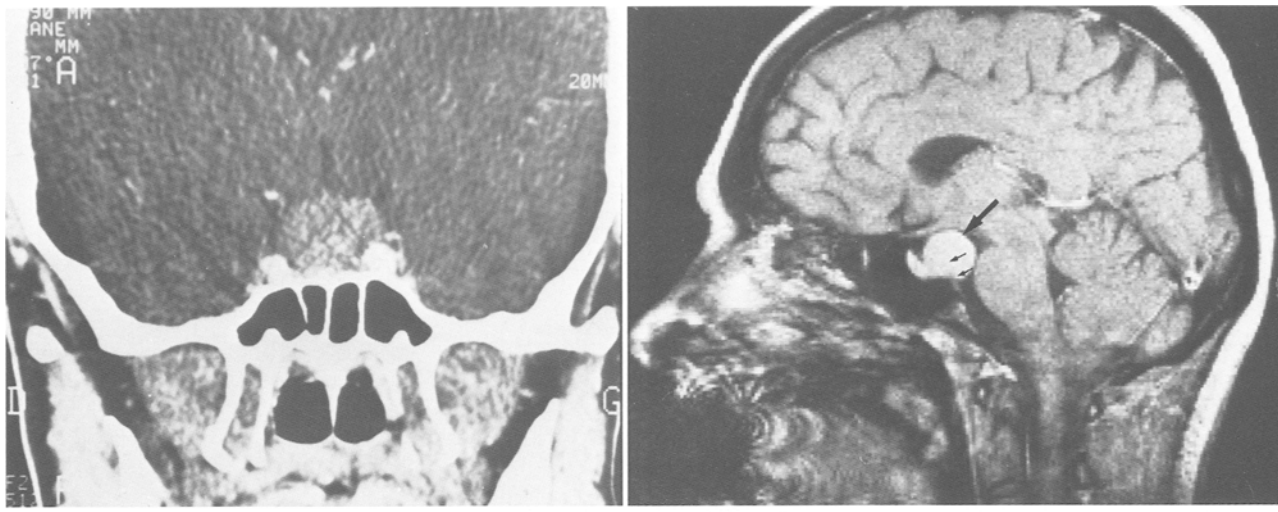


Fig. 3. Case 2: A lateral X-Ray of the sella turcica: enlargement of the sella resulting from the erosion of the dorsum sellae (arrow)

Results: In both cases, the cyst walls were lined with a pseudostratified columnar epithelium abutting against a thin connective tissue space (Fig. 6). Epithelial cells were cuboidal or columnar in shape and some, but not all were ciliated. Clear cytoplasmic vacuoles were occasionally seen (Fig. 7). Some areas showed transition with pluristratified epithelium and others with a monolayer epithelium. The cytoplasmic vacuoles were positive with both PAS and Alcian Blue. Some PAS deposits were also seen on the surface of non ciliated cells. No stain was observed with anti-GFAP antibody. Rare cells were immunoreactive with anti-EMA and more than 40% of cells were positive with antycytokeratin antibody. In addition, some cells were positive with anti-CEA antibody in case 2 (Fig. 8).



4 5

Fig. 4. Case 2: CT scan shows a well enhanced suprasellar homogeneous lesions whose location is further defined on the MRI scan

Fig. 5. Case 2: Sagittal plane Gadolinium enhanced MRI scan showing a tumour with uniform enhancement lying in the interpeduncular cistern (big black arrow) which explains the erosion of the dorsum sellae (double small black arrows) and confirms the chronic evolution of the lesion

Discussion

The histological findings in our cases were in keeping with neurenteric cysts (NC), Rathke's cleft cysts (RCC) or coloid cysts (CC)[40, 49]. However, the location was rather consistent with ectopic RCC[4, 5, 13, 26, 27, 47, 57, 58, 61].

Various authors have suggested that immunohistochemical detection of Cytokeratin, GFAP and CEA was instrumental in distinguishing these cysts[21, 24, 25, 30–34, 36, 38, 42, 49, 52, 55, 60] (Table 1):

Cytokeratin is nearly always observed in these three kinds of cysts and allowed confirmation of the epithelial origin[21, 24, 31, 34, 36, 38, 49, 52, 55, 60].

GFAP is absent in NC and CC. In RCC immunoreactivity is inconstant[21, 25, 31, 32–34, 36, 38, 49, 52, 55, 60]. In our two cases GFAP was absent.

CEA is an interesting marker of embyronic gastrointestinal tract[6] and it may be observed in endodermic cysts[21, 25, 32, 24, 42, 60] as well as in RCC and CC[25, 34, 37]. It has been reported neither in arachnoid cysts nor in choroid cysts[25, 52]. CEA immunoreactivity was obser-

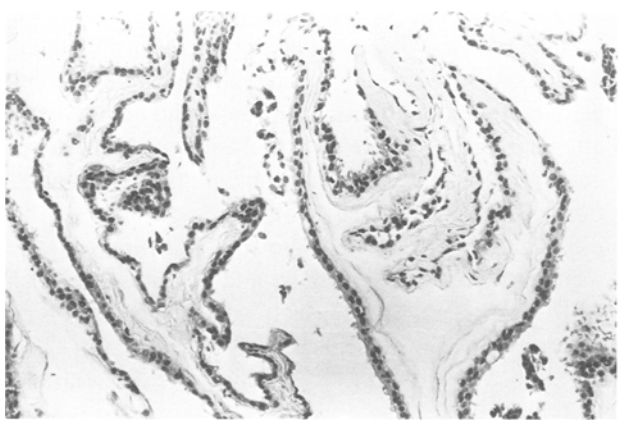


Fig. 6. Pseudostratified epithelium alterning with flat epithelium abutting against a thin connective tissue space. Case 1 (HPS × 170)

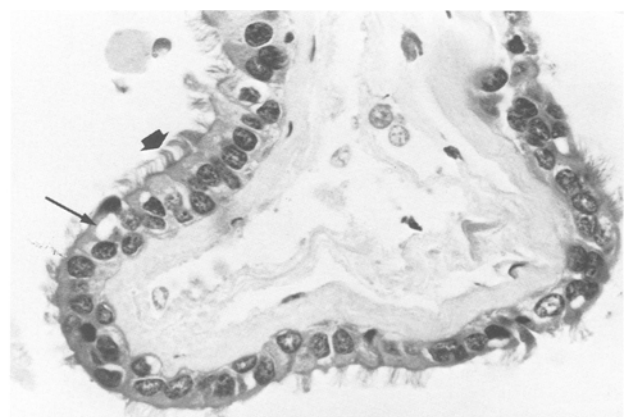


Fig. 7. The epithelial cells are cuboidal or columnar in shape, some are ciliated. A cytoplasmine vacuole is observed at the apical pole (arrow). Case 2 (HPS × 270)

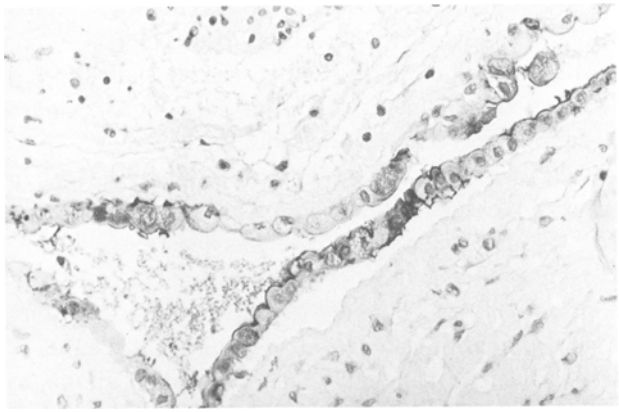


Fig. 8. Some cells are immunoreactive with anti-CEA antibody. Case × 270

ved in one of our cases. Because of the inconstant presence of CEA in these three kinds of cysts, the lack of CEA immunoreactivity is not sufficient for rejection of the diagnosis.

PAS staining is observed in RCC, NC and CC and is interesting for distinguishing these cysts from arachnoid cysts[49].

Thus, immunochemistry (CEA, Cytokeratin, GFAP) and PAS staining allows us to distinguish RCC, NC, and CC from arachnoid and choroid cysts but is not sufficient to distinguish RCC, NC and CC. This may explain the fact that some cysts located within the fourth ventricle have been reported either as "colloid cysts" or "neurenteric cysts"[1, 37, 46, 60] and other within the sella reported as "colloid cysts"[9, 48].

NC are uncommon lesions and are usually located in the posterior mediastinum[14]. In the central nervous system, some cases have been reported of an intradural spinal location leading to spinal cord compression[2, 10, 11, 42]. When these spinal cysts are associated with bony vertebral defect, diastematomyelia, anterior or posterior spina bifida, the expression "split notochord syndrome" may be used[14]. On the other hand, when the associated cutaneous, osseous and visceral abnormalities are absent, the expression "occult spinal dysraphism" is employed[14]. The endodermal origin of these cysts is well known and their pathogenesis has been discussed previously[10, 14].

Intracranial NC are rare and most often observed in the posterior fossa cisterns[7, 12, 16–19, 23, 28, 29, 32, 35, 38, 50, 53, 54]. Some cases have been described in the fourth ventricle[1, 37, 56, 60], the medulla, the pons or the cerbellum[33, 39, 41, 62]. In one case, multiple intracranial cysts were found[55]. The pathogenesis of these posterior fossa cysts is controversial:

– Shuangshoti *et al.* have suggested that they may be of ependymal or choroidal origin. This is not compatible with recent immunohistochemical studies[43, 51].

Table 1. *Immunohistochemical Findings in Rathke's Cleft Cysts, Neurenteric Cysts and Colloid Cysts Concerning GFAP, CEA and Cytokeratin*

	Gliofibrillar acidic protein			Carcino-embryonic antigen			Cytokeratin		
	Rathke's cleft cyst	Neurenteric cysts	Colloid cysts	Rathke's cleft cysts	Neurenteric cysts	Colloid cysts	Rathke's cleft cysts	Neurenteric cysts	Colloid cysts
Walls (1986)	–	0/1	–	–	–	–	–	1/1	–
Miyagi (1988)	–	–	–	–	1/1	–	–	–	–
Inoue (1988)	1/4	0/2	0/1	1/4	2/2	0/1	–	–	–
Ikeda (1988)	0/13	–	–	–	–	–	–	–	12/13
Van der Wal (1988)	-	0/1	–	–	–	–	–	1/1	–
Ho (1989)	–	0/1	–	–	1/1	–	–	–	–
Lach (1989)	–	0/1	–	–	–	–	–	0/1	–
Kondziolka (1989)	–	–	0/12	–	–	–	–	–	11/12_Kokse
Koksel (1990)	–	0/1	–	–	1/1	–	–	1/1	–
Uematsu (1990)	5/7	0/2	0/6	0/1	–	–	7/7	2/2	6/6
Yoshida (1990)	–	0/1	–	–	1/1	–	–	–	1/1
Breeze (1990)	–	0/1	–	–	–	–	–	1/1	–
Harris (1991)	–	–	–	–	–	–	–	2/2	–
Malcolm (1991)	–	0/2	–	–	–	–	–	2/2	–
Mackensie (1991)	–	0/2	0/5	–	2/2	5/5	–	2/2	5/5
Lach (1993)	2/7	0/2	0/17	2/5	0/2	4/11	7/7	2/2	21/21
Personnal cases	–	0/2	–	–	1/2	–	–	2/2	–

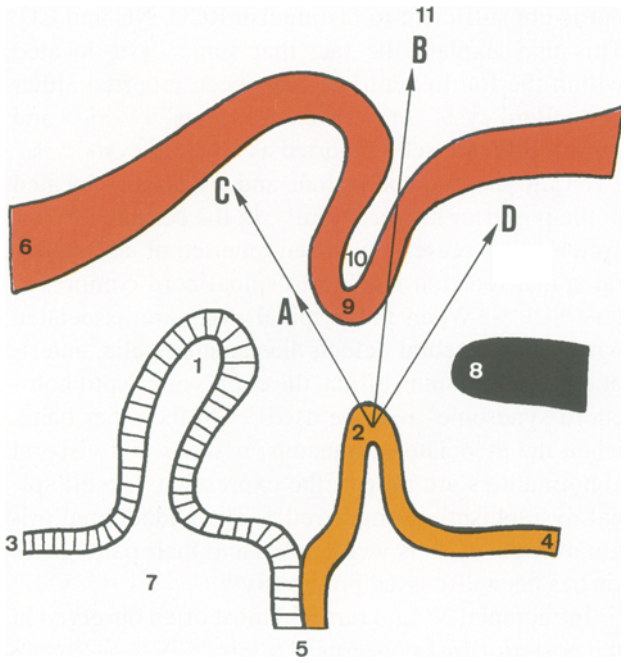


Fig. 9. Section through the diencephalic area of an embryo, 42 day old (Stage 17 of Carnegie). Figure from Auroux and Haegel[3] with personal theorie (arrows) concerning the common endodermal embryological origin of Rathke's cleft cysts, neurenteric cysts and colloid cysts. Behind the oropharyngeal membrane (*5*) the entoblast gives rise to Seesel's pouch (*2*). In the human species this pouch disappeaars in most cases. Remnants of this entoblastic diverticulum could give rise to intracranial neurenteric cysts in the sellar and suprasellar area. The final location of the remnant gives the trade name to the endodermal cyst: Arrow *A*: intrasellar neurenteric cyst (so-called Rathke's cleft cyst), Arrow *B*: intraventricular neurenteric cyst (so-called colloid cysts), Arrow *C* and *D*: suprasellar (*C* presellar, *D* retrosellar) neurenteric cyst (so-called Ectopic Rathke's cleft cyst). *1* Rahtke's pouch, *2* Seesel's pouch, *3* ectoblast, *4* entoblast, *5* oropharyngeal membrane, *6* neurectoblast, *7* stomodeum, *8* rostral end of the chord, *9* diencephalic diverticulum, *10* infundibular recess, *11* third ventricle

– D'Almeida has disscused a possible endodermal metaplasia of the ectroderm or the mesodierm[11].

– Harris *et al.* have suggested that these cysts may be derived from remnants of endoderm associated with neurectoderm during the notochord development[17] but this does not explain the dorsal location of some cysts in the cisterna magna or in the fourth ventricle[1, 16, 37, 60].

– Actually most authors considered that intracranial NC may share the same endodermal origin as spinal neurenteric cysts. According to the theory of split notochord syndrome or occult spinal dysraphism, NC could occur all along the notochord[14]. Due to the fact that the rostral part of the notochord is closed to the mesenchyma which forms the clivus, posterior fossa NC may have the same origin as intradural spinal NC[45]. However if the notochordal channel[14] or gastrulation abnormality[17] theories may explain the location of NC in the posterior fossa, they cannot explain the occurrence of suprasellar NC.

Our two reported cysts were suprasellar and in these two cases the skull base was normal. Only one case of suprasellar enteric cyst has been reported previously and the authors pointed out that "the cyst wall showed similarities with enteric epithelium rather than with classic Rathke's cleft cyst"[44]. Thirteen cases with histological and topographical features similar to ours have been reported previously. These cases have always been called "Ectopic Rathke's cleft cysts"[4, 5, 13, 26, 27, 47, 57, 58, 61]. For most authors, symptomatic RCC originate from cells which line Rathke's cleft, but this theory does not acount for RCC which are entirely suprasellar. To explain peculiar location various hypothesis have been proposed:

– Barrow *et al.* have suggested that suprasellar RCC could originate from Rathke's pouch remnants located along the pars tuberalis above the diaphragma sellae[4]. However, according to this theory, the cyst should always be adherent to the pituitary stalk and be situated in front of this structure. In some reports this was not the case (present study,[1, 5, 13, 44, 61]).

– Shuangshoti *et al.* emphasized the fact that RCC show similar pathological features than CC and proposed for both a neurectodermal origin that could explain the entirely suprasellar location of RCC[51].

– In contrast, some authors have proposed a possible endodermic origin for RCC and CC but do not make clear an exact starting point[26, 44].

In spite of disagreement concerning the precise origin of suprasellar NC, suprasellar RCC and CC (neuro-epithelial or endodermal) most authors agree on their common pathological aspects[15, 20, 33, 40]. New insights based on immunochemistry favour an endodermal origin for these three cysts[34, 37]. As we have discussed above, there is no pathological or immunohistochemical criteria for a distinction between RCC, CC and NC. It is noteworthy that these cysts can only be distinguished through their location. If these three kinds of cysts constitute the same entitiy the question arises as to where these cysts come from?

A stage 17 of Carnegie an endodermal diverticulum appears just behind the oropharyngeal membrane and in front of the rostral end of the chord[43]. The wall of this pouch, made of entoblast and called Seesel's pouch, gives rise to the adenohypophysis in inferior

vertebrates[3, 45]. In the human species, this pouch, which is composed of endodermal cells, regresses in most cases. We tentatively suggest that remnants of this Seesel's pouch may give rise to neurenteric cysts. Whether these remnants are in the suprasellar cisterna, either anterior or posterior to the infundibulum, located between the infundibulum and the Rathke's pouch or intermingled in the third ventricle, the final location and name of the neurenteric cyst will differ (Fig. 9). Like craniopharyngiomas and epidermoid cysts, which are of ectoblastic origin and can occur in the sella, in the suprasellar area or in the third ventricle[59], the neurenteric cysts of the mid-line, originating from Seesel's pouch may be located in the sella (so-called RCC), entirely suprasellar (so-called ectopic RCC or suprasellar NC) or be located in the third ventricle (so-called colloid cysts.)

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Correspondence: Henry Dufour, M.D., Service de Neurochirurgie, Prof. F. Grisoli, Hôpital d'Adultes de la Timone, Bd. Jean Moulin, F-13385 Marseille Cedex 5, France.