



## Combined microscopic/endoscopic management of petrous apex lesions

Vincent Patron<sup>1</sup> · Martin Hitier<sup>1,2</sup>

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Dear Editor,

It was with great interest that we read the article by Sugimoto et al. [1], describing surgical access to the petrous apex using the combined lateral microscopic/endoscopic technique for recurrent cholesteatoma.

Using an endoscope during a lateral microscopic approach to the petrous apex is still the subject of debate [2]; more data need to be shared to improve our strategy and technique when approaching the petrous apex. This is true for cholesteatoma, as exposed by Sugimoto et al., but also for other types of lesion, such as cholesterol granuloma or low-grade chondrosarcoma [3–8].

We would like to emphasize that facial nerve sacrifice should not be considered a necessity in this type of surgery, and that the microscopic/endoscopic technique is the technique of choice for working on the anterior petrous apex and preserving facial function.

The facial canal is a major obstacle for microscopic lateral petrous apex surgery. Facial rerouting certainly improves access to the petrous apex but has a risk of facial palsy [9,

10]. When the facial canal is preserved, the microscopic/endoscopic technique uses the endoscope medial or lateral to the canal to visualize every blind corner in the petrous apex (Fig. 1). We recommend keeping a bony shell to protect the facial nerve, taking care to avoid burning/heating the facial canal with the endoscope.

Another point is that different types of 4 mm endoscope can be used, such as 0°, 30°, or 70° angled endoscopes. An angled view gives access to areas such as the anterior part of the internal auditory canal or even the sphenoid sinus where cholesteatoma remnants can be found. Instruments designed for ear surgery can be used, but can be a little short for reaching certain parts of the petrous apex. Sinus surgery instruments can then be used as they are longer. Angled/malleable suctions, raspatories, and probes can be of great help with removing the matrix of a cholesteatoma. This can be done by means of bimanual dissection as under microscope, with a second surgeon holding the camera and, if needed, a suction tube (the three- or four-hand technique as in endoscopic skull base surgery). Most sinus surgeons are

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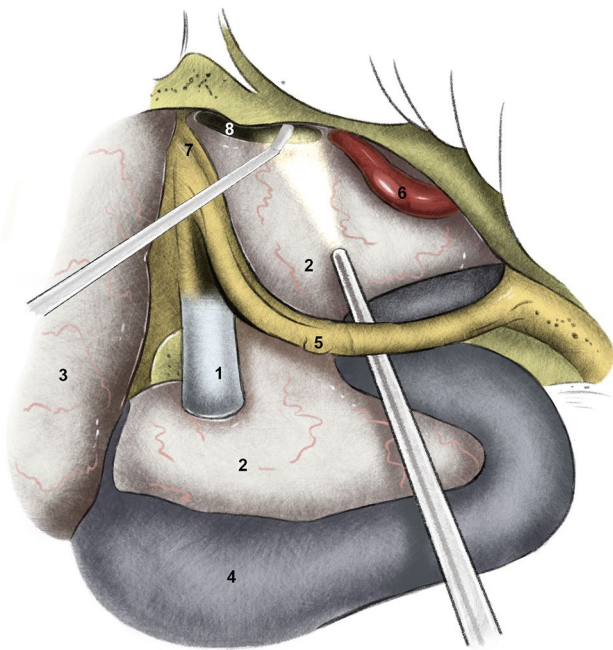
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✉ Vincent Patron  
vtromps@yahoo.fr

<sup>1</sup> CHU de Caen, Service d'Oto-rhino-laryngologie et de Chirurgie Cervico-faciale, Avenue de la Côte de Nacre, Caen 14000, France

<sup>2</sup> UniCaen, UFR de médecine, Caen 14000, France



- 1- Internal auditory canal
- 2- Posterior fossa dura
- 3- Middle fossa dura
- 4- Sigmoid sinus
- 5- Facial canal
- 6- Internal carotid artery
- 7- Geniculate ganglion
- 8- Petrous apex

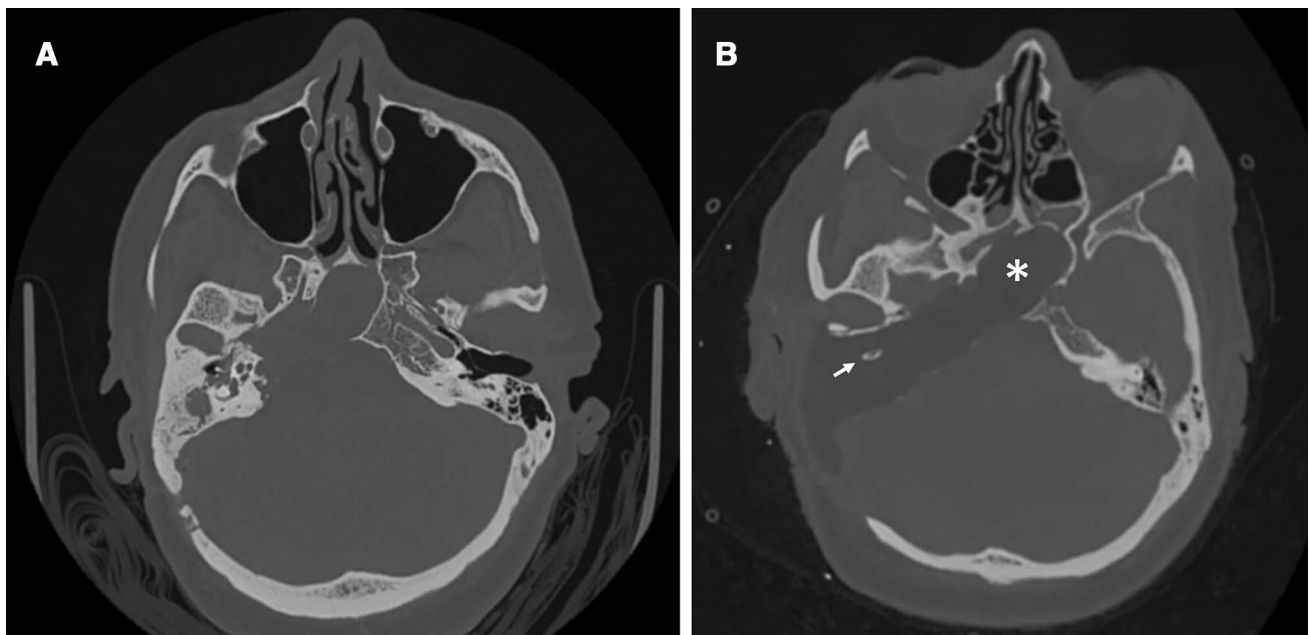
**Fig. 1** Drawing shows surgical access to the petrous apex following a transotic approach with facial nerve conservation. The endoscope makes it possible to remove the lesion from the anterior petrous apex. In this case, the endoscope is placed medial to the facial nerve

now quite familiar with this kind of technique and can be of great help in combined surgery of this nature.

In our experience, this technique makes it possible to preserve facial function with enough access to remove a petrous apex cholesteatoma reaching the sphenoid sinus (Fig. 2). Thus, the facial nerve should only be sacrificed in cases of complete and long-lasting facial palsy, as the authors experienced in their two cases.

Finally, we would like to emphasize that petrous apex cholesteatoma surgery results in a large cavity. In cholesterol granuloma, where drainage is necessary, we agree that the cavity must be left filled with air [3]. For cholesteatoma, filling the cavity should be questioned to decrease dead space and prevent meningocele, meningitis, or carotid artery arteritis. Like other authors, we pack the Eustachian tube and fill the cavity with abdominal fat [4, 7, 8].

In conclusion, we agree with the authors that the endoscope shows promising results for operating inside the petrous apex. Using the endoscope should be considered each time surgeons face a large tumor in the petrous apex. When gathering all the recent publications on the topic, it appeared that this attitude would soon define a new paradigm for management of petrous apex lesions, with less need for translabyrinthine, transotic, or Fisch infratemporal type B approaches.



**Fig. 2** Axial CT of a right recurrent petrous apex cholesteatoma invading the sphenoid sinus. **a** pre-operative CT, **b** post-operative CT showing the cavity filled with fat, including the sphenoid sinus (white asterisk). White arrow: preserved facial canal

## Compliance with ethical standards

**Conflict of interest** The authors declare that they have no conflict of interest.

**Ethical approval** This article does not contain any studies performed by any of the authors with human or animal participants.

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