Published in final edited form as:

J Case Rep Med. 2013 ; 2: 235775–. doi:10.4303/jcrm/235775.

Endoscopic Endonasal Approach for Resection of Infundibular Granular Cell Tumor: Case Report and Literature Review

Jennifer L. Orning, M.D.¹, Dimitri G. Trembath, M.D.², Adam M. Zanation, M.D.³, and Anand V. Germanwala, M.D.⁴

¹Department of Neurological Surgery, University of North Carolina School of Medicine, Chapel Hill, North Carolina ²Department of Pathology, University of North Carolina School of Medicine, Chapel Hill, North Carolina ³Department of Otolaryngology, University of North Carolina School of Medicine, Chapel Hill, North Carolina ⁴Surgical Neurology Branch, NINDS, National Institutes of Health, Bethesda, Maryland

Abstract

Granular cell tumors of the pituitary and infundibular stalk are rare, slow growing tumors. Although usually asymptomatic, neurological deficits with chiasmatic compression can lead to clinical presentation. We describe a case in which a purely endoscopic endonasal approach was used for complete resection of an infundibular granular cell tumor with skull base reconstruction with a pedicled nasoseptal flap. Final pathology confirmed the diagnosis and 24 month follow up revealed no recurrence of the tumor with continued improvement in the patient's vision.

This diagnosis must be entertained for masses noted in the sellar/suprasellar region. Immunohistochemistry and radiographic findings help lead to an accurate diagnosis. Complete surgical resection remains the mainstay of treatment in symptomatic patients, as published reports indicate little value with adjuvant radiation therapy and poor long term control. The complication of panhypopituitarism can often result following complete resection and patients need to be counseled with the risks of treatment. A purely endoscopic endonasal approach was safe and effective and should be attempted only by experienced skull base centers.

Keywords

granular cell tumor; infundibulum; endoscopic endonasal

Corresponding Author: Anand V. Germanwala, M.D., Staff Clinician, Associate Investigator, National Institutes of Health, Surgical Neurology Branch, NINDS, 10 Center Drive, Room 3D20, MSC 1414, Bethesda, MD 20892-1414, Tel: (301) 496-2921, Fax: (301) 480-1615, agermanwala@gmail.com.

Financial disclosure/conflict of interest:

The authors have no financial disclosure or conflict of interest pertaining to any of the drugs, materials, and/or devices discussed in this report

Authors' contributions:

A. M. Zanation and A. V. Germanwala were surgically and clinically involved in the described case. D. G. Trembath reviewed the pathology and assisted with writing that portion of the manuscript. J. L. Orning, A. M. Zanation, and A. V. Germanwala assisted in writing all remaining portions of the manuscript.

Introduction

Granular cell tumors of the pituitary and infundibular stalk are very rare and slow growing tumors. Rarely symptomatic lesions, such neoplasms are not commonly entertained in the differential diagnosis of sellar masses. As surgical resection can lead to cure, the intraoperative identification of these lesions is important. We describe a purely endoscopic endonasal approach for the resection of this tumor and dural reconstruction with a vascularized nasoseptal flap followed by a discussion of the published literature.

Case Presentation

A 41 year old woman initially presented to an outside institution with headaches and blurry vision. MRI imaging revealed a 7 mm sellar mass; she was given recommendations for observation with serial imaging. During the next 6 months, she developed progressive bitemporal vision loss confirmed on ophthalmological testing and presented to our institution. Serum endocrine labs, including prolactin, were normal. Repeat imaging revealed a sellar/suprasellar mass measuring 10 mm arising from the infundibulum with mass effect on the optic chiasm (Fig 1 and 2). The normal pituitary gland was seen inferior to the lesion. The patient was counseled preoperatively about the possibility of developing panhypopituitarism, as well as CSF leak, residual mass, blindness, and infection with surgical removal.

After a full discussion of risks, benefits, and alternative approaches, the patient underwent an extended endonasal approach, including resection of the right middle turbinate, sphenoethmoidectomies, and a posterior septectomy. Transellar and transplanar osteotomies were performed and the sellar dura was opened in the midline, exposing the normal pituitary gland. The dural opening was then extended superiorly along the midline planum following cauterization of the superior intercavernous sinus. After opening the arachnoid, a mass with extensive vasculature infiltrating the proximal aspect of the infundibulum with significant mass effect on the undersurface of the optic chiasm was visualized (Fig 3). The right superior hypophyseal artery was draped on the anterior surface of this mass. A small portion of the mass was cauterized and a capsular opening was made for initial biopsy. Intraoperative frozen section revealed neoplasm, favoring granular cell tumor. Given her symptoms and radiographic progression as well as the intraoperative findings, the decision was made to continue with a goal for gross total resection. Subsequently, the mass, noted to be soft, was internally debulked, and the chiasmatic and hypophyseal perforators were then meticulously dissected off of the anterior capsular wall. The proximal portion of the right superior hypophyseal artery and chiasmatic perforating vessels were preserved. The superior and inferior aspect of the infundibulum were identified and transected, allowing the residual mass to be removed completely. Dural closure and repair was accomplished by using a synthetic inlay allograft followed by a vascularized nasoseptal flap.

Postoperatively, the patient had no immediate change in her vision. She did require pituitary hormone replacement, including desmopressin and hydrocortisone. Postoperative imaging confirmed complete resection (Fig 4 and 5). At 6 month follow up, her vision was significantly improved and repeat imaging at 12 and 24 months showed no sign of tumor

recurrence. Nasal endoscopy revealed a well healed nasoseptal flap and skull base reconstruction.

Final pathological examination confirmed the intraoperative diagnosis. Gross examination demonstrated multiple fragments of white/red tissue. Microscopic examination demonstrated closely arranged polygonal cells with bland, round to oval nuclei, surrounded by copious amounts of granular eosinophilic cytoplasm (Fig 6a). No significant mitotic activity or pleomorphism was identified. Occasional perivascular lymphocytic aggregates were seen. The tumor cells demonstrated positivity for PAS which was resistant to diastase digestion (Fig 6b). By immunohistochemistry, the tumor cells were diffusely positive for CD68 and S-100 as well as GFAP. The tumor cells were negative for synaptophysin. These immunohistochemical findings are consistent with granular cell tumor.

Discussion

Granular cell tumors (GCTs) are rare, comprising 0.1% of primary brain tumors. Approximately 50 cases have been reported in the literature. [1] The first case was reported by Boyce and Beadles in 1893. [2] Women are more likely to present with these tumors, most commonly in the fifth decade. Granular cell tumors of the pituitary are usually asymptomatic. When symptomatic, they present as other more common lesions in this location do, i.e. optic chiasm compression, headaches, and pituitary dysfunction, although diabetes insipidus at presentation is extremely rare. Autopsy cases have revealed asymptomatic minute granular cell nests ranging from 6.7%, up to 17%, and they can often remain small and inconsequential. [3, 4] Given the prevalence at autopsy and the lack of clinical cases in the literature, these tumors are more likely asymptomatic. In our case, however, the growth of this tumor had caused symptomatic optic chiasm compression and lead to the recommendation of surgical intervention.

GCTs have also previously been referred to as choristomas, granular cell myoblastomas, and pituicytomas, and originate from supportive glial cells of the pituitary. There are many different types of pituicytomas, originating from the respective cell types, such as ependymal, major cells, dark cells, oncocytic, astrocyte-like, or granular. Many would differentiate between these distinctions, citing differing light microscopy features. There is also some controversy regarding the cell-type of origin, especially in light of positive staining of S100 and GFAP, yielding the hypothesis of astrocyte origin. [5] As an aside, some reports have described +S100 but negative GFAP staining, but electron microscopy has shown diffuse GFAP in the cytoplasm. [6] Some hypothesize that the cell of origin is the folliculostellate cell (FSC) of the adenohypophysis.

Imaging often reveals an isointense to hypointense, well-defined lesion of the sellar or suprasellar area on T1 and T2. There is usually avid enhancement with contrast. Differential diagnoses based on imaging include pituitary adenoma, Langerhans' cell histiocytosis, craniopharyngioma, astrocytoma, stalk meningioma, germinoma, and infundibulohypophysitis. These lesions are usually endocrinologically inactive, and the most common postoperative complication is new-onset pituitary insufficiency, since maximal resection often requires sacrificing the stalk. [7]. They usually appear slightly hyperdense

with enhancement on CT, and calcifications are rare. FDG-PET is reported to show overall hypometabolism of the mass, despite the possibility of a few small foci of slightly increased glucose metabolism. [8] Angiography can show a moderate tumor blush. [7] These are similar findings as those seen in pituitary adenomas and some other lesions of this area, such as germ cell tumors, and do not clearly differentiate these masses from others by imaging. Grossly, these tumors have been reported to be firm and bleed with manipulation, which can differentiate these from most adenomas intraoperatively. However, they have also been seen to aspirate easily. [8] Our lesion was more consistent with this description.

Treatment for these tumors if incompletely resected and symptomatic is difficult, as radiation therapy tends to be of little or no use. [7, 10] Previous reports have stated that microscopic transphenoidal surgery may be difficult and unrewarding, and is usually not sufficient to resect firm sellar tumors. [11] Recent advancements in skull base surgery technology and techniques may allow experienced cranial base centers to effectively resect such firm tumors in this location through microscopic and endoscopic endonasal approaches. Alternative surgical approaches include craniotomy. [9]

Conclusion

Our case illustrates that resection may be performed safely and effectively with a purely endoscopic endonasal approach. Care must be given towards identification of surrounding neurovascular structures with a goal for complete resection and meticulous dural reconstruction. Attention must also be given towards careful perioperative management of endocrinological disturbances. Such cases should be performed by multidisciplinary teams at institutions with extensive experience.

Acknowledgments

This research was supported in part by the Intramural mural Research Program of the NIH/NINDS. Figure 3 is reprinted from Ameet Singh and Anand V. Germanwala, *Management of postoperative complications of skull base surgery*, Oper Tech Otolaryngol Head Neck Surg, 22 (2011), 237–245 with permission from Elsevier.

Abbreviations

EEA	Endoscopic Endonasal Approach
GCT	Granular Cell Tumor

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Figure 1.
Sagittal post contrast MRI demonstrating contrast enhancing infundibular mass

Figure 2.
Coronal post contrast MRI demonstrating mass effect on chiasm

Figure 3.

Intraoperative photo demonstrating round mass arising from and infiltrating the infundibulum with mass effect on the overlying optic apparatus. (RON = right optic nerve, LON = left optic nerve, RSHA = right superior hypophyseal artery, DIS = distal infundibular stalk, PG = pituitary gland).

Figure 4.
Postoperative sagittal post contrast MRI demonstrating complete resection and vascularized nasoseptal flap

Figure 5.
Postoperative coronal post contrast MRI demonstrasting removal of chiasmatic mass effect

Figure 6. H&E slide (a) demonstrating closely arranged polygonal cells with bland, round to oval nuclei, surrounded by copious amounts of granular eosinophilic cytoplasm. PAS stain (b) highlighting cytoplasmic granules.