

# Endoscopic Facial Nerve Surgery



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## KEYWORDS

- Facial nerve • Endoscopic approaches • Geniculate ganglion • Schwannomas
- Petrous bone fracture

## KEY POINTS

- Endoscopic magnification of the tympanic cavity anatomy and good knowledge of middle ear structures allow a minimally invasive approach for the removal of disease.
- The transpromontorial approach allows eradication of lesions involving fundus of internal auditory canal and petrous apex, with limited extension to the intracochlear, intravestibular, and pericarotid regions.
- The suprageniculate approach allows eradication of pathologic conditions involving the triangular area between geniculate ganglion inferiorly, middle cranial fossa dura superiorly, and labyrinthine bloc posteriorly.
- Endoscopic transcanal facial nerve decompression is applicable in cases of posttraumatic facial palsy, in particular, when there is an involvement of the geniculate ganglion region.
- The endoscopic approach allows a complete exposure of the facial nerve course, from the labyrinthine tract to the second genu, with low morbidity.

## INTRODUCTION

The dissemination of endoscopic ear surgery in the otological community in the last decade expanded the use of the external auditory canal (EAC) as a natural surgical corridor to access diseases located in the tympanic cavity.<sup>1</sup> Several investigators have described the use of exclusive endoscopic transcanal approaches to tympanic cavity cholesteatomas.<sup>2</sup>

These approaches allowed also an improvement of the tympanic cavity anatomic knowledge, especially over the last 5 years. In fact, several studies in

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literature were focused on the endoscopic anatomy of the retrotympanium and epitympanium.<sup>3,4</sup>

Recently, the endoscopic anatomy from the EAC to the internal auditory canal (IAC) was described in detail, and this allowed also the identification of the facial nerve pathway from the second genu until the geniculate ganglion (GG), and from the GG to the intralabyrinthine segment of the facial nerve into the IAC.<sup>5</sup>

Moreover, using the EAC as a natural surgical corridor, the investigators described the possibility of reaching the tympanic segment of the facial nerve, studying the anatomic conformation and its relationships with the surrounding anatomic structures.<sup>3</sup>

The continued progress of the facial nerve endoscopic anatomy knowledge permitted an advancement in surgery, performing facial nerve transcanal exclusive endoscopic surgery for the treatment of facial nerve diseases located on its tympanic portion, GG, and suprageniculate fossa.<sup>6,7</sup>

## ANATOMICAL CONSIDERATIONS

From an endoscopic point of view, it is possible to consider the tympanic facial nerve into 2 portions regarding the orientation to the cochleariform process (CP): precochleariform and postcochleariform segments.<sup>3</sup>

### *Precochleariform Segment of Tympanic Portion of Facial Nerve*

Precochleariform segment is the portion of the tympanic facial nerve lying superiorly and anteriorly to the posterior bony limit of the CP.

This segment of the facial nerve is composed by the GG and the greater petrosal nerve (GPN). It is necessary to remove the malleus head to obtain good visualization of the precochleariform segment and the GG area.

The precochleariform segment has a parallel orientation with respect to semicanal of tensor tendon of the malleus, lying superiorly to this semicanal. Microscopic access to the anterior epitympanium should be made by a mastoidectomy, posterior atticotomy, and removal of the incus and head of the malleus.

On the other hand, after ossicular chain removal, which can be considered mandatory, the GG can be easily accessed using an exclusive endoscopic transcanal route, with the advantages of sparing mastoid tissues and avoiding more extended approaches.

Therefore, endoscopy guarantees true advantages compared with microscopy in terms of surgical maneuvering and access of extreme anterior segment of the tympanic facial nerve toward the GG (Fig. 1A).

### *Geniculate Ganglion*

The CP represents an excellent landmark to identify the GG, which is located just medially and superiorly to the CP.

GG is in the floor of the anterior epitympanic space and has a horizontal orientation parallel to the semicanal of the tensor tendon of the malleus (Fig. 1B).

In 66.7% of cases, the GG is covered by the bone of the anterior epitympanic space cells, so in these cases the cells of the anterior epitympanic space just anteriorly and superiorly to the CP should be removed in order to expose the GG.

From literature, in 33.3% of cases a partial dehiscence of the ganglion in the anterior epitympanic space cells was found.<sup>3</sup>

Another anatomic landmark for GG is the transverse crest, which is a bony ridge extending inferiorly from the tegmen tympani of the anterior epitympanic space, just anterior to the CP, also known as the "COG" (Fig. 1B).<sup>8,9</sup>

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