

# **Olfactory Groove Tumors: Differentiating** Schwannoma from Meningioma in a Complex Case



Maxwell A Marino, DO, MPH<sup>1</sup>; Ali O Jamshidi, MD<sup>2</sup>; Fernando A Torres, MD<sup>3</sup> <sup>1</sup>Riverside University Health System, <sup>2</sup>Kaiser Permanente Woodland Hills, <sup>3</sup>Kaiser Permanente Los Angeles

# Abstract

Olfactory groove Schwannomas (OGS) are extremely rare and often misdiagnosed as **olfactory groove meningiomas** due to their **similar** radiological features. We present a 38-year-old male who underwent endonasal resection for a presumed meningioma, later confirmed via histopathology (S100 & SOX10 positivity) to be a Schwannoma.

Preoperative imaging favored meningioma based on dural attachment and homogeneous enhancement, but retrospective analysis revealed heterogeneous enhancement and cranial nerve involvement, subtle features more suggestive of Schwannoma. This case underscores the **diagnostic** challenges in distinguishing these tumors and highlights the need for refined imaging criteria to improve preoperative diagnosis and surgical planning.

# Imaging

**Preoperative MRI Findings** 

•Presumed Diagnosis: Left anterior skull base meningioma, measuring 2.4 cm, with avid contrast enhancement.

#### •Key Features Favoring Meningioma:

- Extra-axial mass with dural attachment
- Homogeneous enhancement
- No cranial nerve involvement
- Stable without significant mass effect

#### **Postoperative Imaging & Final Diagnosis**

•Surgical changes noted from an endoscopic transnasal/transcribiform **resection**, including:

### Introduction

Olfactory groove tumors present a **diagnostic challenge**, as both Schwannomas and meningiomas can appear radiologically similar but have distinct histopathological origins and clinical **implications**<sup>1,2</sup>. **Meningiomas** are the most common extra-axial tumors in this region, typically demonstrating **dural attachment**, homogeneous enhancement, and hyperostosis on imaging<sup>3</sup>. In contrast, Schwannomas, particularly in the olfactory groove, are exceedingly rare, often exhibiting heterogeneous enhancement, cystic changes, and cranial nerve involvement.<sup>4</sup>

Misidentifying Schwannomas as meningiomas can lead to **unexpected** intraoperative findings and influence surgical approach and patient counseling. Since meningiomas arise from the dura, their resection often involves dural excision and reconstruction, whereas Schwannomas originate from **cranial nerves**, requiring a different microsurgical strategy<sup>5</sup>. A more precise radiological distinction between these tumors could aid in preoperative planning, reduce surgical morbidity, and help predict postsurgical olfactory outcomes. This case highlights the importance of considering Schwannomas in the differential diagnosis when imaging features are atypical for meningioma.

# **Clinical Presentation**

**Patient Overview** 

Fat-fascial graft and nasal septal flap reconstruction

Minimal curvilinear enhancement along the anterior skull base (post-op changes)

No nodular or mass-like enhancement suggestive of residual tumor •Histopathology confirmed Schwannoma, suggesting initial imaging misinterpretation.

# **Key Radiological Differentiators**

Feature	Meningioma	Schwannoma
Enhancement	Homogeneous	Heterogeneous
Attachment	Dural-based	Cranial nerve-based
Cystic Changes	Rare	Common
Hyperostosis	Common	Rare

# **Operative Course**

#### Surgical Approach & Technique

•Procedure: Endoscopic transnasal/transcribiform resection of an anterior cranial fossa tumor.

•Surgical Team: Neurosurgery & ENT collaboration with frameless stereotactic guidance.

•Steps Performed:

**Tumor Exposure:** Identified via **Draf 3 approach**; tumor found invading ethmoid sinus.

#### •Age: 36 years old

•Medical History: Previous craniotomy for ependymoma, followed by radiation therapy. Now presents with a presumed radiation-induced meningioma. •Symptoms: Chronic headaches since a past COVID-19 infection, but no other neurological deficits.

•Failed Conservative Treatment: Patient tried and failed non-surgical management and now **wishes to proceed with surgery**.

#### **Physical Exam Findings**

•Neurological: Fully alert (GCS 15), intact cranial nerves, full motor strength (5/5), and normal sensation. No facial droop, tongue midline, no pronator drift. •Incision Site: Some soft tissue swelling inferior to the previous craniotomy scar, but the wound is well-healed.

**Preoperative Considerations** 

•Surgical Plan: Endoscopic endonasal approach (EEA) planned for tumor resection.

### Conclusions

This case highlights the **diagnostic challenge** of differentiating **olfactory groove** Schwannomas from meningiomas based on imaging alone, emphasizing the importance of histopathology (S100 & SOX10 positivity) for definitive diagnosis. Future advancements in neuroradiological techniques may help

**Vascular Control: Ethmoidal arteries ligated**, tumor **devascularized**.

Bone Resection: Anterior cranial fossa floor & crista galli removed circumferentially.

**Tumor Debulking: Sonopet used** for controlled piecemeal removal; margins carefully dissected.

**Endoscopic Inspection: 30-degree & 0-degree scopes** used to ensure complete tumor resection.

Pathology		
Category	Findings	
Specimen Type	A: Skull base tumor (brain, resection) B: Dura (resection)	
inal Diagnosis	Schwannoma (Specimen A) Fibroconnective Tissue (Specimen B)	
Microscopic Features	Spindle cell proliferation with <b>diffuse</b> <b>S100 positivity</b> , supporting Schwannoma.	
mmunohistochemistry (IHC) Findings	SOX10 & S100: Positive EMA, STAT6, SSTR2a, AE1/AE3: Negative GFAP: Patchy positivity Ki-67: Proliferation index 5-10%	

#### improve preoperative differentiation, optimizing surgical planning and patient

outcomes.

### Contact

#### Alii O. Jamshidi, MD Kaiser Permanente Medical Center, Woodland Hills 5601 De Soto Ave, Woodland Hills, CA 91367 ALI.O.JAMSHIDI@kp.org

818-719-2000

### References

- 1. Darie, Ioana et al. "Olfactory ensheathing cell tumour: case report and literature review." Journal of neuro-oncology vol. 100,2 (2010): 285-9. doi:10.1007/s11060-010-0162-4
- 2. Tan, T C et al. "Subfrontal schwannoma masquerading as meningioma." Singapore medical journal vol. 42,6 (2001): 275-7.
- 3. Buetow, M P et al. "Typical, atypical, and misleading features in meningioma." Radiographics : a review publication of the Radiological Society *of North America, Inc* vol. 11,6 (1991): 1087-106. doi:10.1148/radiographics.11.6.1749851
- 4. Skolnik, Aaron D et al. "Cranial Nerve Schwannomas: Diagnostic Imaging Approach." Radiographics : a review publication of the Radiological Society of North America, Inc vol. 36,5 (2016): 1463-77. doi:10.1148/rg.2016150199
- 5. Hadley, Caroline et al. "Microsurgical Management of Complex Meningiomas Involving Dural Venous Sinuses: Operative Techniques, Case Illustrations and Long-Term Outcomes in a Series of 70 Cases." World neurosurgery vol. 189 (2024): e888-e897. doi:10.1016/j.wneu.2024.07.029