

# Follicular Thyroid Carcinoma with Insular Component Metastatic to the Sphenoid Wing

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## Abstract

A 60-year-old woman with a history of follicular thyroid carcinoma with insular component presented with a large asymptomatic sphenoid wing mass discovered on routine surveillance. Therapeutic options including observation, surgical excision, radiation therapy, and I-131 therapy were initially debated. Each option presented potential morbidity. The patient initially underwent treatment with iodine-131 (I-131) with a decrease in size of the mass over 8 months. Subsequent MRI at 11 months revealed enlargement of the sphenoid wing mass with involvement of the orbital apex, cavernous sinus, and the middle cranial fossa. The patient ultimately underwent surgical resection and debulking via a frontotemporal orbitozygomatic approach. Although rare, follicular thyroid carcinoma with insular features often has an aggressive clinical course with local invasion and distant metastases. It carries a poor prognosis and can be difficult to treat due to a lack of available treatment protocols and the known morbidity of current therapies.

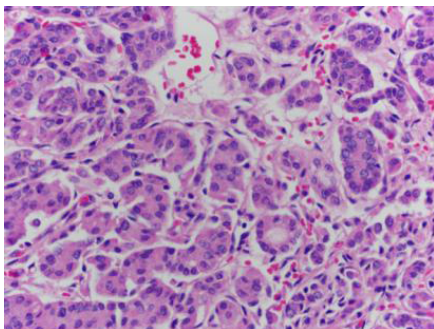
## Introduction

Insular carcinoma is a rare subtype of follicular thyroid carcinoma, often with an aggressive clinical course with frequent extensive local invasion and distant metastases. Metastasis can occur via hematogenous spread and most commonly involves the lungs and bone, respectively [1]. The presence of insular features suggests a poor prognosis. Management of metastasis of this type of tumor is ill defined due to its rarity.

## Case Report

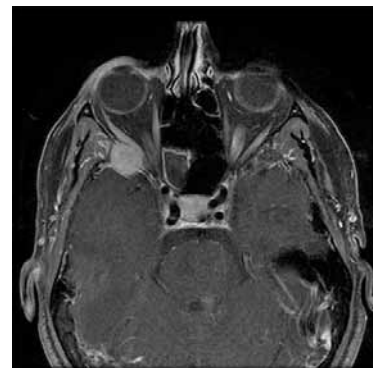
A 60-year-old woman with known follicular thyroid carcinoma presented asymptotically to the ophthalmology service following routine surveillance with whole body imaging and PET scan for a known history of thyroid carcinoma 5 year prior. An iodine uptake scan revealed an abnormal hyperintense region in the right sphenoid region. Pathology from prior total thyroidectomy revealed a less-than-well-differentiated follicular thyroid cancer with insular features (Figure 1). She had been treated with radioactive iodine (RAI) ablation (I-131) immediately post-operatively and again two years later. A total dose of 152.6 mCi had been delivered. The patient's past medical history was otherwise unremarkable. Medications included Cytomel and Synthroid.

On ophthalmologic examination, the patient's visual acuity



**Figure 1:** H and E stain demonstrating a poorly differentiated follicular thyroid carcinoma with large areas forming solid nests and trabecular characteristic of insular carcinoma (400x magnification).

with correction was 20/25 OU. Pupils reacted normally without an afferent pupillary defect. Intraocular pressures, extra-ocular muscle movements, color testing, and slit lamp examination were within normal limits. Hertel exophthalmometer measurement was 17 mm OU. Dilated fundus exam and Humphrey visual field central 30-2 tests were normal. Thyroglobulin level was 3809.3 (normal 1.3-31.8 ng/mL) and TSH was 56.690 (normal 0.340-3.500 uIU/mL). MRI revealed a 2.0x1.2 cm mass in the area of the greater wing of the right sphenoid with displacement of the right lateral rectus. There was encroachment of the dura at the tip the middle cranial fossa (Figure 2).



**Figure 2:** Orbital MRI depicting a 2.0x1.2 cm mass in the area of the greater wing of the right sphenoid with displacement of the right lateral rectus. There is encroachment of the dura at the tip the middle cranial fossa.

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Received September 09, 2012; Accepted October 27, 2012; Published November 02, 2012

**Citation:** Moscato EE, Kim HJ, Vagefi MR, Silkiss RZ (2012) Follicular Thyroid Carcinoma with Insular Component Metastatic to the Sphenoid Wing. J Clin Exp Ophthalmol 3:251. doi:10.4172/2155-9570.1000251

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The patient initially deferred surgical biopsy and debulking by either a lateral orbitotomy or an orbitozygomatic cranial approach. After extensive consultation and review by the tumor board of several institutions, the patient underwent treatment with 163.8 mCi of oral I-131. The patient was placed on oral high dose steroids with taper. Thyroid hormone supplementation had been discontinued 6 weeks prior to initiating treatment.

Two months after treatment with I-131, thyroglobulin level decreased to 854.9 and TSH normalized. Ten months after treatment, thyroglobulin level was 582.6. Follow-up MRI at 2 and 8 months revealed hyperlucent changes and continued reduction in size of the mass (Figure 3). Follow-up ophthalmologic exam throughout this post-treatment period revealed normal vision, color testing, fundus exam, and Humphrey visual field tests (10 months). Eleven months after initial presentation, MRI revealed enlargement of the sphenoid wing mass with extensive involvement of orbital apex, cavernous sinus, and the middle cranial fossa (Figure 4), despite initial good response

to RAI. The patient developed compressive optic neuropathy from mass effect of the tumor, as evidenced by decreased vision (20/30), proptosis, restricted extraocular movements, and optic disc edema with consistent changes on Humphrey visual field testing. She ultimately underwent preoperative embolization followed by surgical resection and debulking of bone and tumor in the inferotemporal region via a frontotemporal orbitozygomatic approach. A large pedicle-based pericranial flap was rotated over into the inferotemporal region, and a fat graft was used to augment the dural closure. Post-operatively, vision was 20/25 with normal extraocular movements. There was resolution of optic disc edema and normalization of Humphrey visual field tests. She subsequently underwent external beam radiotherapy.

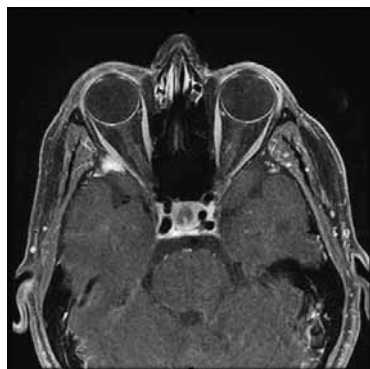
## Discussion

The authors present a case of follicular thyroid carcinoma with insular features metastatic to the greater wing of the sphenoid. Insular carcinoma is a rare subtype of follicular carcinoma characterized by an insular growth pattern admixed with follicular or papillary features. The histopathology of insular carcinoma demonstrates well-defined nests, or insulae, composed of small round cells with small nuclei and scant cytoplasm, arising from follicular epithelium, often with associated mitotic figures, foci of tumor necrosis, and vascular invasion [1,2]. These tumors may have an aggressive clinical course with extensive regional and distant metastasis. A 2.7-fold increase in the risk of death in the presence of insular features has been reported [2]. The incidence of insular carcinoma is 1.8-3.8% of all thyroid malignancies [3].

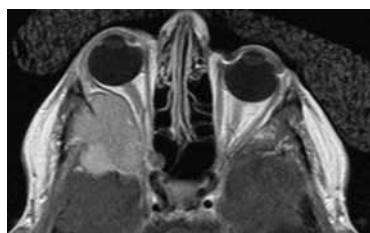
To the authors' knowledge, this is the first reported case of follicular carcinoma with insular component metastatic to the sphenoid wing following treatment for a known thyroid malignancy. Although few cases of follicular carcinoma metastatic to the orbit have demonstrated response to I-131 treatment [4,5], we found no prior reports demonstrating regression of tumor size after RAI in the presence of insular features. Interestingly, our patient presented 5 years after total thyroidectomy and two prior sessions of I-131. She demonstrated an extremely high thyroglobulin level of 3809.3 (normal 1.3- 31.8 ng/mL).

Various ocular and orbital side effects of radioactive iodine (RAI) for thyroid ablation, adjuvant treatment, and treatment of distant metastasis have been reported, including conjunctivitis, xerophthalmia from lacrimal gland inflammation, and epiphora secondary to nasolacrimal obstruction [6]. Due to the rarity of thyroid carcinoma metastasis to the orbit, no data exists regarding I-131 and the risk of post-treatment optic neuropathy. The point at which the optic nerve may become compromised may depend on the proximity of the mass to the optic nerve in addition to the total dose of I-131.

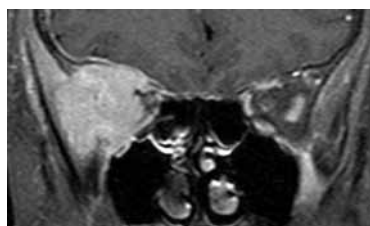
The rarity of follicular carcinoma with insular component, as well as the unique challenge of treating a metastasis adjacent to the optic nerve, complicated the development of a treatment protocol for this patient. Interestingly, carcinomas with insular features have a distinct potential to concentrate radioactive iodine. Unlike external beam radiotherapy, I-131 often concentrates in the center of the tumor and creates minimal destruction to surrounding tissue, with an emission range of 0.8 mm to a maximum of 2 mm [7]. Our patient received a dose that falls within levels that are therapeutic and had a good initial response. Although she ultimately underwent surgical resection and debulking of the mass due to compressive optic neuropathy, the role of RAI in the treatment of follicular carcinoma with insular component remains ill-defined. There may be a role in early phase treatment for small orbital metastases or to decrease the size of the mass prior to surgical resection.



**Figure 3:** Follow-up orbital MRI at 8 months demonstrating hyperlucent changes within the mass and a decrease in size of the mass.



**Figure 4a:** T1 weighted MRI showing right sphenoid wing intraosseous enhancing mass (3.5 cm×3.5 cm) that extends into the orbit with displacement of the lateral rectus. The mass involves the right cavernous sinus and exerts mass effect on the middle cranial fossa.



**Figure 4b:** T1 weighted MRI demonstrated extension of the mass medially into the orbital apex and the sphenoid sinus.

### Conflict of Interest

The authors have no proprietary interest.

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