

## Case Report

# Exteriorization of Petrous Bone Cholesteatoma by Endonasal Endoscopic Approach: A Case Report

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A 61-year-old woman presented with diplopia and headache. The patient had a longstanding history of petrous bone cholesteatoma (PBC) on the left side and had undergone multiple surgeries to address it. Computed tomography (CT) revealed a radiolucent lesion with bony destruction in the left petrous apex. Magnetic resonance imaging of the lesion revealed a hypointense area on T1-weighted images and a hyperintense area on T2-weighted and abnormal diffusion-weighted images. A diagnosis of recurrent petrous apex cholesteatoma was made. The patient was treated by exteriorization using an endoscopic endonasal approach. The patient is in remission and doing well. The ideal treatment of PBC is complete excision, though exteriorization using an endoscopic endonasal approach is considered a second option when excision is not possible.

**KEYWORDS:** Petrous bone cholesteatoma, endoscopic endonasal approach, exteriorization, endoscopic transsphenoidal approach

## INTRODUCTION

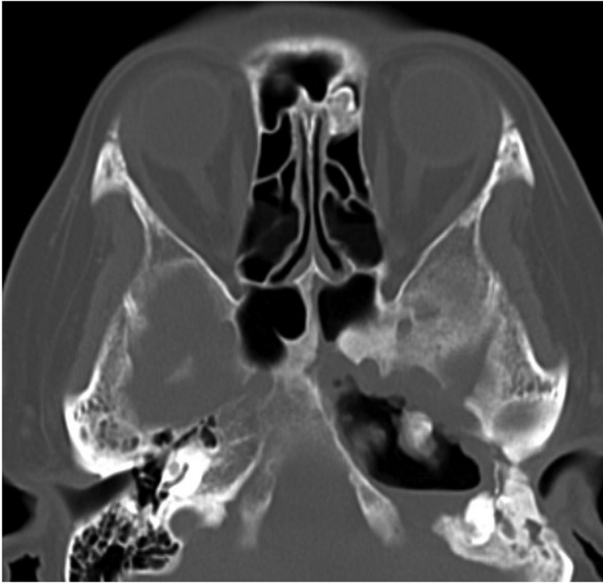
Petrous bone cholesteatoma (PBC) is an epidermoid cyst in the petrous portion of the temporal bone.<sup>1</sup> Classical surgical approaches to the petrous temporal bone include the lateral transtemporal and the middle cranial fossa approaches.<sup>2</sup> With the lateral transtemporal approach, direct exposure of the PBC is difficult due to the overlying structures, which include the facial nerve, internal carotid artery (ICA), jugular bulb, and otic capsule.<sup>3</sup> The transcranial middle fossa approach is technically difficult and involves retraction of the brain to a certain extent, which could lead to brain injury. An open transsphenoidal approach to petrous apex cholesterol granulomas was first described in 1977 by Montgomery.<sup>4</sup> Subsequent reports established the utility of an endoscopic transsphenoidal approach to treat cholesterol granulomas.<sup>5,6</sup> Though the goal of treatment is to excise PBCs completely, it is challenging to perform since the thin membrane of the cholesteatoma adheres tightly to soft tissues such as the dura mater, ICA, jugular bulb, and surrounding nerves. Exteriorization is considered a second option when excision is not possible.<sup>1</sup>

In this report, we describe a patient with cholesteatoma of the petrous apex successfully treated by exteriorization using an endoscopic endonasal approach.

## CASE PRESENTATION

### History

A 61-year-old woman had a longstanding history of PBC for which she had undergone 4 surgeries (through transmastoid and transcochlear approaches) at another hospital, with repeated recurrences. Eventually, the cholesteatoma extended into the posterior wall of the sphenoidal sinus, and the cyst matrix drained into the sinus cavity. Deafness and facial palsy were the only symptoms, and the patient was under regular follow-up at the previous hospital. A computed tomography (CT) scan was recommended, revealing that the petrous apex was aerated (Figure 1). However, when the patient experienced diplopia and headache, she presented at our hospital.



**Figure 1.** Preoperative computed tomography. A destructive lesion involves the bone at the petrous apex, and the body is aerated. There is a bony defect in the posterior wall of the left sphenoidal sinus.

#### Investigation

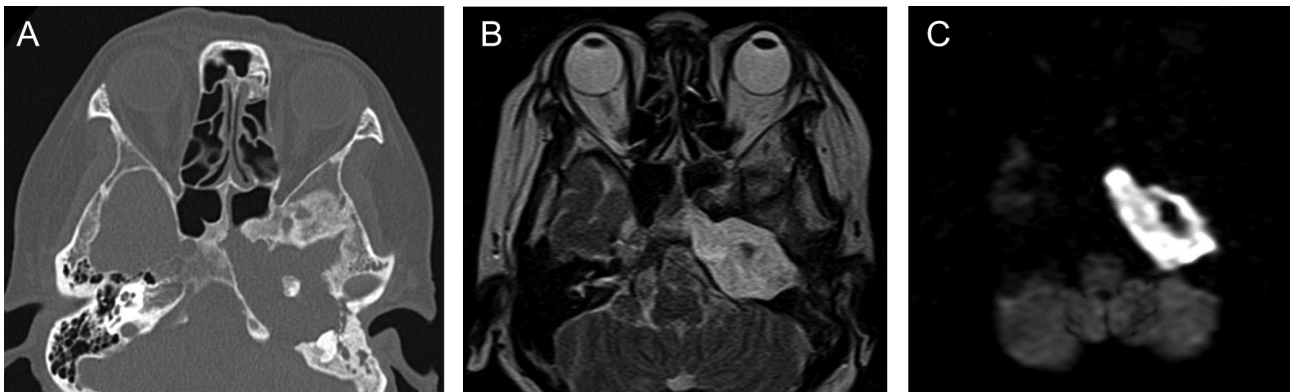
The patient's left external auditory meatus was blocked due to previous surgeries. The patient had limited left eye abduction, suggesting sixth

cranial nerve palsy, and exacerbation of left facial paralysis. CT revealed a radiolucent lesion with bony destruction in the petrous apex region (Figure 2A). The lesion involved the posterior wall of the left sphenoidal sinus. Magnetic resonance imaging of the lesion revealed hypointense areas on T1-weighted images and hyperintense areas on T2-weighted and abnormal diffusion-weighted images (Figure 2B and C).

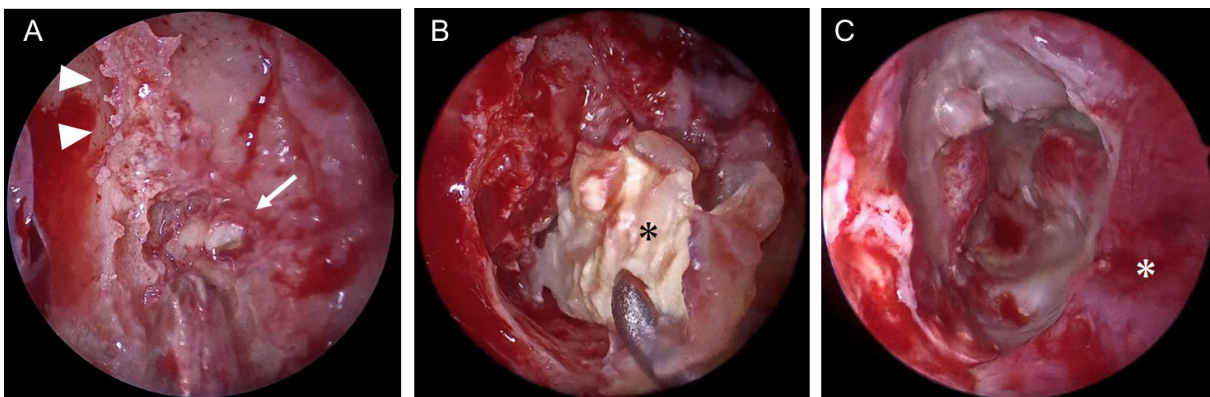
#### Treatment

Symptoms did not progress, as the matrix had drained into the sphenoidal sinus. We expected the matrix to have adhered to the dura mater or the ICA, and therefore we presumed that excision of the cholesteatoma matrix would be difficult and high-risk. Therefore, we decided on exteriorization using an endoscopic transsphenoidal approach.

First, bilateral sphenoidotomies were performed for instrument access. A "2 nostrils-4 hands technique"<sup>7</sup> was employed. A bony defect was found in the posterior wall of the left sphenoidal sinus, through which the PBC matrix could be observed (Figure 3A). The bony defect was enlarged using a drill, and the matrix was curetted as much as possible (Figure 3B). Since the matrix had strongly adhered to the surrounding soft tissues, exteriorization was performed. A pedicled nasoseptal flap (Hadad-Bassagasteguy flap)<sup>8</sup> was then positioned on the posterior sinus wall, avoiding the sphenoidal drainage pathway to prevent its obstruction (Figure 3C). Cerebrospinal fluid (CSF) leakage was not observed during the surgery.



**Figure 2.** (A) Preoperative computed tomography. The petrous apex filled with the shadow of a soft tissue lesion. (B) Hyperintense lesion on T2-weighted magnetic resonance imaging. (C) Hyperintense lesion on diffusion-weighted magnetic resonance imaging.



**Figure 3.** Intraoperative findings: (A) A wide bilateral sphenoidotomy with removal of the rostrum and the intersinus septum (white arrow head) was performed. The matrix (white arrow) is exposed on the posterior wall of the left sphenoidal sinus. (B) The site after matrix (black asterisk) removal. (C) The exposed bony window of the fenestration was covered with a nasoseptal mucosal flap (white asterisk).



**Figure 4.** Postoperative computed tomography. The petrous apex is aerated and patent with the sphenoidal sinus.

### Outcome and Follow-up

The patient was discharged on the sixth day following surgery. Left eye movement improved after a few days. The patient was followed up and periodic cavity debridement was performed in the outpatient setting. CT revealed absence of recurrence 1 year after the procedure (Figure 4).

### DISCUSSION

PBC is a slowly proliferating epidermoid lesion arising in the petrous portion of the temporal bone. It may involve the anatomical structures within the temporal bone and extend to the cerebellopontine angle or the infralabyrinthine region, posing a risk of damage to vital structures.<sup>1</sup> Over the years, several approaches to the petrous apex have been described, which can be categorized as open approaches and endonasal approaches.<sup>9</sup> Open approaches include the transtemporal and middle cranial fossa approaches. The former includes the infracochlear, infralabyrinthine, suboccipital, and translabyrinthine approaches.<sup>9</sup> These approaches are limited by the superior bulb of the internal jugular vein inferiorly; by the labyrinth, facial nerve, and internal auditory canal medially; by the dura mater superiorly; and by the ICA laterally.<sup>10</sup> The transcranial middle fossa approach is difficult and has its own risks. In 1994, Fucci et al.<sup>5</sup> reported the first endoscopic endonasal approach to a giant cholesterol cyst of the petrous apex. The endonasal approach can be considered minimally invasive when compared to open approaches, and its advantages include avoiding craniotomy, faster recovery, and shorter hospitalization time. Furthermore, facial muscle weakness, hearing loss, and loss of vestibular function, which are common complications of the transtemporal and middle fossa approaches, have not been reported for the endoscopic transsphenoidal approach.<sup>11</sup> Although the decision to use an endoscopic transsphenoidal approach depends on the lesion's proximity to the ICA and the degree of medial expansion, this approach can be considered whenever feasible in PBC patients. Endonasal approaches to the petrous apex include the medial approach, the medial approach with ICA lateralization, and the transpterygoid infrapetrous approach.<sup>12</sup> The choice of a surgical approach depends on the medial expansion of the lesion and the position of the paraclival carotid artery.<sup>12</sup> Whenever there is medial expansion of the lesion into a well-pneumatized sphenoidal sinus,

the medial approach is optimal. If the sphenoidal sinus is poorly pneumatized, or there is no expansion into the sinus, it becomes necessary to lateralize the ICA. However, if lesions are not accessible with the medial approaches through the sphenoidal sinus, the transpterygoid infrapetrous approach is more suitable. In the present case, there was sufficient medial expansion of the matrix into the sinus cavity; therefore, we used the medial approach without lateralization of the ICA.

The ideal treatment of PBC is surgical excision; however, it is challenging to deal with soft tissues such as the dura mater, ICA, jugular bulb, and accompanying nerves.<sup>1,13</sup> If complete curettage of the matrix from intact neurovascular structures cannot be achieved, and if CSF leak is absent, exteriorization is favored.<sup>14</sup> A sole report on PBC treated by an endonasal approach<sup>11</sup> reported a minor pontine stroke resulting in a transient hemiparesis. This was due to inadvertent and unnoticed rupture of a minute pontine artery during matrix dissection from the dura mater.<sup>11</sup> In the present case, it was expected that the matrix could have adhered to the dura mater and ICA due to multiple surgeries in the past. It was assumed that excision would be difficult; hence, our case was managed with an exteriorization. To maintain the patency of the exteriorized cavity in the petrous apex, a pedicled nasoseptal flap is useful.<sup>15</sup> In our patient, the exteriorized cavity has been kept open using a pedicled nasoseptal flap, and it has been a year since the surgery.

### CONCLUSION

Recurrent PBC, which can adhere to critical structures such as the dura mater and ICA, can be managed with exteriorization using an endoscopic endonasal transsphenoidal approach. This method is a minimally invasive surgical approach for treating such conditions.

**Informed Consent:** An informed written consent was obtained from the patient who participated in this study.

**Peer Review:** Externally peer-reviewed.

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