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Technical Notes & Surgical Techniques

# Translabyrinthine approach surgical technique

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## 1. Introduction

The translabyrinthine approach was described by Panse in 1904 and firstly used to resect a cerebellopontine angle tumor by Quix in 1912, it was not until House [6] reported on 47 resections with no deaths in 1964 that the approach was truly popularized.

Since that time it has been well described in the literature as a useful approach for resecting vestibular schwannomas (VS) in cases in which hearing preservation is not a concern [8].

These techniques involving the collaboration of neurotologists and neurosurgeons provide ample surgical exposure and minimize brain retraction during access to the cerebellopontine angle (CPA).

## 2. Indications

The translabyrinthine approach is used for VS when the hearing is poor or in cases in which hearing preservation would be unlikely [1].

Advantages of the translabyrinthine approach are [1,7]:

- It is the most direct route to the CPA.
- It exposes the internal auditory canal (IAC) in its entirety.
- The facial nerve can be found with typically undisturbed anatomy anterior to vertical crest (Bill's bar) at the fundus.

Anatomic variants that limit the exposure include an anterior position of the sigmoid sinus, a high jugular bulb, or a low middle fossa plate [3].

The chosen approach for a given VS is highly variable based on the experience and background of the surgical team members. Tumor size and residual hearing are the most important factors influencing VS approach in centers that routinely use the translabyrinthine, retrosigmoid, and middle fossa craniotomies. The translabyrinthine approach is recommended in cases in which the tumor is larger than 2.5 cm and hearing has progressed to a non-serviceable level [10].

## 3. Surgical considerations

### 3.1. Patient position

The patient is placed supine with the ipsilateral shoulder elevated and the head turned to the opposite side in order to position the mastoid surface at the highest point. The patient's head is maintained in a natural position without fixation (Fig. 1).

The surgeon is then seated at the patient's side. This position minimizes fatigue and allows stabilization of the arms and hands during the exacting microsurgical procedures [4].

Electromyographic intraoperative facial nerve monitoring is necessary to locating the nerve, and provides prognostic facial function information at the end of the surgery. The leads of the facial nerve monitor are inserted into the ipsilateral orbicularis oculi, and orbicularis oris.

### 3.2. Incision

A C-shaped scalp incision is made 2 cm above the pinna of the ear curving 4 cm posteriorly and inferiorly behind the body of the mastoid and ends below the mastoid tip (Fig. 1).

The scalp is deeply elevated to the galeal layer and raised anteriorly until the impression of the posterior border of the external auditory canal is located.

There are several methods of incising the musculofascial layer; however, a T-shaped incision will work best in terms of closure at the end of the surgery (Fig. 1). It is best to incise this layer sharply, avoiding cautery, which tends to shrink the flaps and make closure more difficult [5].

Emissary veins are often encountered with elevation of the pericranium posteriorly. This provides an estimate of the sigmoid sinus location and the bleeding is controlled with bone wax.

The anterior limit of the elevation is the external auditory canal. Inferiorly the mastoid tip is exposed.

*Abbreviations:* TL, temporalis linea; VS, vestibular schwannoma; CPA, cerebellopontine angle; EAC, external auditory canal; IAC, internal auditory canal; CSF, cerebrospinal fluid; SS, sigmoid sinus; MF, middle fossa; U, uncus; JB, jugular bulb; SDA, sinodural angle; PSD, presigmoid dura; P, porus; F, fundus; BM, body of the mastoid; MT, mastoid tip; SCC, semicircular canal

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**Fig. 1.** The patient is placed supine with the head turned to the opposite side. A C-shaped retroauricular skin incision was made and dissected anteriorly. Then, an T-shaped musculoperiosteal flap was prepared to expose the mastoid bone.

### 3.3. ENT stages

The initial bone removal of a translabyrinthine craniotomy consists of a mastoidectomy.

#### 3.3.1. Mastoidectomy

The important bony landmarks that are identified at this point are anteriorly the spine of Henley and the posterior rim of external auditory canal, posteriorly the backside of the body of the mastoid (this is the ridge at the posterior margin of the mastoid bone), superiorly the temporalis linea, and inferiorly the mastoid tip (Fig. 2).

The spine of Henley or suprameatal spine, is a small bony prominence that is located at the postero-superior rim of the external auditory canal and is useful as a superficial landmark that approximates the deep site of the lateral semicircular canal and the tympanic segment of the facial nerve [3].

Bone removal is started along the posterior rim of external auditory canal to the mastoid tip, and then horizontally along the temporalis linea. The junction of these lines lies over the mastoid antrum.

Posteriorly the sigmoid sinus is uncovered, generally appears as a blue discoloration of smooth dural bony plate. Bleeding from the sigmoid sinus can be controlled with surgicel and bipolar coagulation. As soon as the sigmoid sinus has been outlined, the operating microscope is brought into place. Removal of bone over the sigmoid sinus must be done carefully.

Once skeletonizing of the sigmoid sinus is completed, mastoid air cells are removed anteriorly and superiorly to expose the middle fossa dura. Once the heavy bone is removed, thinning can be performed with a diamond tip, which results in less bleeding and less risk of lacerating the dura. Exposing the middle fossa dura is critical for best possible access into the antrum.

The area between the sigmoid sinus and the middle fossa plate, or the sinodural angle, can be fully evacuated of air cells. The sinodural angle is delineated by first using a medium-sized cutting burr, then a diamond burr. The superior petrosal sinus, which runs along the sinodural angle inside the dura, should always be kept in mind and the drilling executed with care [3].

The external opening must be as large as possible and a wide cortical mastoidectomy is performed with exceeding of the edges at least 2 cm superior to the middle fossa floor and posterior to the sigmoid sinus (Fig. 3).

Subsequently, the air cells surrounding the inferior segment of the sigmoid sinus and the digastric ridge are removed. The digastric ridge constitutes an important landmark in locating the facial nerve at the stylomastoid foramen. The ridge is formed by the impression of the digastric groove, in which we find the origin of the posterior belly of the digastric muscle. This ridge leads directly to the stylomastoid foramen.

The next step is opening the mastoid antrum in the superior portion of the exposure. The antrum can be identified as a larger aircontaining space, lies immediately below the deepest point of penetration into the temporal bone posterior to the spine of Henley and the temporalis linea. The horizontal semicircular canal is plainly seen in the open antrum, oriented in the axial plane (Fig. 3).

Exposure should be carried anteriorly until the entire length of the lateral semicircular canal is visible in the medial wall of the antrum, thus revealing the short process of the incus.

The superficial landmark for the incus is the spine of Henley. By

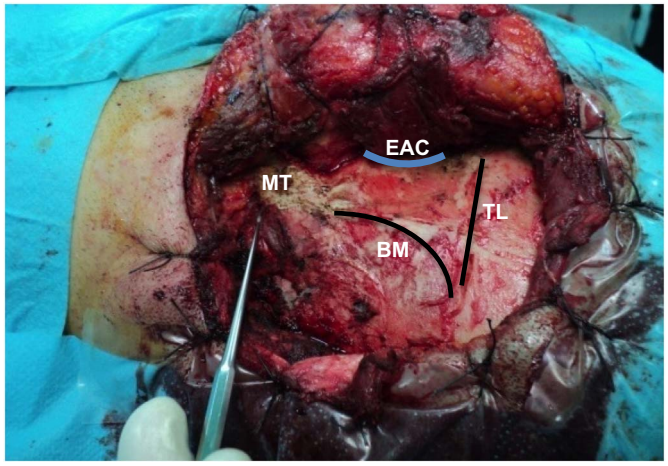


**Fig. 2.** The important bony landmarks of mastoidectomy: the posterior rim of external auditory canal (EAC), posteriorly the backside of the body of the mastoid (BM), superiorly the temporalis linea (TL), and inferiorly the mastoid tip (MT).

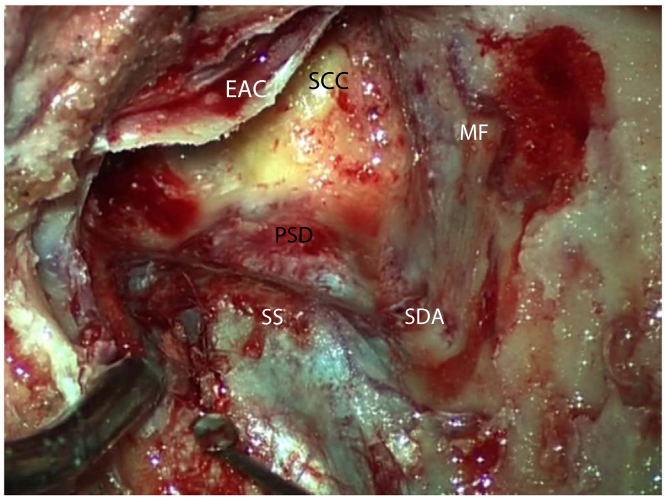


**Fig. 3.** Complete mastoidectomy was performed. The posterior wall of the external auditory canal (EAC) was thinned (anterior limit of the approach). The sigmoid sinus (SS) and the middle fossa dural plate (MF), which are the posterior and superior limit of the approach, respectively, were skeletonized. All the bones in the sinodural angle (SDA) and presigmoid dura were removed. In depth the mastoid antrum was opened and horizontal semicircular canal (SCC) was identified.