Acta Neurochir (Wien) (1994) 127: 48–54

Acta Neurochirurgica

Tectal Plate Gliomas
Part II: CT Scans and MR Imaging of Tectal Gliomas

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Summary

CT scans and MR images were analized in 12 patients with histologically proved tectal plate gliomas. In an attempt to identify the nature of these lesions, their radiological characteristics were correlated with the histological results.

In four of our patients CT scan failed to show the tumour. MR imaging demonstrated the tectal distorsion in all cases. Contrast enhancement, calcification, cystic portions, exophytic nature were observed in both high and low-grade gliomas.

We conclude that in the case of intrinsic tectal tumours, the most probable diagnosis is that of low-grade astrocytoma while in the case of exophytic tectal tumours, the differential diagnosis from pineal region tumour is required and a histological verification is necessary.

Keywords: CT; MRI; tectal plate astrocytoma.

Introduction

With the advent of MR imaging the tectal plate can be accurately evaluated. Limited changes of its normal architecture can be detected. If MR anatomy of the aqueduct and the normal tectal plate is already well known, the neuroradiological differential diagnosis between the lesions involving this region is still difficult[1]. There is a wide variety of pathological diagnoses in this anatomical region and only a limited number of series published in the literature.

Among the tumours, the most common is the astrocytoma but one should be concerned about other possibilities such as oligodendroglioma, ependymoma, ganglioglioma, medulloblastoma, primitive neuro-ectodermal tumours, metastases, and other lesions such as vascular malformation (angioma, cavernoma) abscess, hamartoma, granulomatous disease, and periaqueductal gliosis[1–15].

This report describes the neuroradiological findings of 12 tectal plate gliomas. All were histologically confirmed.

Materials and Methods

Patients Characteristics

Tectal plate gliomas were diagnosed in 12 patients over a 15-year period (1977–1992). The clinical summaries of our patients are given in Table 1 of part I of this publication [see Acta Neurochir (Wien) 126: 76–83].

Neuro-Imaging

All patients underwent serial CT scans. 9 patients had pre-operative MR scans. MR imaging, at our institution, was obtained on a 1.5 T whole body system (Siemens, Erlangen, Germany) by using spin-echo sequences 500/26 ms (TR/TE) and 2 600-90 ms (TR/TE).

Repeat T 1-weighted images were obtained after infusion of contrast agent in 5 cases. All the lesions were surgically removed at least partially, and pathological examination was performed. Neuroradiological and pathological findings are summarized in Table 1 of this part of the publication.

Results

CT scan: demonstrated hydrocephalus in all cases. It showed abnormalities of the quadrigeminal plate in 7 cases (Table 1). In case 3, CT scan failed to show the tumour but pneumoencephalography showed the tumoural compression of the aqueduct. In 3 recent cases (case 1, 11, and 12) MRI performed after negative CT scan revealed a tumoural lesion.

One patient (patient 5) was followed-up for supposed congenital aqueductal stenosis for 4 years. The first scan was performed in 1979 and the tectal tumour was not seen. In 1981 this patient underwent a new CT scan examination showing a tumour with a cystic component and a rim of contrast enhancement.

Tectal calcifications were present in 3 lesions. Focal

Table 1. *Summary of Neuroradiological Findings*

Patient no.	Age/Sex	CT-scan				MRI			Localization			Pathology (grade)
		Tumour	Cy	Ca	CE	T1	T2	CE	Tegmentum	Tectum	Exophytic	
1 AE 47 439	11/F	not seen	–	–	–	iso SI	hyper SI	0	+	+	–	ord. astroc. grade II
2 W 29 952	11/F	+	–	+	+	0	0	0	–	+	–	juvenile type astroc.
3 S 21 986	12/F	not seen	–	–	–	0	0	0	–	+	–	ord. astroc. grade I
4 AE 47 922	13/F	+	–	–	–	hypo SI	hyper SI	+	–	+	+	juvenile type astroc.
5 AD 45 751	15/F	1978: not seen = cas 1982: +	+	–	+ ring like	0	0	0	–	+	+	oligod. grade A
6 AD 46 706	17/M	+	–	+	–	hypo SI	hyper SI	0	+	+	+	ord. astroc. grade III
7 AC 44 395	23/M	+	+	–	+	hypo SI	hyper SI	+	–	+	+	oligo-astroc. grade I
8 AC 45 046	24/F	+	–	–	+	hypo SI	hyper SI	0	–	+	+	ependymoma grade II
9 AE 47 718	31/F	+	+	–	–	hypo SI	hyper SI	+	–	+	+	ord. astroc. grade III
10 AE 48 084	34/M	+	–	+	+	iso SI	hyper SI	–	–	+	–	juvenile type astroc.
11 AE 48 433	12/F	not seen	–	–	–	iso SI	hyper SI	+	–	+	–	juvenile type astroc.
12 AF 48 910	8/M	not seen	–	–	–	iso SI	hyper SI	+	–	+	–	juvenile type astroc.

ICP intracranial pressure; *Cy* cyst; *Ca* calcification; *CE* contrast enhancement; *SI* signal intensity; *cas* initial diagnosis of congenital aqueductal stenosis.

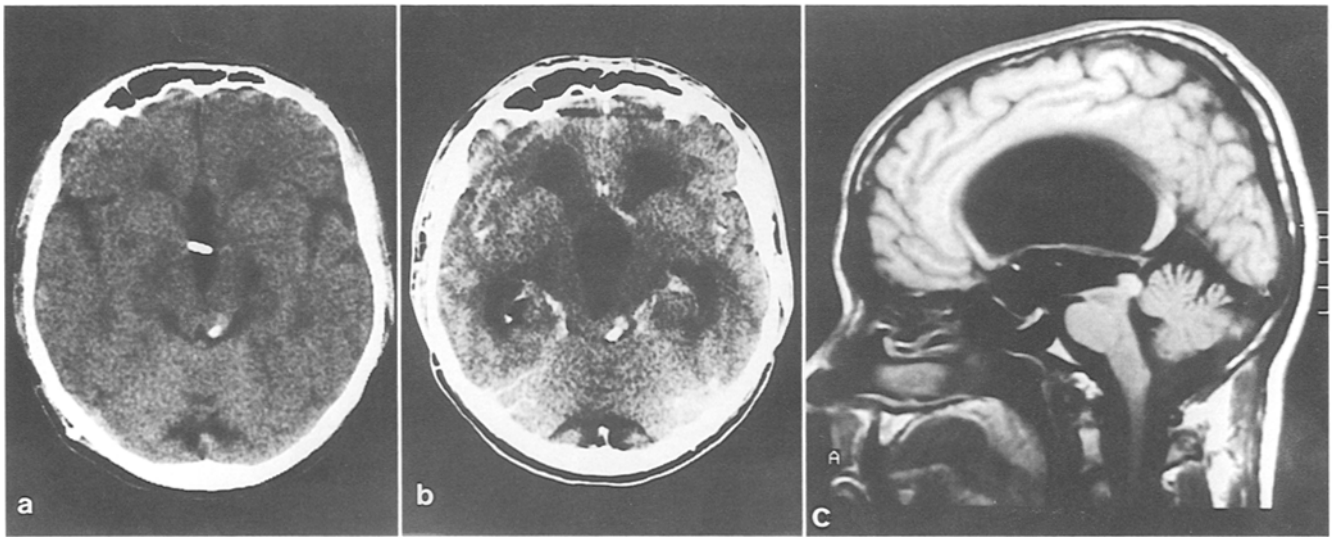

Fig. 1 Case 10. Intrinsic tectal juvenile type astrocytoma. (a) Axial unenhanced CT scan shows tectal calcification on the left side of the tectal plate. (b) Post injection axial CT scan shows focal enhancement around the calcified area. (c) Sagittal T 1-weighted image (SE 450/25) shows tectal distorsion by an intrinsic tectal tumour

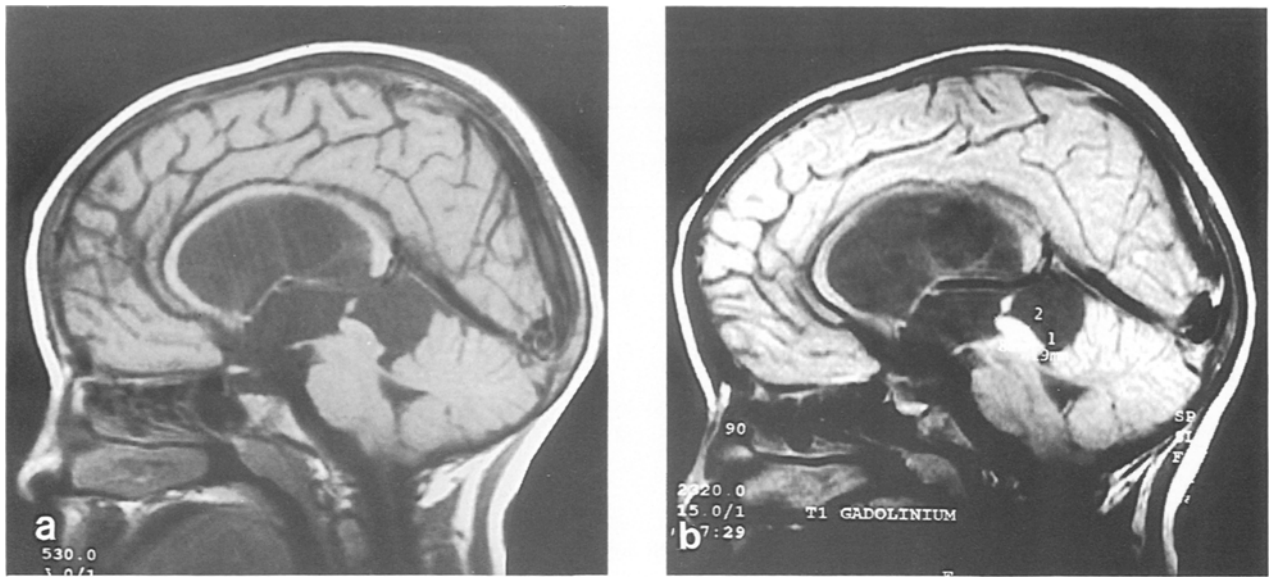

Fig. 2. Case 12. Intrinsic tectal juvenile type astrocytoma. (a) Sagittal SE 530/15 image reveal an elongation of the tectal plate by an arachnoid cyst. (b) Sagittal SE 2320/15 image after infusion of Gd-DTPA shows the length (19 mm) and thickness (8 mm) of the enhancing tumour

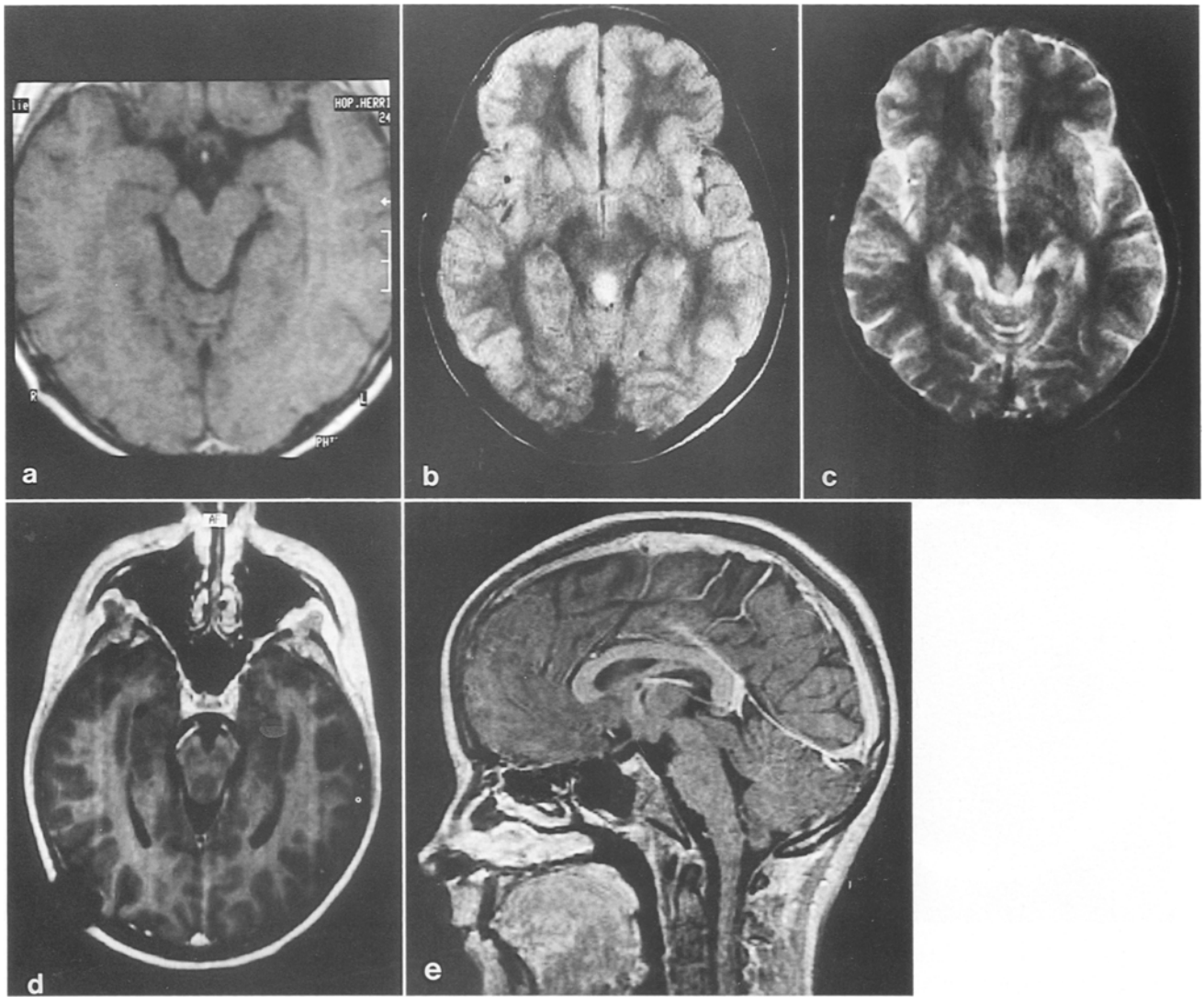

Fig. 3. Case 11. Intrinsic tectal juvenile type astrocytoma. (a) Axial SE 500/20 image shows slightly hypo-intense lesion in the tectum. (b) Axial SE 2620/50 image shows hyperintense tectal lesion. (c) Axial SE 2620/15 image shows hyperintense tectal lesion. (d) Two-dimensional axial image obtained with three-dimensional FISP imaging (TR/TE : 40/5) shows hypo-intense tectal lesion. (e) Two-dimensional sagittal image obtained with three-dimensional FISP imaging (TR/TE : 40/5) shows localized hypo-intense tectal lesion

enhancement of the tumour on post injection scan was seen in 5 patients (Fig. 1). A cystic component was found in 3 patients.

MR imaging: MR examinations were performed in 9 patients. The tectal distorsion was demonstrated in all cases and allowed the diagnosis of tectal tumour (Fig. 1).

In all cases of localized tectal tumours, thickness and/or length of the quadrigeminal plate were found to be above the 7 mm and 17 mm confidence level[1] (Fig. 2).

On T 1-weighted sequence the lesion appeared to be iso or hypo-intense with the corpus callosum. Post-contrast MR examinations were performed in 5 patients and showed contrast enhancement in all of them. Increased tectal intensity on T 2- weighted images was present in every case (Fig. 3).

In 6 cases the lesion was exophytic (Fig. 4) while in two cases tegmental infiltration was observed (Fig. 5). In five cases the tumour was localized in the tectal plate without any surrounding invasion. Oedema was difficult to evaluate, but was clearly seen in one case on the T 2-weighted sequence (Fig. 6). Pathological diagnosis revealed low-grade astrocytoma in 7 cases, high-grade astrocytoma in 2 cases, oligodendroglioma once, oligoastrocytoma once, and ependymoma once.

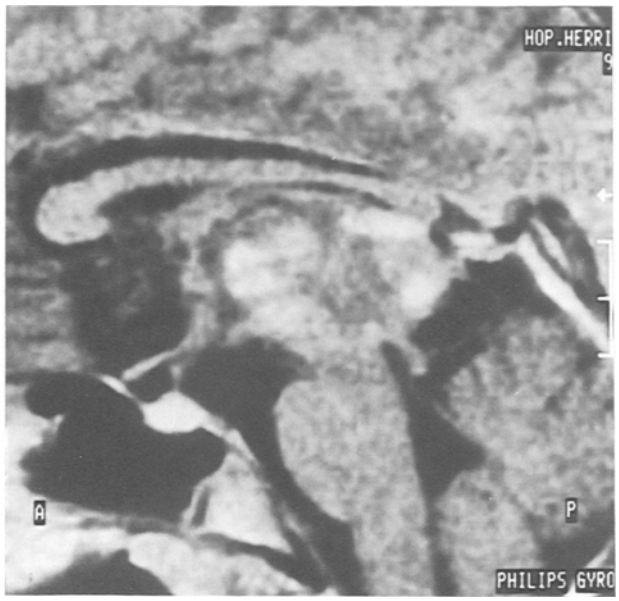

Fig. 4. Case 4. Exophytic tectal juvenile type astrocytoma sagittal SE 520/20 image shows heterogeneous pineal mass

Discussion

There have been several reports depicting evaluation of mesencephalic tumours using CT scan, CT cisternography, or CT ventriculography[16–18].

In 4 of our patients, the tumour was visualized on MR images but not on CT scan. Several authors[3, 7] reported CT scan failure to visualize peri-aqueductal tumours. They concluded that MR imaging should be the investigation of choice in cases of late-onset aque-

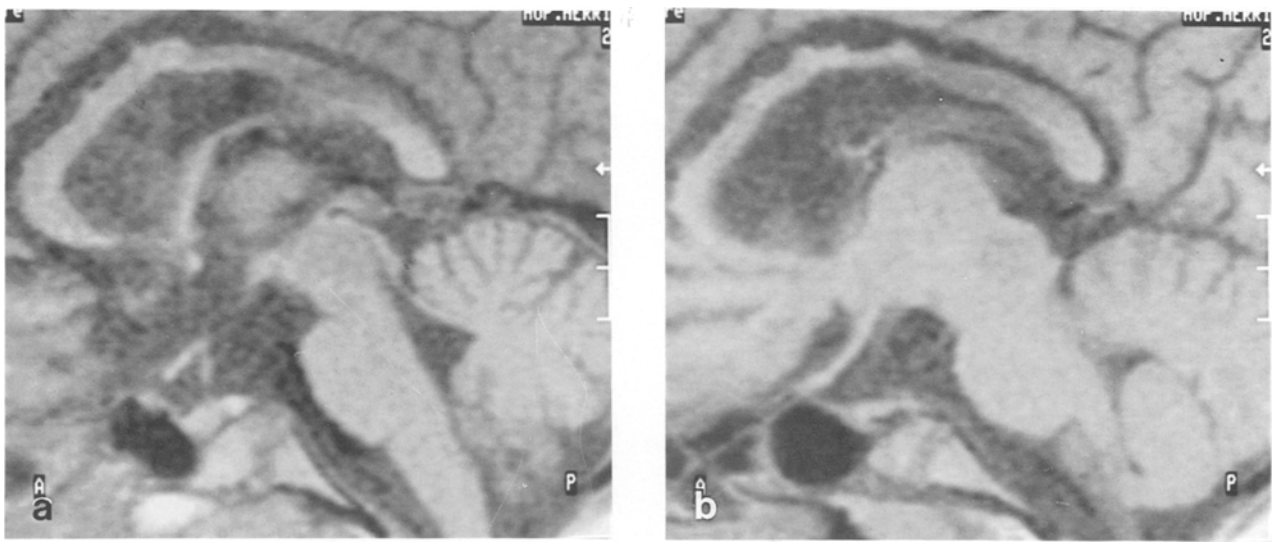

Fig. 5. Case 1. Tectal astrocytoma infiltrating the tegmentum (grade II). (a) Sagittal SE 500/20 image shows hypo-intense tegmental lesion. (b) Paramedian sagittal SE 500/20 image shows involvement of the tectal plate

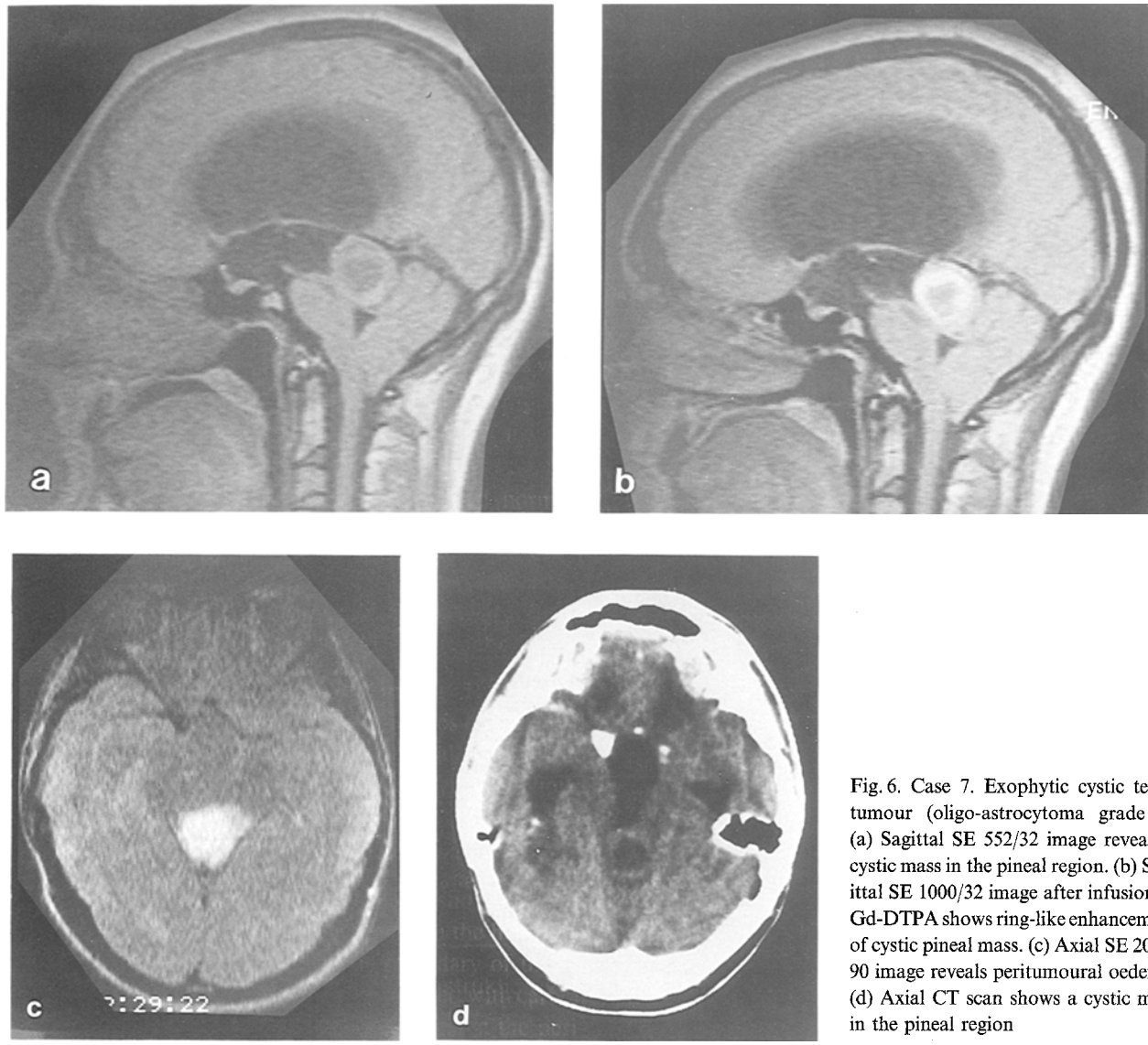

Fig. 6. Case 7. Exophytic cystic tectal tumour (oligo-astrocytoma grade I). (a) Sagittal SE 552/32 image reveals a cystic mass in the pineal region. (b) Sagittal SE 1000/32 image after infusion of Gd-DTPA shows ring-like enhancement of cystic pineal mass. (c) Axial SE 2000/90 image reveals peritumoural oedema. (d) Axial CT scan shows a cystic mass in the pineal region

ductal obstruction. The administration of gadolinium in such cases may be helpful.

Since Steinbock reviewed 32 cases in 1987, we found 30 more tectal plate lesions in the literature but only 14 pathologically confirmed[1, 4, 6–8, 15, 19].

We analysed the neuro-imaging characteristics of our 12 patients (all were histologically confirmed). The diagnosis of mesencephalic tumours was obvious in both ventrally infiltrating or dorsally exophytic tumours. In the latter, the diagnosis was much more confusing because of similar radiological patterns to some pineal tumours (Fig. 7). The histological type of these largest tumours were juvenile type astrocytoma, oligo-astrocytoma, ependymoma, and astrocytoma grade III.

The main difficulty is to differentiate benign from tumoural aqueductal stenosis with MR imaging in case of intrinsic tectal gliomas.

The major pattern is bulbous localized masses with potential aqueductal obstruction at any localization. A prolonged T2 relaxation time compared with normal brain tissue was observed in all of our cases. Enhancement after Gadolinium injection was independent of tumour grading.

High and low-grade astrocytomas can have both exactly the same MRI and CT appearance: we reported four patients with astrocytoma grade I and two grade III. Contrast enhancement, calcification, cystic portions, exophytic nature were observed in these two pathological groups. May *et al.* have identified a specific group of "benign intrinsic tumours" on the basis of tectal calcification, lack of contrast enhancement

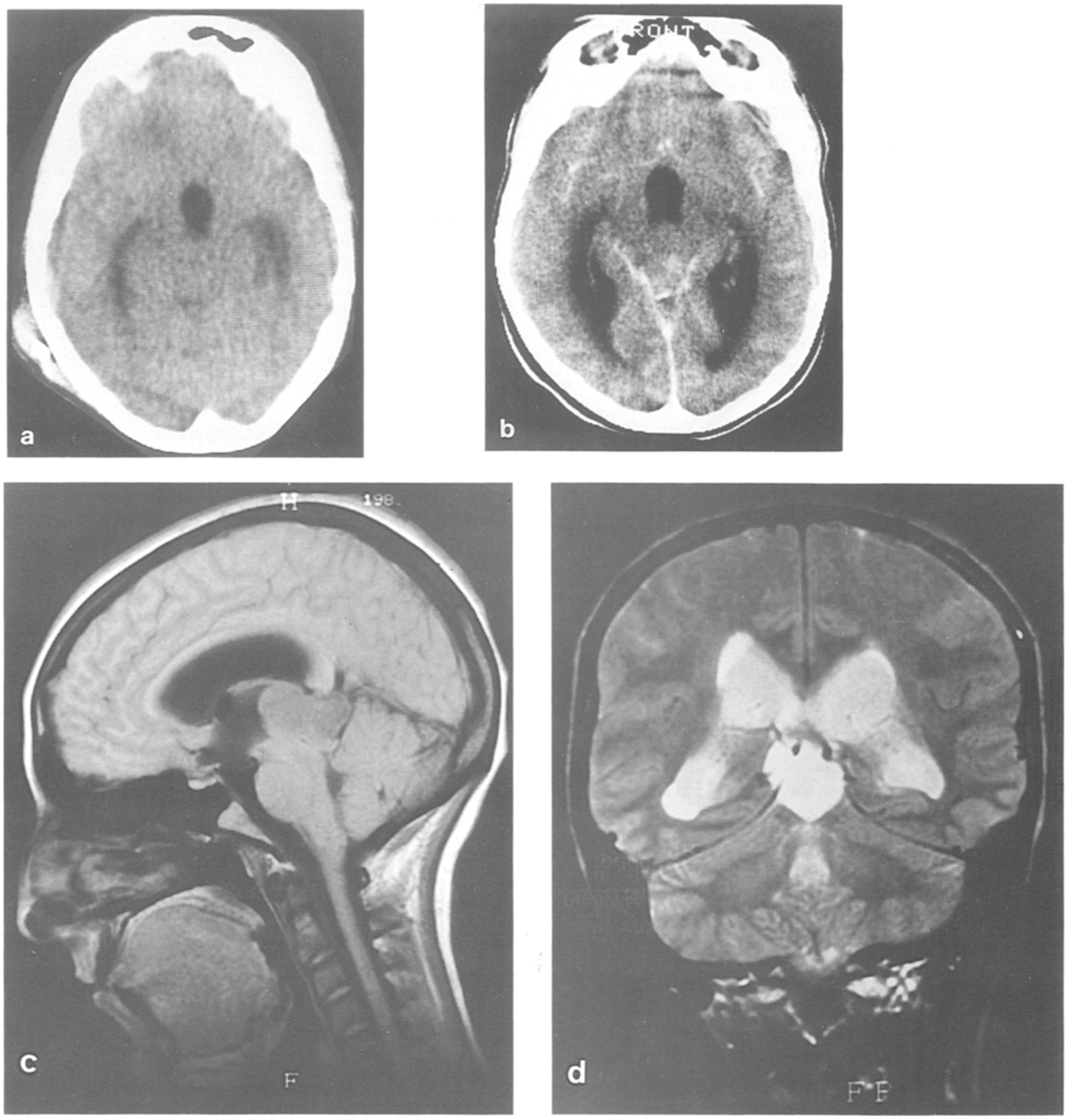

Fig. 7. Case 8. Exophytic tectal tumour. Ependymoma grade II. (a) Axial CT scan shows tumoural mass in the pineal region. (b) Axial post contrast CT scan shows enhancing tumour in the pineal region. (c) Sagittal SE 400/14 image shows hypo-intense lobulated mass in the pineal region. (d) Coronal SE 2000/100 image shows hyperintense mass in the pineal region

increased signal intensity on T 2-weighted images and no evidence of progression in the follow-up period[19].

Juvenile type astrocytoma can be an intrinsic tectal tumour but can exhibit an exophytic component. In one patient with astrocytoma II, MRI showed tegmental infiltration. This suggests the possibility of growth in low-grade tumours. The different patterns encountered could correspond to different steps of evolution of a unique tumoural type. It is well known from the literature that a low-grade astrocytoma can give spinal metastases[8, 20, 22].

Unfortunately we have to conclude that these ra-

diological parameters cannot predict the histological nature of the tumours.

We have never seen a high-grade astrocytoma strictly limited to the tectal plate. All but one case of low-grade astrocytomas were purely intrinsic. This fact leads us to think that the most valuable benign character of a tectal tumour is its size. In case of intrinsic tumour, MRI follow-up seems to be justified. Chapman *et al.* described 8 cases of indolent gliomas of the tectal plate: five of them were operated on, demonstrating low-grade astrocytomas[4]. He also proposed a serial MR follow-up of intrinsic gliomas.

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