Presentation and management of parasellar and suprasellar metastatic mass lesions

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SUMMARY Ten patients with parasellar metastatic lesions presented with insidious painful or painless ophthalmoplegia. Visual loss secondary to a chiasmal syndrome was identified in three of them. A mass lesion was demonstrated by CT scan with precise outlining of the location and size of the lesion. Symptomatic relief was achieved with local radiotherapy in those patients who had early diagnosis.

The clinical manifestations of parasellar and suprasellar lesions are so characteristic that their constellation of symptoms and signs has a localising value.¹ Although the great majority of mass lesions in these areas represent expanding pituitary tumours, other intracranial neoplasms and a variety of non-neoplastic conditions can also be found.² Metastatic tumours involving the parasellar and/or suprasellar regions are relatively infrequent.³⁻⁵ We report our experience with such lesions accumulated over the past four years. The anatomical and oncological aspects of these lesions have been discussed previously.⁶⁻⁹ The main purpose of this paper is to provide greater information about the CT findings and to emphasise the favorable effects of radiotherapy observed in our patients.

Materials and methods

In a period of four years ten patients presented between 1979 and 1982 with neuroophthalmologic complaints (table 1) including painful or painless diplopia and/or insidious visual loss. The mean age was 59 years. Five were men and five were women. Eight of these patients were known to have systemic malignancy and had evidence of disseminated metastatic disease at the time that parasellar or suprasellar lesions were identified (table 2). In two patients the intracranial lesion was the first manifestation of the neoplasm and the diagnosis was made after the biopsy of the mass.

In the majority of the patients clinical examination

revealed oculomotor signs (table 1). The simultaneous ipsilateral paralysis of IIIrd and VIth nerves suggested cavernous sinus involvement in three cases; likewise, painful ophthalmoplegia in two additional cases was also consistent with a cavernous sinus lesion. A chiasmal syndrome and ophthalmoplegia were seen in one patient as an early manifestation of the tumour. Nonspecific painless diplopia occurred in three patients. Finally, one patient with diabetes insipidus presented with a painful Horner's syndrome.

Visual fields were tested in eight patients, as part of their initial examination. In seven no abnormalities were found; the other patient had bitemporal superior field depression. At a later date, two patients developed bitemporal visual field defects identified by confrontation. Formal visual field testing was not possible due to their systemic debilitation.

Radiological studies included computed tomography (CT scan) obtained with a Phillips TomoScan 310 in nine patients. All CT scans were obtained after the infusion of 300 ml of meglumine diatrizoate (Hypaque 60%) administered over a period of five minutes. The scan sequence included four to six 1.5 mm thick transverse and coronal tissue sections with visualisation of the sella turcica and the suprasellar cistern. The CT scan showed a uniformly enhancing mass lesion in eight patients (table 1). The area of enhancement was round or triangular in shape and occupied the entire cavernous sinus in the majority of cases (fig 1). In one patient the lesion involved both the cavernous sinus and the suprasellar cistern. The size of the lesion was best demonstrated by coronal cuts in all patients.

The CSF was examined by lumbar puncture in eight patients in whom the diagnosis was initially uncertain; the results are summarised in table 3. A twofold increase in the level of protein content of the cerebrospinal fluid (CSF) was common, the glucose levels were normal, and the cytology was negative except in one patient with associated carcinomatous meningitis. A cisternal tap was performed in one patient in an effort to establish a diagnosis. The cisternal fluid protein content was increased over the protein level measured in the lumbar spinal fluid. Other para-

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Table 1 Neurophthalmological and CT scan results

Patient	Symptoms	Examination	Initial Ct scan
I	Painful ophthalmoplegia	Left lateral rectus palsy	Parasellar mass
II	Painful ophthalmoplegia	Right lateral rectus palsy and hemifacial spasm	Parasellar mass
III	Painless ophthalmoplegia	Left incomplete IIIrd and VIth nerve palsies	Parasellar mass
IV	Painless ophthalmoplegia and binocular visual loss	Bitemporal superior quadrantsopia and left IIIrd nerve palsy	Large suprasellar and parasellar mass
V	Painless diplopia	Right lateral rectus palsy	Parasellar mass
VI	Painless diplopia	Right lateral rectus palsy	Parasellar mass
VII	Painful diplopia	Right IIIrd and VIth nerve palsies	Parasellar mass
XIII	Painful diplopia	Horner's syndrome	Not done
IX	DI and ptosis of left eye	Bilateral VIth nerve and right Vth nerve palsy	Normal
X	Painless diplopia	Left IIIrd and VIth nerve paresis	Parasellar mass

meters were normal.

Surgery, was performed in two patients without known primary malignancies. The diagnosis was established by the biopsy results. In seven patients with known primary extracranial malignancies, the diagnosis was made on the basis of the clinical and neurooentgenologic findings. In the remaining two patients with terminal cancer, the diagnosis was confirmed following necropsic examination.

Eight patients received radiation therapy to the brain or parasellar region for palliation of symptoms (table 2). Five were treated with whole brain radiation by opposed lateral fields. Total doses ranged from 2900–4000 rad in 200–300 rad fractions administered five times per week. Two patients received additional 1000 rad boosts to the sellar, suprasellar, and parasellar regions. Two patients were treated with more limited radiation fields. One had previously received radiation therapy for nasopharyngeal carcinoma. When disease recurred in the parasellar region, radiation therapy was administered by 180° arc to the cavernous sinus to a total dose of 3960 rad, followed by a 1000 rad boost. An additional patient with a recurrence of a salivary gland tumour received 4400 rads to the base of the brain by opposed lateral fields. Radiation therapy records were not available for review in one patient.

Among eight patients treated, seven demonstrated significant clinical improvement (table 2). The pain resolved almost immediately and the ophthalmoplegia subsided within two to three weeks after the initiation of treatment. CT scans after radiation were obtained in three of the

improved patients, in one of whom the CT showed disappearance of the tumour mass and in the other two the size of the lesion, the local mass effect, and degree of enhancement were decreased. Although nine of the patients in this series died in an average of nine months after the initial ocular signs, it is our opinion that the quality of their lives was substantially improved with treatment.

Discussion

While intrasellar pituitary metastases are not uncommon findings in necropsy or hypophysectomy specimens in patients with systemic malignancy,^{2,13} symptomatic metastatic lesions involving parasellar or suprasellar structures are infrequent.^{2,8} Metastatic lesions in this area probably start as a mass placed lateral to the sella turcica; however, rapidly invasive tumours in any location near the sella in left untreated can involve the suprasellar and parasellar spaces in addition to the pituitary gland and possibly the hypothalamus, as illustrated in three of our patients (fig 2A, B).

Ophthalmoplegia was the cardinal manifestation of intracranial involvement in our patients and was associated with signs and symptoms strongly suggestive of cavernous sinus involvement.¹ Among the different causes of ophthalmoplegia to be consi-

Table 2 General clinical data in 10 patients with suprasellar and parasellar metastatic lesions

Patient	Age (yr)	Sex	Primary tumour	Interval* between diagnosis and metastases	Other systemic metastases	Additional CNS lesions	Results of treatment
I	51	F	Lymphoma	28 mo.	+	—	Unknown
II	61	M	Nasopharyngeal cancer	51 mo.	—	Hemifacial spasm	Improved
III	74	M	Cancer of salivary gland	12 yr.	+	—	Improved
IV	69	F	Lung	Initial presentation	+	—	Improved
V	38	F	Breast	4 yr.	+	Lumbar epidural metastases	Resolved
VI	70	F	Nasopharyngeal	Initial presentation	+	—	Resolved
VII	50	M	Thyroid cancer	12 mo.	—	—	Improved
VIII	47	F	Breast	3 yr.	+	+	Not treated
IX	57	M	Colon	2 yr.	+	+	Not treated
X	71	F	Breast	18 mo.	+	Carcinomatous meningitis	Improved

*Interval between initial diagnosis and signs fo parasellar and/or suprasellar involvement.

Fig 1 Coronal views of contrast-enhanced CT scan of the brain. The arrows point to a large right-sided parasellar mass lesion in a patient with ophthalmoplegia and primary anaplastic carcinoma of the thyroid.

dered in patients with systemic malignancy (table 4), leptomeningeal carcinomatosis is probably the most frequent; up to 70% of patients with carcinomatous meningitis¹⁴⁻¹⁸ had extraocular muscle palsies. Increased intracranial pressure, opportunistic meningeal infections,¹⁹⁻²³ metastatic lesions in the brainstem or other locations within the base of the skull such as the clivus, the petrous apex, and the orbits should be considered as well. Theoretically, ophthalmoplegia in patients with cancer can be a complication of radiation therapy;²⁴ however, this has not been confirmed by any specific report to date. Chemotherapy can occasionally cause diplopia which is usually mild and reversible. Paresis of convergence has been described with 5-fluorouracil.²⁵

While upper eyelid ptosis is frequent in patients with vincristine neuropathy, ophthalmoplegia is not as frequent. Among twenty subjects treated with vincristine by Albert, Wong, and Henderson, individual extraocular muscle palsies and ptosis developed in thirteen patients; five of whom had lateral rectus paresis;²⁶ the ophthalmoplegia in their cases was dose-related and reversible after discounting the drug. Superior oblique paresis was reported in 10% of leukaemic patients treated with vincristine.²⁷

In this series two patients had nasopharyngeal carcinomas; the importance of a thorough ENT examination in patients with progressive or painful ophthalmoplegia cannot be overemphasised.²⁸⁻²⁹ Third nerve palsy with misdirection of fibres was not seen in any of our patients during the period of observation. Formal endocrine studies were not performed routinely in our cases. With the exception of one subject with diabetes insipidus, no overt clinical endocrine abnormalities were present. Frequently endocrinologically symptomatic metastatic lesions are secondary to simultaneous involvement of the pituitary gland and the hypothalamus.³⁰ Diabetes insipidus is particularly frequent with metastatic lesions, suggesting a predilection for systemic cancer to invade the capillary network that supplies the hypothalamic nuclei, pituitary stalk, and neurohypophysis. One third of all patients with diabetes insipidus have metastatic and less commonly primary tumours in the suprasellar region.³⁰ Recent reports also emphasise a high incidence of panhypopituitarism which is often missed in patients with advanced carcinoma.³¹⁻³²

The contrast-enhanced CT scan demonstrated a uniformly enhancing mass lesion in 9 of the cases. We found direct coronal cuts to be quite helpful in outlining the actual size and shape of the lesion.³³⁻³⁴ In some cases sellar radiography may be necessary to demonstrate sellar destruction.³⁵ The spinal fluid in eight of our patients showed nonspecific abnormal findings. The protein was increased, the glucose content was normal, and the cytology and cultures were negative in most cases. Only one of the subjects had leptomeningeal carcinomatosis. Based on these observations, in a given patient with cancer who

Table 3 Cerebrospinal fluid analysis

Patient	Glucose	Protein	Pressure	Cytology	Cell Count
I	60 mg%	37 mg/dl	Normal	Negative	0 WBC
III	84 mg%	31 mg/dl	Normal	Negative	0 WBC
V	61 mg%	85 mg/dl	Normal	Negative	0 WBC
VI	63 mg%	41 mg/dl	Normal	Negative	0 WBC
VII	61 mg%	60 mg/dl	Normal	Negative	1 WBC
VIII	63 mg%	73 mg/dl	Normal	Negative	0 WBC
IX	84 mg%	77 mg/dl	Normal	Negative	0 WBC
X	169 mg%	200 mg/dl	Normal	Positive	Not done

Fig 2 (a) View of cranial floor depicting metastases of colonic adenocarcinoma in and above sella turcica and the left anteromedial middle cranial fossa, involving Meckel's cave with the Gasserian ganglion ($\times 1$). The larger tumour deposits are marked by arrows. (b) Coronal section at anterior hypothalamic level through columns of fornix, anterior commissure, and optic chiasm. A metastasis (in continuity with the suprasellar mass illustrated in fig 2(a) is seen in the posterior margin of the chiasm. (Luxol-fast blue hematoxylin-eosin, $\times 8$.)

Table 4 Causes of ophthalmoplegia in patients with systemic cancer

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(1) Leptomeningeal carcinomatosis	
(2) Increased intracranial pressure	
(3) Metastases to the base of the skull:	(a) Orbital metastases
	(b) Parasellar metastases
	(c) Petrous apex metastases
	(d) Clivus metastases
	(e) Brain stem metastases
(4) Opportunistic meningeal infections	
(5) Side effects of chemotherapy:	(a) vincristine
	(b) 5 fluorouracil
(6) Radiation-induced cranial neuropathy	
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develops ophthalmoplegia and has a juxtaseilar mass in the CT scan, additional tests do not seem necessary to establish a diagnosis unless other unexplained clinical signs are present.

Haematogenous spread of distant neoplastic tissue probably explains most of the metastatic lesions here considered. The bone surrounding the sella is probably the initial site⁷ with secondary involvement of the cavernous sinus, pituitary gland, and suprasellar cistern. In one of our cases with metastatic colon carcinoma to the base of the skull, necropsy revealed infiltration by the adenocarcinoma of cavernous sinus, pituitary gland, chiasm and hypothalamus (fig 2A, B). The majority of our patients had widespread metastatic disease at the time that ocular signs developed. In the patients with nasopharyngeal tumours a likely pathway of extension to the skull base is infiltration of the large cranial nerve foramina which have a direct access to the subarachnoid space and cavernous sinus.^{28, 29} Nasopharyngeal tumours account for 20% of all cavernous sinus syndromes.² Invasion of the pituitary gland parenchyma and the pituitary stalk by metastatic tumour is an additional frequent mechanism, particularly in patients with carcinoma of the breast.³⁶ Leptomeningeal carcinomatosis associated with large tumour nests sitting in the perisellar region, as observed in one of our cases is another possible route. Finally, an unusual mechanism of perineural neoplastic infiltration from primary skin carcinomas can result in a cavernous sinus syndrome.³⁷ Pituitary chromophobe adenomas are rarely an incidental finding in patients with cancer,⁵ however, it is important to differentiate metastatic perisellar tumours from invasive pituitary adenomas or adenocarcinomas which are generally associated with markedly increased serum prolactin levels.³⁸

Finally, we believe that rapid identification and treatment of metastatic disease in the perisellar region has a potential for measurable clinical improvement.

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