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Epidermoids of the Cerebellopontine Angle (cpa): Usefulness of CT Scan

By

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With 6 Figures

Summary

The AA report their experience of 8 cases of epidermoids of the cerebellopontine angle (cpa). In analyzing the various clinical, radiological and operating aspects and the results they emphasize the diagnostic pre-operative value of CT scan.

Introduction

In a previous study [18] we described the pathological anatomy, clinical features, and surgical results of dermoids and epidermoids of the central nervous system (CNS) operated on in our department. In this paper we report our experience of epidermoids of the cerebellopontine angle (cpa), and draw attention to the new prospects of computerized tomography (CT) in the preoperative diagnosis of these tumours.

Material

From December 1952 to December 1977 77 patients with embryonal tumours of the CNS (Table 1) were operated on in the Department of Neurosurgery of Rome Medical School. Tables 2, 3, and 4 summarize the clinical data, radiological data, and surgical results for the eight epidermoids located in the cerebellopontine angle.

Findings, Operations, and Results

a) Clinical History and Symptoms

Of embryonal tumours epidermoids are those most frequently found in the cerebellopontine angle, though they are nonetheless fairly rare: Zülch [31] 4.6%; Pertuiset [26] 5.5%; Gonzalez-Revilla [16]

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6.3%. Epidermoids of the cpa are tumours of adult life without sex preference. Our patients, four men and four women, were all in the third and fourth decades of life.

The clinical history and symptoms depend on the peculiar adaptability of the tumour to its surroundings [15, 23, 24, 30], in consequence of which the adjacent structures are enveloped and enclosed rather than displaced and compressed. The length of history is thus characteristically long, ranging in our series from 2 to 15 years, with the

Table 1. *Total Number of Disembryogenetic Tumours of the CNS Operated on in the Department of Neurosurgery of Rome Medical School*

Site	Epidermoids	Dermoids	Teratomas
Extradural	10	14	—
Suprasellar	2	2	2
Parasellar-Sylvian	5	—	—
Intraparenchymal	3	—	1
Intraventricular supratentorial	4	1	3
Cerebellopontine angle	8	—	—
Vermis cerebelli	—	4	—
Fourth ventricle	2	2	—
Dorsal	1	1	—
Dorsolumbar	—	6	1
Lumbar	4	—	1
	39	30	8

exception of case 4, a woman who had already been operated on elsewhere and whose recurrence symptoms were a year old. The peculiar adaptability likewise explains how it is that the early and characteristic signs are irritative symptoms rather than deficits of the fifth and seventh cranial nerves [10, 16, 22, 25]. They were present in patient 6 of our series, a woman who had suffered from violent trigeminal pain for 15 years, and in patient 7, a woman who had had facial spasm for 4 years.

None of our patients had episodes of meningism, due to rupture of the tumour capsule with leakage of cholesterol, held by some authors [3, 5, 17, 19, 27–29] to be characteristic of this oncotype.

An intracranial hypertension syndrome with headache, vomiting, and papilloedema occurred in only two of our patients (cases 1 and 3) at a late stage in the history.

In patients 2 and 8 the tumour, which was very extensive, had a supratentorial development, and in both the initial symptom was

epilepsy with a subsequent motor deficit. Patient 8 also had a deficit of the third cranial nerve on the right, which at operation was enclosed by the tumour.

Most patients present with a cerebellar syndrome and involvement of one or more nerves of the cpa (Table 2).

Table 2. *Clinical Findings*

Case	Sex	Age	Side	Clinical history in years	Symptoms
1	M	38	left	3	headache, vomiting, papilloedema, mental slowing, cerebellar ataxia
2	F	40	right	4	epilepsy, right hemiparesis, nystagmus, deficits of the 5th, 7th, and 8th cranial nerves on the right side
3	M	44	left	7	headache, papilloedema, diplopia, deficit of 8th cranial nerve on right
4	F	48	left	1	cerebellar ataxia, nystagmus, deficits of 5th, 7th, 9th, 10th, and 11th cranial nerves on left
5	M	48	right	10	cerebellar ataxia, nystagmus, right lip paresthaesias, 8th cranial nerve deficit on right
6	F	34	left	15	cerebellar ataxia, nystagmus, left trigeminal neuralgia, and left facial spasm
7	F	34	left	4	nystagmus, left facial spasm, deficits of 7th and 8th cranial nerves on left
8	M	48	right	2	left hemiparesis, diplopia, deficits of 3rd and 7th cranial nerves on right

b) Radiological Findings

Apart from patient 4, previously operated on elsewhere, all our patients underwent *X-ray examination of the petrous bones.* Only one of them, case 5, had widening of the internal acoustic meatus; nothing pathological was found in any of the other cases. This datum tallies with the findings of Lepoire and Pertuiset [22], according to whom epidermoids of the cpa, unlike meningiomas and neurinomas, rarely present bone changes.

Neuroradiological *investigations with contrast media,* such as pneumocisternography, vertebral angiography, and ventriculography, yielded generic evidence of a cpa space-occupying lesion. Only in one case did PNX show the cauliflower pattern described by other workers [5, 6, 12, 20, 27, 29].

We were able to do *CT scans* only in the last 3 cases.

In patient 6 surgery was decided on the evidence of a clear left cpa syndrome and the neuroradiological investigations (vertebral angiography and CT), which revealed a space-occupying lesion with contralateral displacement of the fourth ventricle. Actually, we had thought of an epidermoid in the preoperative period because of the signs of fifth and seventh nerve irritation and because of the length of the clinical history, but we did not give due weight to the CT finding of a hypodense area in and ventral to the left cpa.

Patient 7 came to us with a 4-year history of facial nerve spasm and hypoacusis on the left side. A CT scan done at another hospital was judged to be

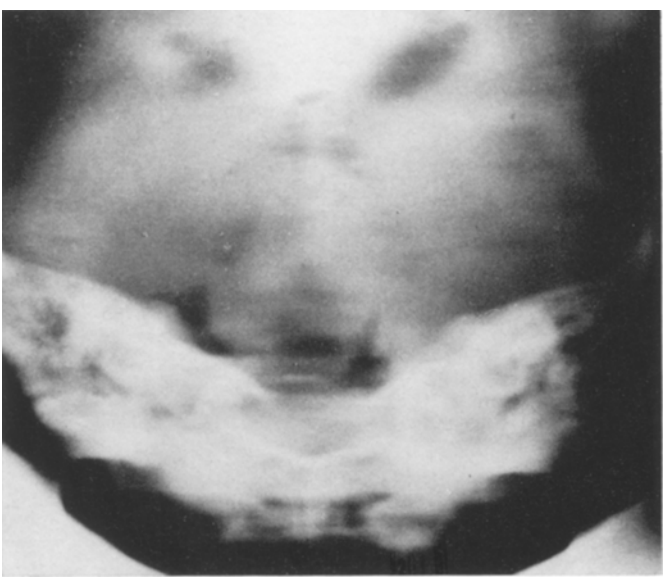
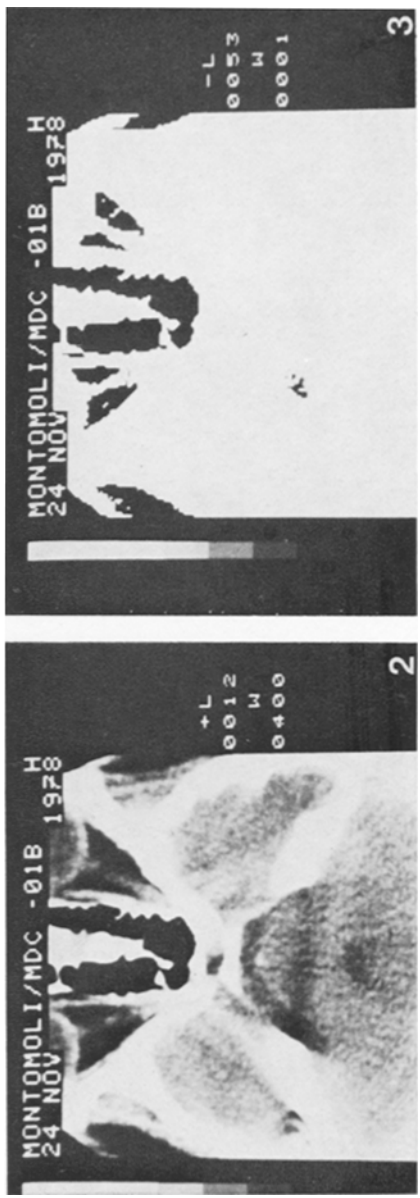


Fig. 1. No visualization of the left cerebellopontine cistern; a narrow semilunar stripe surrounds the expanding lesion

within normal limits. X-rays of the petrous bones revealed nothing abnormal, and pneumocisternography failed to visualize the left cpa cistern (Fig. 1). So it was decided to do another CT (Fig. 2), the findings of which could, at first sight, be interpreted as a modest dilatation of the left cerebellopontine cistern or even, to justify the pneumocisternographic findings, as an arachnoid cyst. After our experience with the previous patient, we did a careful densitometric study: the suspect area proved to have a lower density than cerebrospinal fluid and was typical of cholesterol [7, 8, 9, 11, 13, 21], which enabled us to arrive preoperatively at the diagnosis of epidermoid (Fig. 3).

Patient 8 came to us with a diagnosis of "glioma of the brainstem" made at another neurosurgery centre mainly on the strength of a CT scan. We repeated the examination (Fig. 4), and the density study yielded values similar to those of cholesterol. We decided to operate on the assumption that the tumour was an epidermoid. Vertebral angiography clinched the diagnosis, showing a tumour extrinsic to the brainstem (Figs. 5, 6).



Figs. 2 and 3. Area of very low coefficient of attenuation at the cerebellopontine angle: — 53 U H

c) Operating Technique

In a previous study by this school [18] the importance of total removal of the epidermoid, including the capsule to prevent recurrences, was emphasized.

Complete removal of the capsule can be exceedingly difficult in epidermoids of the cpa because of the close adhesions it forms with the nerves of the region, the brainstem, and the vascular structures. In spite of this, it must be removed as far as possible, with the aid, where necessary, of an operating microscope.

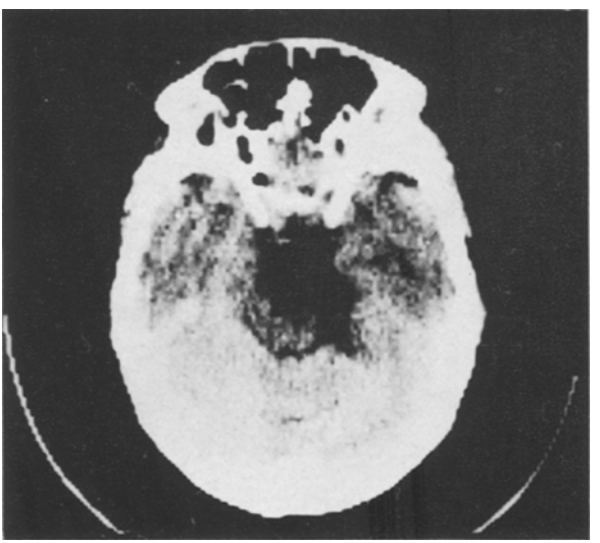


Fig. 4. Very large hypodensity in the right sellar, posterosellar, and laterosellar areas (up to the homologous cerebellopontine angle): — 50 U H

Thus, in patient 8, the last of our series, although the tumour, which was large, adhered tightly to the third, fifth, seventh, and eighth nerves, to the brainstem, and to the basilar artery, it was possible with the aid of an operating microscope to remove the capsule completely, sparing all of the nervous and vascular structures and with a very good postoperative result.

The purpose of removing the capsule completely, or as completely as possible, is not only to cut out the risk of a resumption of growth but also to prevent postoperative chemical meningitis, which can easily develop into a septic meningitis through the onset of superinfection.

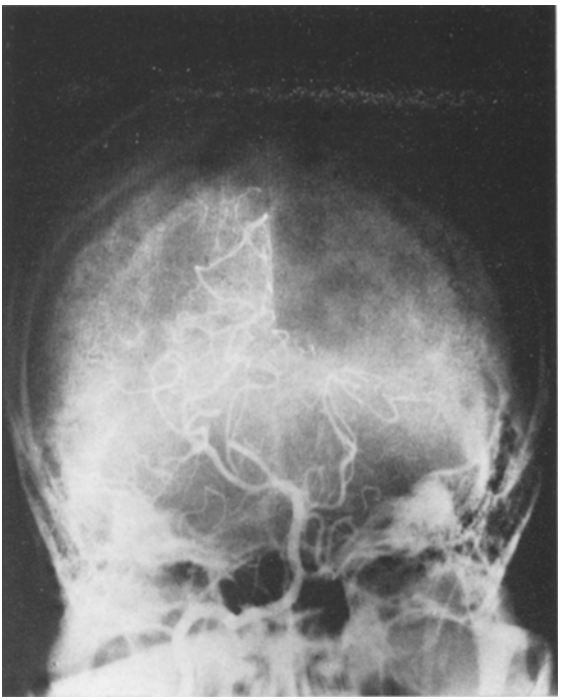


Fig. 5

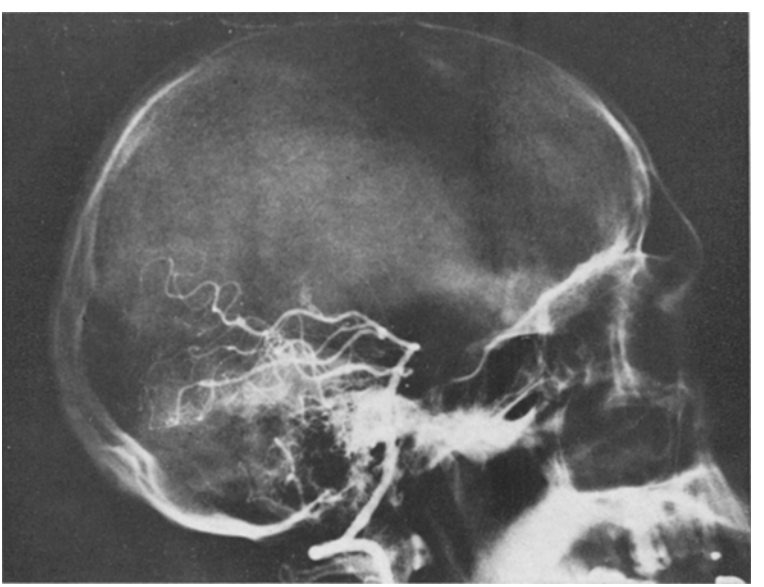


Fig. 6

Figs. 5 and 6. Posterior displacement of the basilar artery with marked lifting of the anterior superior cerebellar artery in its horizontal part

d) Late Results

Patient follow-up ranges from 1 year in patient 8 to 15 years. As Table 3 shows, the late result in 5 cases was very good with complete recovery. In one, case 5, the result may be considered good for, despite a deficit of the eigth cranial nerve on the left side, he was

Table 3. *X-Ray Findings*

Case	Plain X-rays	Ventriculography	PNX	Vertebral angiography	CT
1	normal	left cerebellar spaceoccupying lesion	—	—	—
2	normal	—	—	basilar artery displaced backward and contralaterally	—
3	signs of intracranial hypertension	left cerebellar spaceoccupying lesion	—	nothing noteworthy	—
4	normal	—	cistern of left pca not visualised. Amputation left lateral recess	—	—
5	widening of left acoustic meatus	—	amputation of left interpeduncular cistern	—	—
6	normal	—	—	unvascularised space-occupying lesion on left side	hypodense area in left pca
7	normal	—	cistern of left pca not visualised	—	hypodense area in left pca
8	normal	—	—	unvascularised space-occupying lesion in right pca	hypodense area in right pca

able to resume his normal occupation. In two cases the result was fair: the patients, although independent, were unable to return to their previous occupations.

Discussion and Conclusion

On the strength of what we have said we think that the advent of CT has made a noteworthy contribution to the preoperative diagnosis of epidermoids of the cerebellopontine angle, not always possible on the evidence of traditional radiological investigations, the

clinical history, or clinical signs. In our experience CT, and especially careful measurement of tissue density, was necessary not only for differentiation from neurinomas and meningiomas, whose CT patterns differ greatly from those of epidermoids, but also from other diseases, which, though rare, may still be found at cpa level and whose hypodensity characteristics can make differentiation from epidermoids difficults. We refer mainly to arachnoid cysts of the cpa [2] (Zülch [31]: 1.2% of all pathology of the area) and intrinsic CNS lesions invading the angle secondarily.

Table 4. *Surgical Results*

Case	Extent of removal	Postoperative complications	Result
1	total	aseptic meningitis	very good
2	partial	—	fair
3	partial	aseptic meningitis	fair
4	total	—	very good
5	total	—	good
6	total	—	very good
7	total	—	very good
8	total	—	very good

Patients 7 and 8 illustrate these difficulties of diagnosis. In patient 7 the PNX and CT findings could lend themselves to a misdiagnosis of arachnoid cyst, but the densitometric values were lower than those proper to the CSF of arachnoid cysts [1, 4], and so pointed to a collection of cholesterol.

Still more important, as shown in patient 8, is the possibility of differentiating between epidermoids of the cpa, extrinsic tumours that can be dealt with by radical surgery, and secondaries invading the angle from other sites, through a careful density study. In this patient the density values were the first evidence that enabled us to correct the diagnosis of intrinsic tumour and think in terms of an extrinsic tumour of embryonal origin.

References

1. Anderson, F. M., Segall, H. D., Caton, W. L., Use of computerized tomography scanning in supratentorial arachnoid-cysts. A report on 20 children and 4 adults. J. Neurosurg. *50* (1979), 333—338.
2. Averbach, P., Developmental arachnoid cysts of the posterior fossa. An analysis of 13 cases. Acta Neurochir. (Wien) *39* (1977), 181—186.

3. Bailey, P., Cruveilhier's "tumeurs perlées". Surg. Gynec. Obstet. *31* (1920), 390—401.
4. Banna, M., Arachnoid cysts on computed tomography. Am. J. Roentgen. *127* (1976), 976—982.
5. Brihaye, J., Mage, J., Martin, P., Kystes épidermiques crâniens. Acta Neurol. Belg. *8* (1958), 557—596.
6. Childe, A. E., Young, A. W., Pneumographic diagnosis of intraventricular epidermoid, report of a case. Radiology *48* (1947), 56—60.
7. Chambers, A., Lukin, R., Tomsich, T., Cranial epidermoid tumors, diagnosis by computed tomography. Neurosurg. *1* (1977), 276—280.
8. Constant, P., Diagnosis of tumors of the posterior fossa using a "total body". J. Neuroradiol. *3* (1976), 245—256.
9. Cornell, S. H., Graf, C. J., Dolan, K. D., Fat-fluid level in intracranial epidermoid cyst. Am. J. Roentgen. *128* (1977), 502—503.
10. Dandy, W. E., Surgery of the brain, in: Practice of surgery, Vol. XII (Lewis, D., ed.). Hagerstown, Md.: W. F. Prior. 1945.
11. Davis, K. R., Roberson, G. H., Taveras, J. M., New, P. F., Trevor, R., Diagnosis of epidermoid tumor by computed tomography. Radiology *119* (1976), 347—353.
12. Dyke, C. G., Davidof, L. M., Encephalographic appearance of intraventricular epidermoid. Bull. Neurol. Inst. N. Y. *6* (1937), 489—493.
13. Fawcitt, R. A., Isherwood, I., Radiodiagnosis of intracranial pearly tumors with particular reference to the value of computed tomography. Neuroradiology *11* (1976), 235—242.
14. Fohanno, D., Les neurinomes du nerf acoustique. Etude diagnostic et thérapeutique (a partir de 70 observations). Thèse, Paris, 1967.
15. François, J., Hoffmann, G., Van der Eecken, H., *et al.*, Cholestéatomes perlés intracrâniens, angle ponto-cérébelleuse et région optochiasmatique. Acta Neurol. Belg. *8* (1958), 682—698.
16. Gonzalez-Revilla, A., Tic douloureux and its relationships to tumors of posterior fossa. Analysis of 24 cases. J. Neurosurg. *4* (1947), 233—239.
17. Guidetti, B., Corradi, M., Riccio, A., Le cisti epidermoidi del cranio e del nevrasse. Lav. Neuropsich. *24* (1953), 3—111.
18. Guidetti, B., Gagliardi, F. M., Epidermoid and dermoid cysts. J. Neurosurg. *47* (1977), 12—18.
19. Keville, F. J., Wise, B. L., Intracranial epidermoid and dermoid tumors. J. Neurosurg. *16* (1959), 564—569.
20. Krieg, W., Aseptische Meningitis nach Operation von Cholesteatomas des Gehirns. Zentralbl. Neurochir. *1* (1936), 79—86.
21. Laster, D. W., Moody, D. H., Ball, M. R., Epidermoid tumors with intraventricular and subarachnoid fat report of two cases. Am. J. Roentgen. *128* (1977), 504—507.
22. Lepoire, J., Pertuiset, B., Les kistes épidermoides cranio-encéfaliques. Paris: Masson et Cie. 1957.
23. Moscatelli, G., Gagliardi, F. M., Epidermoidi, dermoidi e teratomi. Lav. Neuropsich. *43* (1968), 1—63.
24. Obrador, S., Lopez-Zafra, J., Clinical features of the epidermoids of the basal cisterns of the brain. J. Neurol. Neurosurg. and Psychiatr. *32* (1969), 450—454.
25. Olivecrona, H., Cholesteatomas of the cerebello-pontine angle. Acta Psychiatr. Scand. *24* (1949), 639—643.

26. Pertuiset, B., Les neurinomes de l'acoustique. Neurochirurgie *16* (1970), suppl. 1.
27. Peyton, W. T., Baker, A. B., Epidermoid, dermoid and teratomatous tumors of the central nervous system. Arch. Neurol. Psychiatry *47* (1942), 890—917.
28. Rand, C. W., Reeves, D. L., Dermoid and epidermoid tumors (cholesteatomas) of the central nervous system, report of 23 cases. Arch. Surg. *46* (1943), 350—376.
29. Tan, T. I., Epidermoids and dermoids of the central nervous system (with two exceptional cases not represented in the literature). Acta Neurochir. *26* (1972), 13—24.
30. Ulrich, J., Intracranial epidermoid. A study on their distribution and spread. J. Neurosurg. *21* (1964), 1051—1058.
31. Zülch, K. J., Die Hirngeschwülste in biologischer und morphologischer Darstellung. Leipzig: Johann Ambrosius Barth. 1951.

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