

ROMANIAN
NEUROSURGERY

Vol. XXXX | No. 3

September 2026

Olfactory nerve schwannoma:
endoscopic management of a rare lesion

Hrushikesh Kharosekar,
P. Skhandeshwaran,
Vernon L. Velho



Olfactory nerve schwannoma: endoscopic management of a rare lesion

Hrushikesh Kharosekar, P. Skhandeshwaran, Vernon L. Velho

Department of Neurosurgery, Grant Medical College and Sir J.J. Group of Hospitals, Mumbai, Maharashtra, INDIA

ABSTRACT

Schwannomas are common benign lesions but olfactory nerve schwannoma is rarely being reported in literature. These lesions can mimic esthesioneuroblastoma. If suspected early in workup these lesions can be excised completely with endoscopic approach as there is rarely intracranial extension.

INTRODUCTION

Schwannomas are benign, slowly growing nerve sheath tumours which usually arise from any peripheral nerve containing Schwann cells including distal portions of the cranial nerve. However, the optic and olfactory nerve do not have Schwann cell layer and therefore schwannoma, theoretically, cannot develop in these nerves⁽¹⁾. There are however rare instances of such lesions occurring and theories formed for it thereof. Up to date and according to our best of knowledge, less than 100 cases have been reported till now⁽¹⁾ but none were recurrent or malignant.

We report a rare case of recurrent/residual olfactory schwannoma mimicking esthesioneuroblastoma at first presentation.

CASE REPORT

A 24-yr old male patient had presented to private hospital with nasal stuffiness and anosmia for 1 year. Also, since last 4 months he had noticed a gradually increasing swelling over nasal bridge. It was associated with headache. On radiological investigations an anterior cranial fossa space occupying lesion was seen, lobulated moderately enhancing mass lesion in ethmoid sinuses with intracranial extension along left > right frontal lobes, a provisional diagnosis of esthesioneuroblastoma was made. The patient then underwent bifrontal craniotomy and biopsy of the tumour was done as complete excision was not possible through that approach in a private hospital. The histopathology was suggestive of schwannoma. Patient was discharged. His anosmia did not improve but other symptoms improved.

Keywords

olfactory nerve,
schwannoma,
endoscopic excision



Corresponding author:
Hrushikesh Kharosekar

Grant Medical College and Sir J.J.
Group of Hospitals, Mumbai, India

hkharosekar@gmail.com

Copyright and usage. This is an Open Access article, distributed under the terms of the Creative Commons Attribution Non-Commercial No Derivatives License (<https://creativecommons.org/licenses/by-nc-nd/4.0/>) which permits non-commercial re-use, distribution, and reproduction in any medium, provided the original work is unaltered and is properly cited.

The written permission of the Romanian Society of Neurosurgery must be obtained for commercial re-use or in order to create a derivative work.

ISSN 2344-4959 (online)
ISSN 1220-8841 (print)

© Romanian Society of
Neurosurgery



First published
September 2026 by
London Academic Publishing
www.london-ap.uk

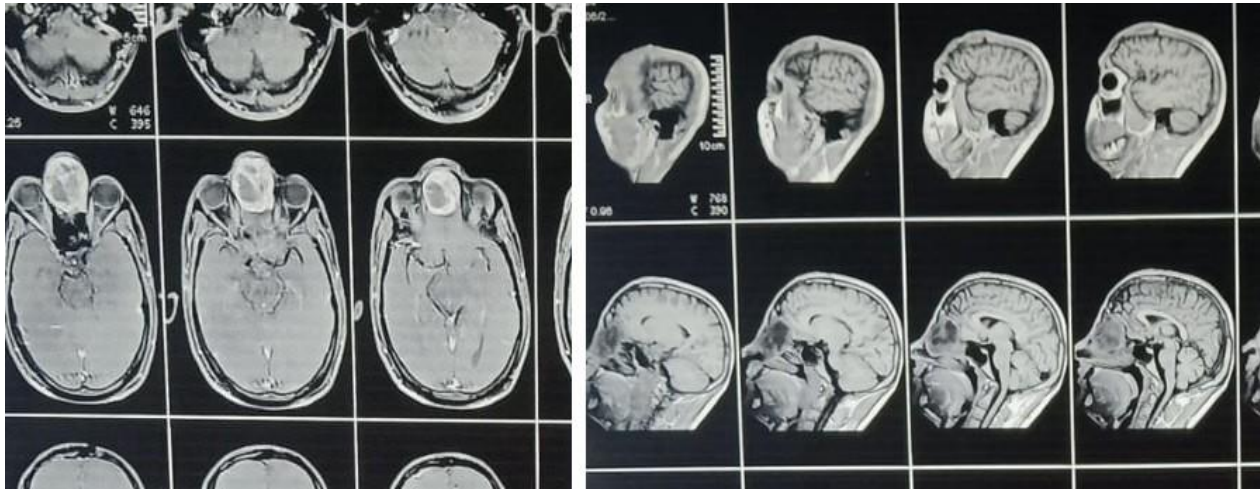


Figure 1. Preoperative contrast-enhanced MRI of the brain.

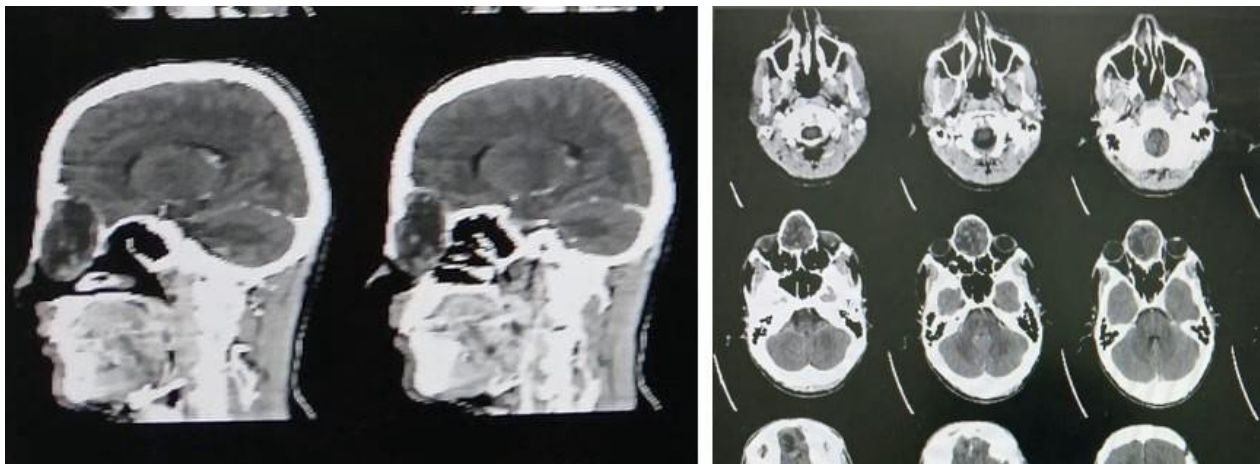


Figure 2. Preoperative contrast-enhanced CT of the brain.

One year later, he again started to get swelling over the nasion region and severe nasal stuffiness and mouth breathing and headache. Repeat MRI was suggestive of large residual lesion. Then he was referred to our institute for further management (Figures 1 and 2).

At our institute, we decided to approach the lesion endoscopically through trans-nasal route. Intra-operatively, the tumour was reddish, was only moderately vascular, suckable, and well encapsulated. It was extradural and with destruction of the floor of the anterior cranial fossa was seen. Complete excision of lesion was achieved. Postoperative course was uneventful (Figure 3).

Histopathology was suggestive of respiratory tract epithelium lined by pseudostratified ciliated columnar epithelial cells and a tumour composed of neoplastic spindle cells arranged in bundles. Cellular

areas show spindle cells arranged in palisading fashion and having organoid arrangement forming Verocay bodies (Antoni Type A areas). The cells in Antoni B areas have round condensed nuclei and indistinct cytoplasm. Areas of calcification, hyalinization and haemorrhages are noted. The intervening stroma is fibrocollagenous. These findings were suggestive of olfactory nerve schwannoma (Figure 4).

DISCUSSION

The exact cause and mechanism of olfactory nerve schwannoma (ONS) formation remain unknown. In most cases, they are believed to result from sporadic mutations⁽²⁾. Since cranial nerves I and II (olfactory nerve and optic nerve, respectively) lack Schwann cells, questions arise regarding the cell of origin of schwannomas in these locations. Most tumours are

sporadic in nature, and no well-established predisposing factors have been observed. Risk factors for ONS may include a family history of the tumour, the presence of neurofibromatosis type 2, and genetic conditions characterized by non-cancerous tumour formation in the nervous system⁽²⁾. Schwannomatosis, often seen in adults, can result in multiple schwannomas. Gorlin-Koutlas syndrome is a complex genetic disorder associated with multiple tumours in the body, including multiple schwannomas, and frequent exposure to ionizing and non-ionizing radiation⁽²⁾. Our patient did not have any family history of any tumours CNS or otherwise – and a detailed examination did not reveal any tumour anywhere else in the CNS or in his body. He was a farmer with no significant exposure to radiations – ionising or otherwise, hence a sporadic tumour – consistent with most common pattern.

The olfactory and optic nerves are not susceptible to schwannomas because they lack a Schwann cell coating. This raises questions about the true pathogenesis. To promote axonal growth, olfactory ensheathing cells (OECs) and Schwann cells both wrap unmyelinated axons of nerve fibres up to two exterior layers of the olfactory bulb. There are two main theories or hypotheses to explain the development of these tumours – developmental and non-developmental theories. Developmental theory speculates whether neural crest cells migrate within the central nervous system or mesenchymal pial cells transform into ectodermal Schwann cells⁽⁷⁾. Non-developmental hypotheses propose that Schwann cells found in nearby structures like the perivascular nerve plexus, the meningeal branches of the trigeminal nerve, and the anterior ethmoidal nerves innervating the anterior cranial fossa and olfactory groove give rise to intracranial schwannomas. Some researchers have concluded that the olfactory nerve contains Schwann cells originating from precursor cells found in the olfactory epithelium. The question of whether Schwann cells are present in the olfactory nerve remains a subject of debate. According to some authors, these tumors can develop from the ensheathing cells of the olfactory nerve and bulb, the embryonic terminal nerve, the nerve plexus of the dural vessels, or the fila olfactoria⁽²⁻⁵⁾. In our case, the tumor was partially attached to the dura near the cribriform plate which was almost destroyed; our

patient had bilateral anosmia, so we can conclude that it was developed from fila olfactoria; it is known to acquire a Schwann cell sheath that extends approximately 0.5 mm beyond the olfactory bulb⁽²⁻⁴⁾.

These tumors can be asymptomatic and detected incidentally on scans done for other purposes. Larger tumors however do cause symptoms – anosmia or hyposmia (most common), visual deficits, cognitive disturbances, seizures, rhinorrhoea, headaches, motor and sensory dysfunction, intracranial hypertension. Less common symptoms may encompass epilepsy, pyrexia, nausea, confusion, drowsiness, vomiting, epiphora, nasal discharge, facial droop and altered touch sensation on the face (facial paraesthesia) may occur when the tumour compresses the facial nerve. Our patient had anosmia, headache, nasal stuffiness, and visible bulge over the nasion – consistent with reported symptoms.

Diagnosis, apart from detail clinical evaluation is by MRI scan which is imaging modality of choice. Signal characteristics include variable enhancement on T1, heterogeneous intermediate signal on T2, and moderate to intense intermediate signal (usually) on T1 with contrast (Gd). These lesions are characterized by well-circumscribed and encapsulated masses with low to intermediate signal intensity on T1-weighted images and high signal intensity on T2-weighted images. The MRI in our patient was overall consistent with the reported findings. However, there are very close differential diagnoses that must be considered like esthesioneuroblastoma, olfactory groove meningioma, olfactory neuroblastoma, or low-grade astrocytoma – confirmation is by tissue diagnosis⁽²⁻⁵⁾. Histopathological examination shows benign spindle-shaped cells, with elongated nuclei and fibrillary cytoplasm (Antoni-A pattern), and less cellular, loosely textured tumor areas with Verocay bodies. Our patient also exhibited the classical Antoni A, Antoni B patterns with Verocay bodies – confirming the diagnosis (Figure 4).

While partial resection is an option because the tumor is benign and slow-growing, complete excision is typically the preferred approach. The use of adjunctive therapy is a good option, and patients generally have a good prognosis after complete tumor removal. These tumors as typical for their location can be approached either through nasal endoscopic or through craniotomy and subfrontal

approach. Our patient was already operated by bifrontal craniotomy and subfrontal approach before recurrence. We reviewed the scans in detail and planned for trans-nasal excision and if needed

prepared for supraorbital keyhole craniotomy and subfrontal approach to complete the excision. However, we were able to achieve gross total excision by the endoscopic route itself.

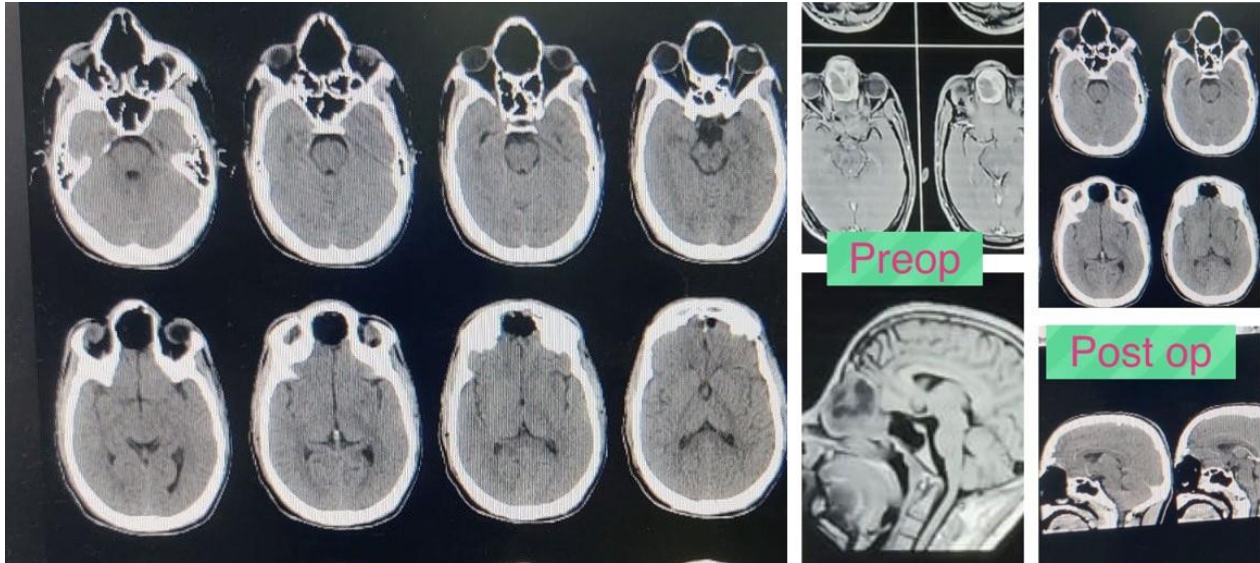


Figure 3. Postoperative images: postoperative CT (left); preoperative MRI compared with postoperative CT (right).

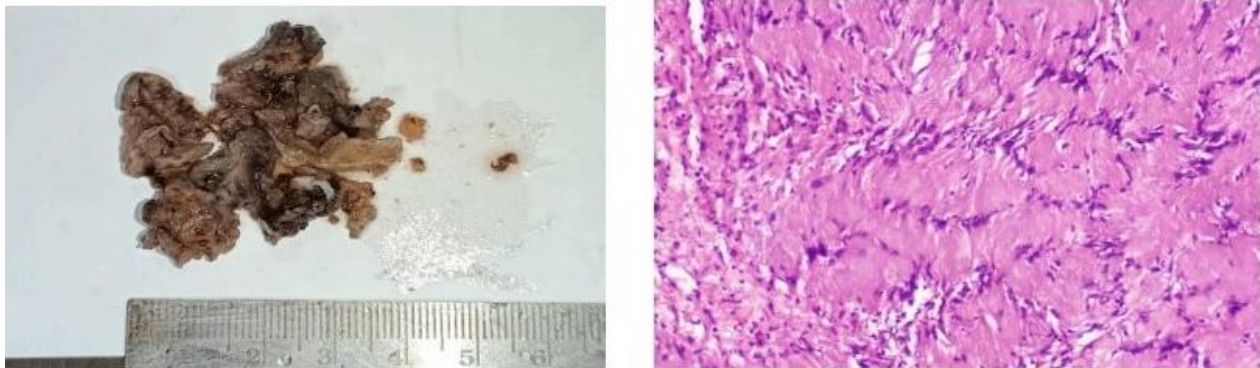


Figure 4. Histopathology: gross specimen (left) and microphotograph showing Verocay bodies (Antoni Type A areas) (right).

Additional treatment options, such as chemotherapy and/or radiation therapy, may be considered if the tumor is malignant. The use of chemotherapy and radiation therapy is determined on a case-by-case basis by healthcare providers. Chemo/radiation therapy is used for bilateral schwannomas and individuals in poor general health. Merlin, also known as schwannomin, is associated with the development of schwannomas. Everolimus, temsirolimus, and the dual mTORC1 and mTORC2 inhibitor vistusertib (AZD2014) have shown promise in inhibiting schwannoma growth in preclinical studies and may be of use in the future⁽⁵⁾. Malignant transformation is extremely rare and in the few

reported cases till now, it has not been seen and the same can be said for recurrence also; after a thorough review of literature^(4,5). Complications from ONS may include permanent damage to the olfactory nerve, leading to the loss of smell and facial droop. After the complete removal of schwannoma, recurrence is rarely observed. Occasionally, symptoms, especially anosmia, may recur after surgery. Our case mostly has a permanent anosmia apart from one time recurrence – no other complications.

In our case, we did gross total excision confirmed with a scan (CE-CT) and HPE showed no malignant features, hence we again have not advised any other

modality of treatment and are keeping patient on follow up. Hence this interesting case of an olfactory schwannoma is being reported.

REFERENCES

1. Taha MM, AlBakry A, ElSheikh M, AbdelBary TH. Olfactory Nerve Schwannoma: A Case Report and Review of the Literature. *Surg J (N Y)*. 2018 Sep 10;4(3):e164-e166. doi: 10.1055/s-0038-1669991. PMID: 30206542; PMCID: PMC6131093.
2. Nazmin Ahmed, Gianluca Scalia, Giuseppe E. Umana, Sruthi Ranganathan, Samsul Arifin, Md Isma Azam, Mohammad Morshad Alam, Mohammed A. Azab, Minaam Farooq, Daniel Encarnacion-Santos, Bashir Ahammed, Oday Atallah, Bipin Chaurasia, Olfactory Nerve Schwannoma: a case series with a systematic review of the literature focusing risk factors, etiology, clinical presentation, and management, *Oncologie*, Volume 26, Issue 3, 2024, Pages 379-393, ISSN 1765-2839, <https://doi.org/10.1515/oncologie-2023-0586>.
3. Chuah, MI, Au, C. Olfactory Schwann cells are derived from precursor cells in the olfactory epithelium. *J Neurosci Res* 1991;29:172-80. <https://doi.org/10.1002/jnr.490290206>.
4. Figueiredo, EG, Soga, Y, Amorim, RLO, Oliveira, AMP, Teixeira, MJ. The puzzling olfactory groove schwannoma: a systematic review. *Skull Base* 2011;21:31-5. <https://doi.org/10.1055/s-0030-1262945>.
5. Gande, A, Kano, H, Bowden, G, Mousavi, SH, Niranjana, A, Flickinger, JC, *et al*. Gamma Knife radiosurgery of olfactory groove meningiomas provides a method to preserve subjective olfactory function. *J Neuro Oncol* 2014;116:577-83. <https://doi.org/10.1007/s11060-013-1335-8>.