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Metastatic follicular thyroid carcinoma to the paranasal sinuses: a case report and review

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Abstract
Thyroid carcinoma metastatic to the paranasal sinuses is extremely rare, with only 11 cases reported in the English and European literature. We report a case of metastatic follicular thyroid carcinoma to the clivus with extension into the sphenoid and posterior ethmoid sinuses. Pathological diagnosis was obtained using an intranasal endoscopic biopsy. As with our patient, metastatic thyroid carcinoma may present with symptoms related to distant metastases rather than the primary lesion. Distant metastases in differentiated thyroid carcinoma portends a poor prognosis. Our case of metastatic thyroid carcinoma to the paranasal sinuses is summarized in the context of the 11 additional cases, and treatment options are discussed.

Key words: Thyroid neoplasms; Neoplasm metastasis; Paranasal sinuses; Endoscopy

Case report

An 81-year-old African American male with a history of partial thyroidectomy for a multinodular goitre at age 69 presented with a two-week history of progressive, severe intermittent headaches. Neurological evaluation was unremarkable, but a computed tomography (CT) scan of the brain was performed (axial bone window shown in Figure 1) which revealed a 5 × 5 × 5 cm mass in the region of the sella/base of skull which extended anteriorly through the sphenoid and posterior ethmoid sinuses, expanding the sella, and posteriorly invading the clivus. This lesion was confirmed on magnetic resonance imaging (MRI) seen in Figure 2 as a T1, contrast-enhanced sagittal image. Lateral extension into the middle cranial fossa also involved the carotid/cavernous sinus regions, but flow within the carotids was normal. Superiorly it extended into the suprasellar cistern.

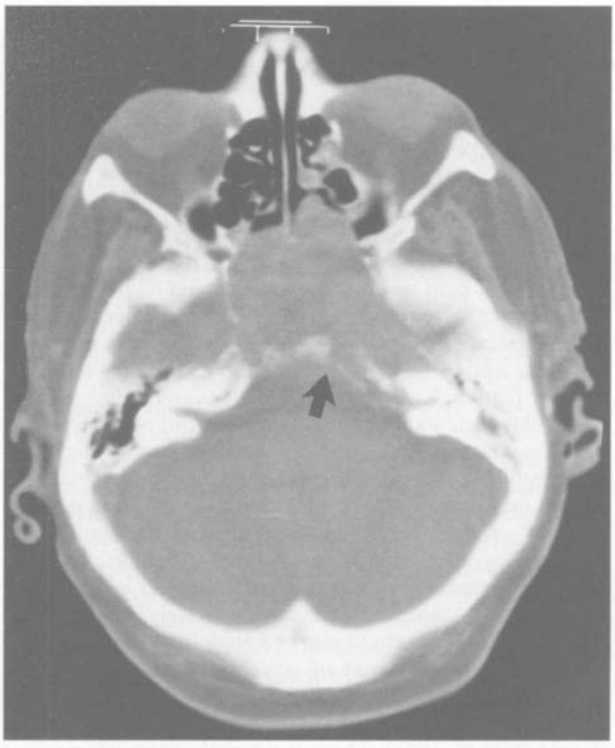

FIG. 1
Axial CT (bone windows) revealing the sphenoid mass extending to the ethmoid sinuses anteriorly, and eroding the clivus posteriorly (arrow).

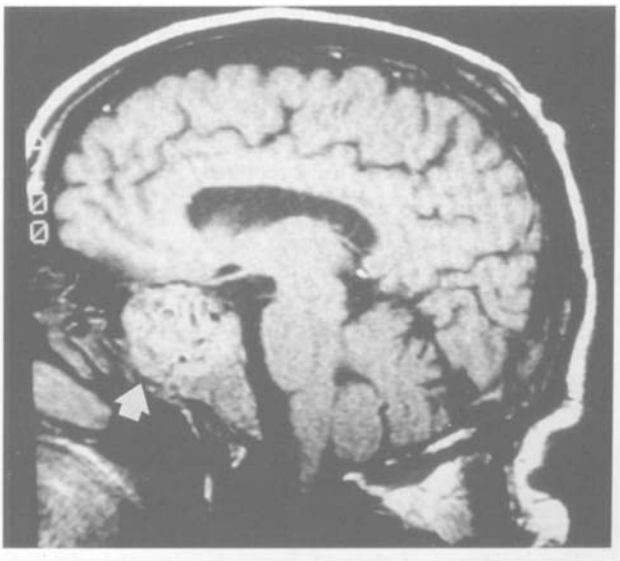

FIG. 2
Saggital T1-weighted MRI with contrast enhancement, revealing clinoid/sphenoid sinus mass (arrow).

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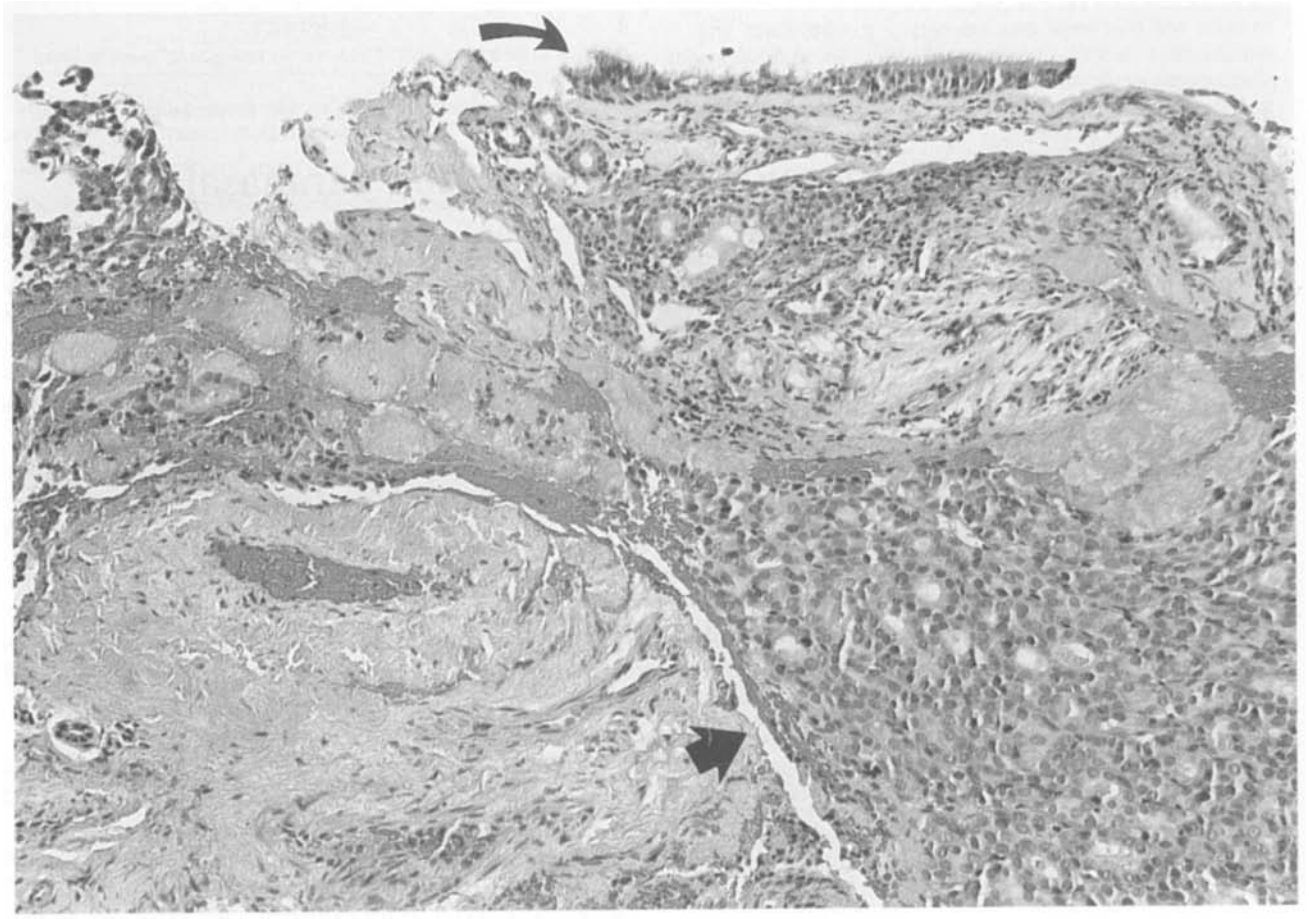

FIG. 3

Haematoxylin-eosin stain of the intranasal biopsy at 10 × magnification. Note the ciliated respiratory epithelium (curved arrow) superficial to glandular stroma overlying the tumour (straight arrow).

The patient was taken to the operating room where a nasal endoscopic approach was used to biopsy the mass, which appeared as soft tissue protuberance through the posterior ethmoids. Pathological evaluation revealed metastatic neoplasm deep to normal respiratory nasal mucosa (Figure 3). Higher magnification revealed the tumour to be composed of small spaces containing colloid, lined by atypical cuboidal cells with hyperchromatic nuclei and few mitoses consistent with follicular thyroid carcinoma (Figure 4). Immunoperoxidase staining for thyroglobulin was strongly positive, confirming thyroid origin. Thyroid function tests were unremarkable as the patient was on levothyroxine for suppression of his presumed multinodular goitre (TSH–0, T4–9.0).

Persistence of the patient's large substernal thyroid was confirmed with CT of the chest. He underwent a course of radiation therapy to the base of the skull to palliate his metastasis, and three months after diagnosis returned for a completion thyroidectomy and subsequent ^{131}I radioablation. The patient died approximately one year after diagnosis of his metastatic disease.

Discussion

The incidence of thyroid carcinoma is approximately 1–10/100,000, the overwhelming majority being epithelial in origin (Heitz *et al.*, 1976; Riccabona, 1987). While reports vary greatly, papillary adenocarcinoma accounts for 25–72 per cent, follicular nine to 39 per cent, anaplastic 11–26 per cent and medullary two to seven per cent (Table I). The ratio of papillary to follicular carcinoma similarly varies from 8.6:1 (when comparing the two groups of patients reviewed at the Mayo clinic from 1946 to 1970 by Brennan *et al.*, 1991 and McConahey *et al.*, 1986) to 3.5:1 (Woolner *et al.*, 1968, analyzing the Mayo experience from 1926 to 1955). Samaan *et al.* (1983) present a series of 706 patients treated for differentiated thyroid carcinoma, of which 15 per cent were pure papillary and 67 per cent had a mixed papillary/follicular diagnosis (82 per cent overall with papillary features), while 15 per cent were pure follicular, and three per cent Hurthle cell (leading to a 5.5:1 ratio of papillary variants to follicular carcinoma).

Papillary adenocarcinoma of the thyroid often occurs in patients younger than 50 years old, tends to be histologically multicentric, and rarely results in angioinvasion or distant metastases. Thirty to 70 per cent of these patients present with cervical lymph node involvement (McConahey *et al.*, 1986). In contrast, follicular carcinoma usually presents in patients greater than 50 years old, is histologically unifocal, and approximately 45 per cent present with moderate to marked angioinvasion. Although about six to 20 per cent of patients present with lymph node involvement, 23–65 per cent develop distant metastases usually to the lungs, pleura, pericardium or bone (Brennan *et al.*, 1991). There is a female preponderance of both papillary and follicular thyroid carcinoma.

Microscopically, papillary thyroid carcinoma is characterized by a fibrovascular core lined by epithelial cells. Although virtually all papillary carcinomas contain a varying percentage of follicular elements, the most important feature is the presence of clear 'ground glass' nuclei. In addition, psammoma bodies (round, basophilic,

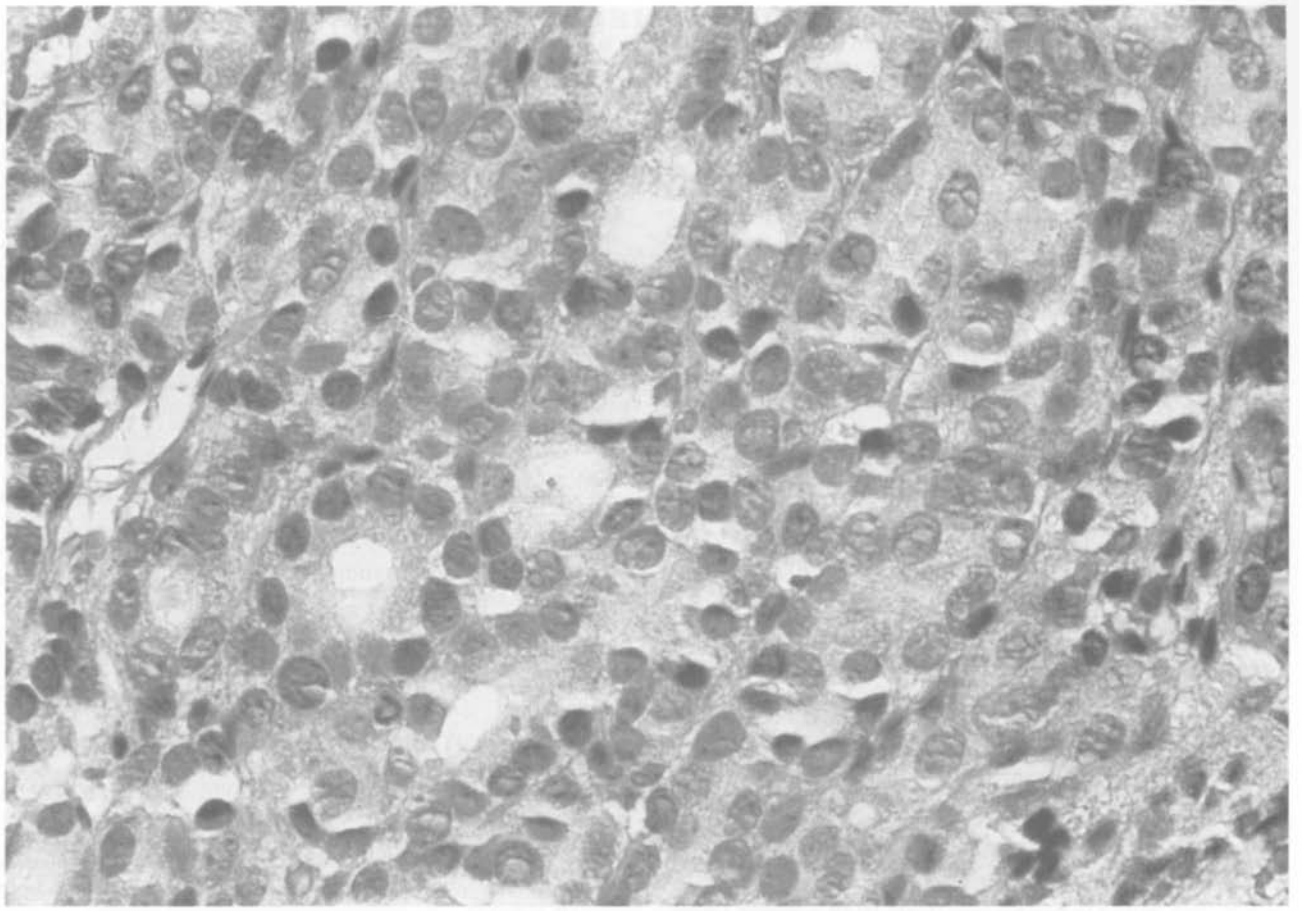

FIG. 4
Haematoxylin-eosin stain of the metastatic follicular thyroid carcinoma at 40 × magnification.

occasionally calcified structures) are found in 40–50 per cent of cases. In contrast, follicular thyroid carcinoma shows follicular differentiation but lacks the 'ground glass' nuclei and psammoma bodies (Simpson *et al.*, 1988). The degree of follicular differentiation ranges from micro- and macrofollicles to trabecular and solid patterns. Figure 4 is consistent with the latter (follicular carcinoma) because of the differentiated follicles containing colloid, and the lack of 'ground glass' nuclei and psammoma bodies.

Thyroid carcinoma most commonly presents with a notable neck mass, however enlarged cervical nodes, hoarseness and neck pain may also be present (McConahey *et al.*, 1986). Clinical suspicion should be high in a patient with a rapidly growing goitre, in addition to those patients showing signs of metastases, such as the appearance of lymph nodes in the neck, weight loss, fatigue, dyspnoea (secondary to tracheal compression from an enlarging thyroid mass) and bone pain (Riccabona, 1987). Brain metastases are rare in thyroid carcinoma, occurring in fewer than 0.01–1 per cent overall and usually with the papillary variety, however patients with brain metastases may occasionally present with a focal neurological deficit as the principal sign of disease (Parker *et al.*, 1986; Venkatesh *et al.*, 1990).

Metastatic tumours to the sinonasal tract are extremely rare, and may present with epistaxis, facial swelling, pain or nasal obstruction. Bernstein *et al.* (1966) describe their review of 82 cases with metastatic foci to the paranasal sinuses, in which 40 patients had lesions in the maxilla, 15 in the ethmoids, 12 in the frontal sinus and six in the sphenoid (other sites included the nose, nasopharynx, palate and alveolar ridge). The overwhelming majority of primary tumours were from the kidney (55 per cent), followed by the bronchus and urogenital ridge (11 per cent each), breast (10 per cent), GI tract (six per cent) and thyroid (three patients).

Barrs *et al.* (1979) contribute a series of eight patients with metastases to the paranasal sinuses, of which two patients had prostate carcinoma as their primary, two had myeloma, and one patient each with kidney, lung, breast and thyroid (follicular). The patient described in the latter report presented with decreased visual acuity and a non-previously diagnosed primary thyroid tumour; his sphenoid mass localized ^{131}I and pathological diagnosis was made from a biopsy of a thyroid nodule.

An extensive review of the literature has revealed a total of 11 prior reports of thyroid carcinoma metastatic to the paranasal sinuses (summarized in Table II), of which five

TABLE I
PREPONDERANCE OF HISTOLOGICAL TYPES OF THYROID CARCINOMA

Reference	Number	Papillary	Follicular	Anaplastic	Medullary
Heitz (1976)	573	25%	39%	26%	2%
Woolner (1968)	1181	62%	18%	14%	7%
Hoie (1988)	1009	72%	9%	11%	7%

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TABLE II
THYROID CARCINOMA METASTATIC TO THE PARANASAL SINUSES

Reference	Age/Sex	Symptoms/Signs	Histology	Metastatic site
von Eiselsberg (1893)	38 M	'chronic meningitis'	adenocarcinoma	skull base sphenoid
Harmer (1899)	44 F	headache, nasal obstruction	medullary	ethmoid, sphenoid, nose
Auriti (1921)	28 M	epistaxis, nasal obstruction	adenoma	nasal septum
De Vincentiis (1959)	50 M	frontal pain, diplopia	adenocarcinoma	frontal, nose
Bataille (1971)	66 F	epistaxis	—	maxillary
Barrs (1979)	54 F	visual loss	follicular	sphenoid, orbit
Cinberg (1980)	80 F	epistaxis	follicular	maxillary
Chang (1983)	50 F	epistaxis, weight loss, nasopharynx pain	papillary/follicular	sphenoid, nasopharynx
Renner (1984)	61 F	epistaxis, anosmia, visual loss	follicular	sphenoid
Cumberworth (1994)	74 F	nasal obstruction	follicular	sphenoid, frontal, ethmoid, maxillary
Yamasoba (1994)	34 F	cheek hypaesthesia, hearing loss	follicular	ethmoid, sphenoid max., intracranial
Altman (present case)	81 M	headache	follicular	sphenoid, ethmoid, skull base/clivus

are from the European literature. An additional report by Frazell and Foote (1958) in a series of 725 patients with thyroid carcinoma refer to one patient with 'suspected skull or brain metastasis,' however insufficient data is presented to include this in our series. There is a predominance of female patients in this series of eight female versus four male patients, consistent with papillary and follicular carcinoma in general. Epistaxis was the most common presenting symptom/sign (occurring in five patients), and is not surprising considering the hypervascular nature of thyroid tumours metastatic to the sinonasal tract (Yamasoba *et al.*, 1994). Headache and pain occurred in four patients, nasal obstruction in three patients, and visual loss or diplopia in three patients. Our case is the only stated case where diagnosis was made from a biopsy taken using a nasal endoscopic approach. Histologically, there is a prevalence of follicular carcinoma in this series. Sites of metastases are usually multifocal, with sphenoid sinus involvement in eight patients, followed by maxillary and ethmoid sinuses (four patients each).

CT is the method of choice for delineating bony involvement and erosion from metastatic lesions to the paranasal sinuses, while MRI is better for defining soft tissue density differences between the lesion and neighbouring structures. Bone scanning with ^{99m}Tc is extremely important for general staging of malignant tumours when there is concern for bone metastases (Riccabona, 1987). As these metastatic lesions to the skull base and paranasal sinuses tend to be hypervascular, angiography and embolization may be helpful pre-operatively (Yamasoba *et al.*, 1994). However, as demonstrated in this series with the preponderance of lesions in the sphenoid and skull base, surgical extirpation of the metastatic lesion is often precluded.

Metastatic disease in differentiated thyroid carcinoma is a poor prognostic sign, in addition to age over 50 years, tumour size greater than 3.9 cm, high tumour grade, marked angioinvasion and adjacent tissue invasion. In their series of 100 patients with follicular thyroid cancer, Brennan *et al.* (1991) found patients with metastatic disease to have a five-year survival of 40 per cent, compared to 99 per cent for those without metastatic disease at the time of diagnosis.

In conclusion, metastasis of differentiated thyroid carcinoma to the paranasal sinuses is extremely rare, with only 12 cases reported in the English and European literature (present case included). Although these tumours tend to be relatively vascular, nasal endoscopy with biopsy may be helpful in obtaining a pathological diagnosis. The proximity of the metastatic lesion to the skull base limits treatment options and portends a poor prognosis.

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