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Case Report

Petrous apex cholesterol granuloma treated via the endoscopic transsphenoidal approach

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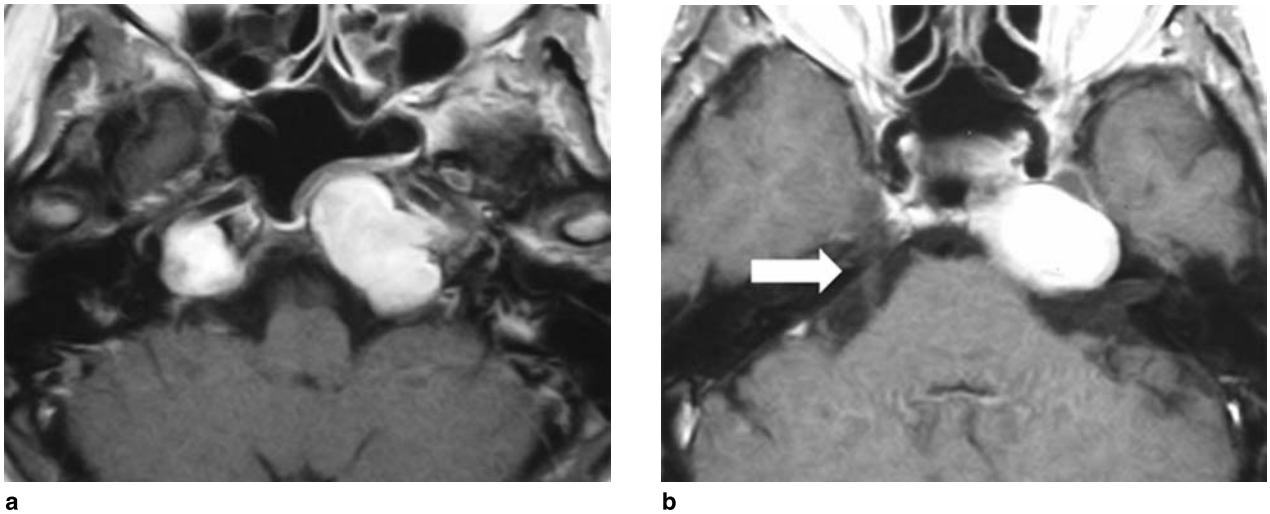
Summary

Numerous surgical approaches have been used to treat petrous apex cholesterol granulomas. They are usually treated via the transtemporal- or middle fossa approach; some are managed endoscopically. We present a patient treated by the endoscopic transsphenoidal approach and review the literature.

Keywords: Petrous apex cholesterol granuloma; trigeminal neuralgia; endoscopy; transsphenoidal approach.

Case report

This 28-year-old woman reported to our hospital with left-sided hemifacial pain. It was diagnosed as left second-division trigeminal neuralgia. MRI showed hyperintense lesions at the both petrous apices on T1-weighted- and heterogeneous intensity on T2-weighted images (Fig. 1). The left trigeminal nerve was compressed upward by a left petrous apex lesion. As her symptoms worsened, we decided to treat the symptomatic lesion on the left by surgical intervention. A CT scan showed that the left



a b

Fig. 1. MRI showed hyperintense lesions at both petrous apices on T1- and heterogeneous intensity on T2-weighted images (a). The left trigeminal nerve was compressed upward by the left petrous apex lesion and invisible and the right trigeminal nerve (arrow) could be seen on the same slice (b)

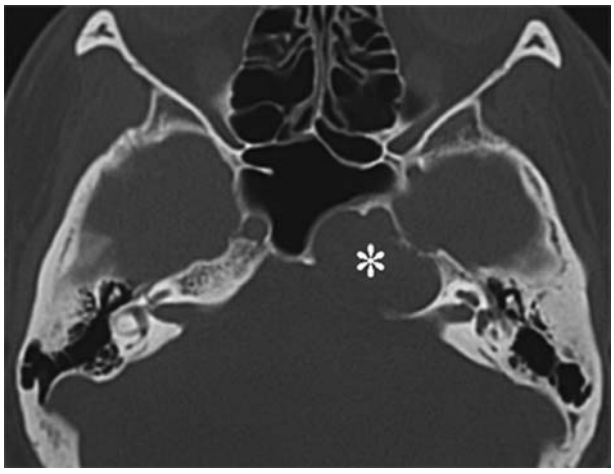


Fig. 2. A CT scan showed that the left petrous lesion (*asterisk*) was separated from the posterior sphenoid sinuses by a thin layer of bone

petrous lesion was separated from the posterior sphenoid sinuses by a thin layer of bone; the left carotid canal was close by (Fig. 2). Endoscopic transsphenoidal surgery (ETSS) using 4-mm straight endoscopes with 0, 30, and 70 lenses (MACHIDA, Tokyo, Japan) was performed through the right nostril to allow for wide access to the cyst cavity and to avoid injury to the left internal carotid artery (ICA). We also used a navigation system (Stealth Technologies, Marine, IL) (Fig. 3) and Doppler ultrasound scanning because we suspected that the left ICA was located behind the lesion. Thin eroded petrous bone was easily removed. After cutting the cyst wall, brownish fluid typical of granulomas flowed out (Fig. 4). Fluid and debris were removed with a curette and by end-curved suction with irrigation (Interchangeable Pituitary Combined Irrigation Sucker; FUJITA Medical Instrument Co., Tokyo, Japan), and the cyst cavity was opened widely. The lower part of the right middle concha was removed to maintain easy access to the lesion for outpatient-based endoscopic follow-up. Her left trigeminal neuralgia improved within a few days after surgery. Pathological examination showed that the cyst wall consisted of fibrous tissue; other findings were consistent with a cholesterol

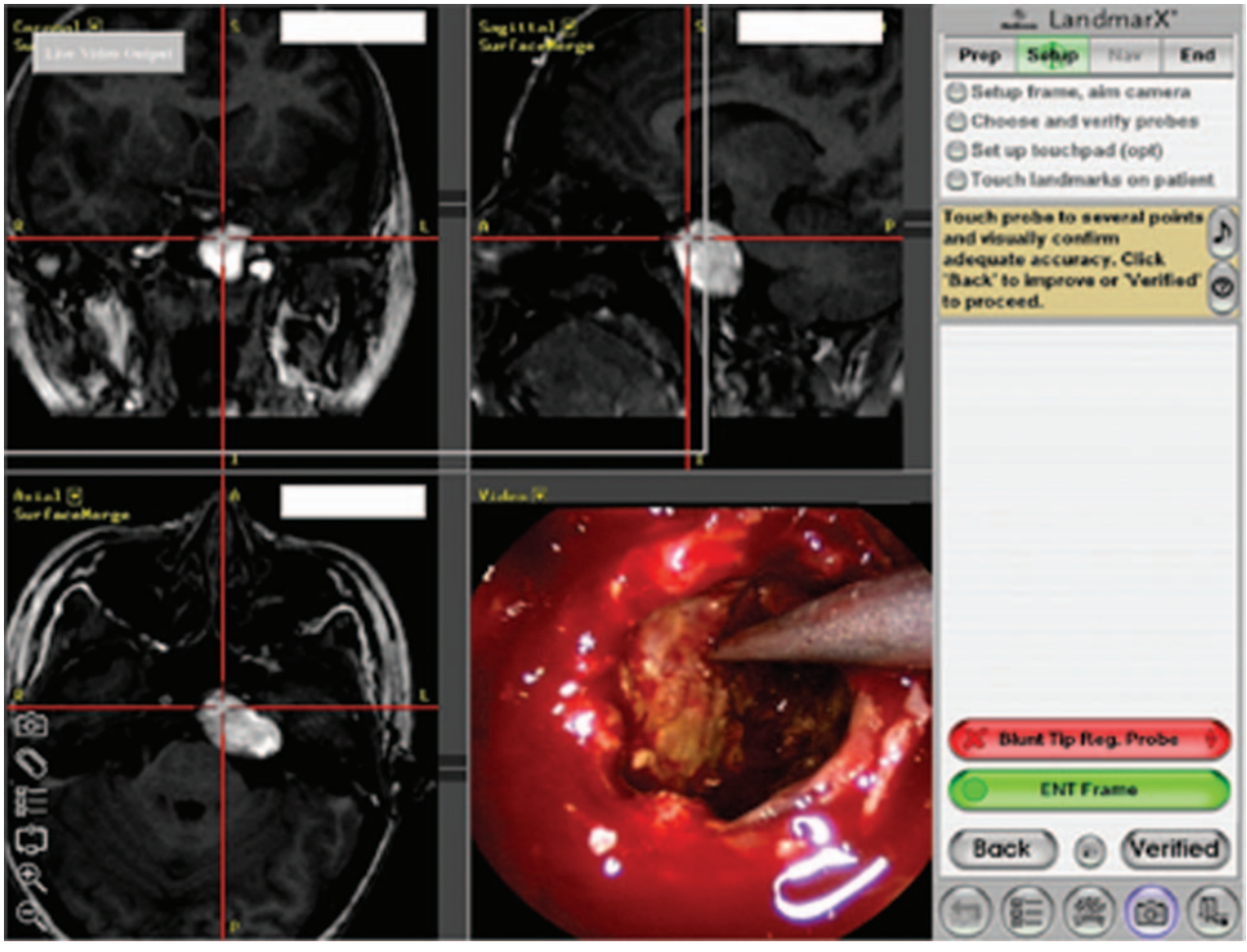


Fig. 3. We used a navigation system to identify the cyst and neighboring vital structures. It was especially useful for confirming the location of the internal carotid artery, making it possible to avoid intra-operative carotid artery injury

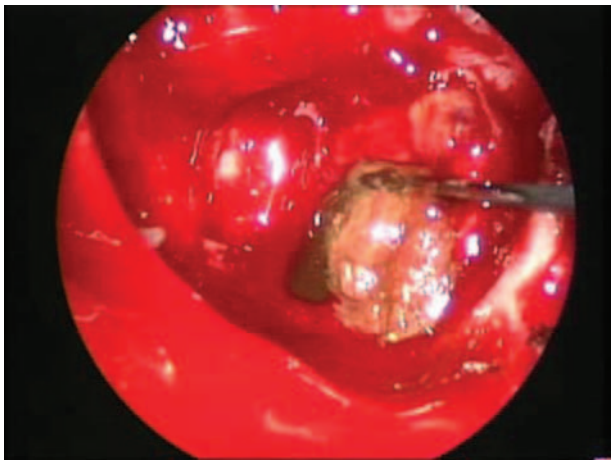


Fig. 4. After removing the eroded petrous bone and cutting the cyst wall, brownish fluid, typical of cholesterol granuloma, flowed out

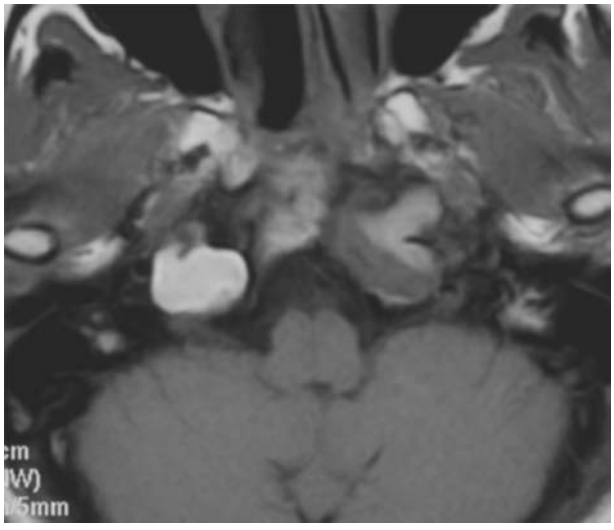


Fig. 5. An MRI scan obtained at 2-year follow-up showed that the left cyst cavity remained collapsed

granuloma. She has remained asymptomatic during the course of 24-month outpatient follow-up and MRI confirmed collapse of the left cyst cavity (Fig. 5).

Discussion

Petrous apex cholesterol granulomas (PACG) result from obstruction of the normal aeration of petrous air cells. Dizziness is the most common symptom, followed by pressure sensation, nausea, leakage from the ear, facial pain, hemifacial spasm, and facial numbness [9]. Surgical approaches to PACG include the middle fossa-, transcochlear and translabyrinthine-, and infralabyrinthine and subcochlear approach to provide a drainage route for the normal pneumatic area [1, 2, 7, 10]. Since the recurrence rate of PACG addressed by these approaches is reportedly as high as 60%, Eisenberg *et al.* [5] recommended the extended middle fossa- and petrosal approach with complete cyst wall removal and cavity obliteration with a pedicle strip of temporalis muscle to avoid recurrence. According to Montgomery [14], the external transethmoidal-transsphenoidal approach is appropriate for cystic lesions of the petrous apex that invade the sphenoid sinus. With the introduction of endoscopic surgery, petrous apex cholesterol granulomas have been treated by ETSS [4, 8, 13] (Table 1), an approach that can be used only in lesions abutting, invading, or prolapsing into the sphenoid sinus [8]. ETSS is useful and safe in patients with a well-pneumatised sphenoid sinus because the petrous apex is easily accessed and the eroded bone can be removed easily. As expanded endonasal endoscopic surgery that is based on specific anatomical knowledge can be adapted to treat various cranial base lesions [2, 3, 6, 11, 12], we expect to see an increase in the number of PACG patients treated by this technique.

ETSS is less invasive and more cosmetic than other approaches to PACG and it preserves hearing and vestibular functions. Transient epistaxis is a rare complication [8]. Patients treated by ETSS can easily be followed on an out-patient basis with a fiberscope, and where necessary, drainage of the cyst can be re-established [4, 8]. We removed the lower part of the right middle concha to maintain an easy access route to the lesion for endoscopic follow-up.

As we used surgical tools designed for endoscopic pituitary surgery, they were a little short for treating the petrous apex lesion. However, end-curved suction with irrigation effectively removed the debris in the deep part of the cyst. The most important issue is the identification of the petrous ICA. Recent advances in endoscopic transnasal surgical techniques have led to the use of the vidian

Table 1.

	Patients' age & sex	Pre ope symptoms	Symptoms on follow up (duration)	Complications
Griffith and Terrell [8]	34, M	dysequilibrium	asymptomatic (18 M)	transient epistaxis
	24, M	hearing loss V3 hypesthesia	asymptomatic (12 M)	none
Michaelson *et al.* [13]	13, F	headache VIth nerve palsy	asymptomatic (6 M)	none
DiNardo *et al.* [4]	62, F	dysequilibrium	asymptomatic (12 M)	none
Present case	28, F	V2 numbness	asymptomatic (24 M)	none

nerve and artery as critical landmarks for the petrous ICA [2, 12]. The petrous bone can be drilled safely if the vidian canal is used to represent the upper border because the vidian nerve and artery travel in the vidian canal to join the genu of the petrous ICA [12].

As our patient had a well-pneumatised sphenoid sinus and the petrous bone was eroded, we could easily remove the eroded petrous bone located in front of the lesion without drilling. In addition, as the preoperative MRI scan showed that the left petrous ICA ran behind the lesion, we used a navigation system to identify the cyst and neighboring vital structures. As navigation and Doppler ultrasound scanning were particularly useful for identifying the location of the ICA, we were able to avoid injury to the carotid artery.

Conclusion

We report that ETSS, a safe, minimally invasive procedure, is a useful means of treating PACG. Navigation and Doppler ultrasound scanning were valuable for avoiding iatrogenic carotid artery injury. Recent advances in the extended endonasal endoscopic approach that is based on anatomical knowledge facilitates adaptation of this procedure to treat PACG.

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Comment

The authors should be congratulated for a short, clear, and useful case presentation. On the basis of good imaging, the authors have chosen the best approach to this lesion and do demonstrate specifically the use of the endoscope in the case of petrous apex cholesterol granuloma. They are aware of the surrounding structures and did undertake all the necessary measures to avoid injury of neural and vascular structures. To be aware of the position of the vidian canal, the vidian nerve and artery in the canal, as well as of the dorsal loop of the ICA, is clear-cut evidence that the tumorous mass did not "pull" the surgeons. On the contrary, they were well aware how far they can go, and what lies beyond. The use of neuronavigation and Doppler were useful tools in their hands. The accompanying pictures in this report are well chosen, they are of good quality and do show important microsurgical details.

And finally, although personally I am not a fan of endoscopic surgery, in this case any other approach would have been more dangerous and even inappropriate.

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