

Cochlear Implant Surgery by the Veria Technique: How and Why? Experience from 1400 Cases

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Abstract The Veria technique for Cochlear implantation is a non mastoidectomy technique which is done through the endaural route for the cochleostomy with a transcanal tunnel drilled in the posterior canal wall. This technique has been used for implanting in more than 1400 cases. This technique uses a specially designed perforator to make the tunnel in the posterior canal wall. Though the conventional technique has been successful it is more time consuming and is prone to various complications especially in children with small facial recess, cochlear malformations and cochlear rotation. This technique is simple, helps in faster healing and earlier fitting of the processor, is precise thereby minimizing trauma to the facial nerve. The surgery can be performed in infants who have not yet developed the mastoid completely.



Keywords Transcanal technique · Veria technique for cochlear implant · Suprameatal well · Cochlear implant

Introduction

The Veria technique or the transcanal technique or the minimally invasive technique is unique for the fact that it provides a wide visibility/accessibility for performing the electrode insertion into the cochlea with minimal or no removal of healthy mastoid bone keeping the mastoid air cell system intact. This technique can handle all cases of cochlear malformations and rotations with no damage to the facial nerve. The endaural approach with the double breasted incision provides a better healing and chances of implant extrusion and infection are rare. The conventional technique is laborious and dangerous and requires the exposure of the entire mastoid air cell system. The visualization of the round window and cochlea through the posterior tympanotomy gives a restricted access to the surgeon making it difficult to access any cochlear anomalies and rotations. Controlled drilling achieved in the case of Veria provides complete safety to the facial nerve than compared to the posterior tympanotomy approach. The surgical technique is described in detail.

Method

The patient's ear is cleaned as in the case of the stapedectomy with complete removal of debris. The bony cartilaginous junction is identified and an endaural incision is made in the canal. An inverted C shaped incision is made in the region of the squamous part of the temporal bone

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meeting the endaural incision. A posteriorly based skin flap is elevated which is supplied by the posterior auricular artery. The underlying temporalis muscle flap (anterior based flap) is elevated to expose the underlying temporal bone. The incision for this flap will lie underneath the bulk of the skin flap thereby preventing the exposure of the implant and electrode to the exterior. It has its blood supply from the superficial temporalis artery. The Hans flap which is the posteriorly based periosteal flap is located in the suprimeatal junction. This covers the electrode in the suprimeatal well [1]. The flaps are supplied individually promoting better healing and the implant lies secure beneath these flaps without crossing the incision.

Sub-periosteal pockets are made superiorly and anteriorly to house the implant and the ground electrode (if present separate from implant). The bed for the implant is marked in the most stable part of the squamous temporal bone. The bed is drilled to a depth where the endosteum is visualised. Margins of the bed are made at right angles which prevents the migration of the implant.

After identifying the suprimeatal line the suprimeatal well is drilled down not more than 1.5 mm deep keeping the edges of the well undermined. This keeps the electrode in-place. Canal wall incisions are made and the tympanomeatal flap elevated (Fig. 1). This gives a wider visualisation of the round window and the promontory.

Canalplasty is done in order to straighten the posterior canal wall. This prevents cholesteatoma occurrence in the implanted children. Drilling at the tympanic plate is avoided as it can obliterate the facial recess. The suprimeatal well and bed are connected by a groove which is undermined at its entry in the well.

The tunnel is made in the posterior canal wall using a specially designed hand piece which has a guide and cutting drill bit at a distance of 4 mm. The tunnel drilled is of 1.4 mm in diameter. While making the tunnel, the entry at the suprimeatal well is at 11'o' clock and exit medially in the middle ear is at 9 'o' clock. Slow to and fro motion of the hand piece with rotations of the drill bit at slow rotations is done which smoothens the tunnel as it progress (Fig. 2). Good irrigation is required at there can be heat dissipation

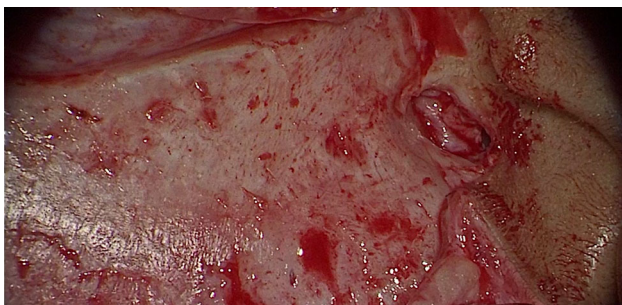


Fig. 1 Tympanomeatal flap elevation

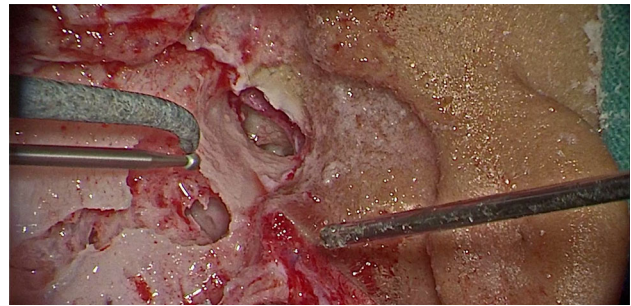


Fig. 2 Specially designed hand piece which has a guide and cutting drill bit at a distance of 4 mm

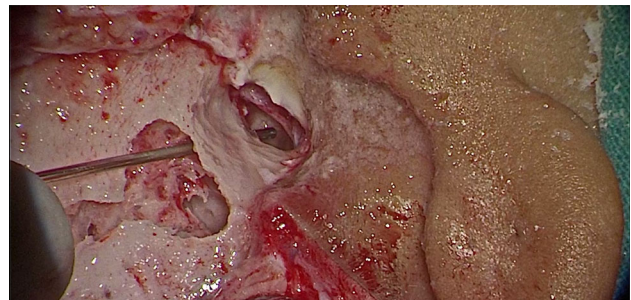


Fig. 3 The tunnel, entry at the suprimeatal well at 11'o' clock and exit medially in middle ear at 9 'o' clock

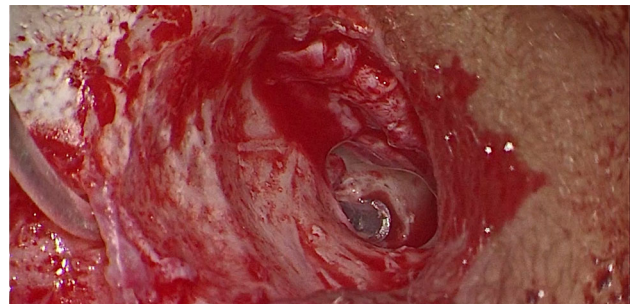


Fig. 4 Smooth transition of the electrode into the cochlea

through the mastoid air cell system towards the facial nerve. The electrode passing through this tunnel is safely surrounded by bone on all sides separated from the mastoid air system. The obliqueness of the tunnel moves the line of drilling away from the origin of the chorda tympani nerve and also keeps the direction of the tunnel parallel to the long process of incus. A total depth of 2 mm of the tunnel from the posterior canal wall (1.4 mm diameter of tunnel and a depth of <0.5 mm) keeps it in the posterior canal wall which keeps the facial nerve safe (Fig. 3).

Identify the round window niche and the basal turn of the cochlea. The junction where these structures meet is marked and cochleostomy is done antero inferior to the round window niche. The hypotympanic cell system should not be mistaken for the niche as it can lead to drilling through the otic capsule and entry into the carotid canal. Cochleostomy

is done using the 1.2 mm diamond burr and a 0.8 mm straight diamond burr. The anterior margin of the cochleostome is undermined and the posterior margin beveled which enables smooth transition of the electrode into the cochlea (Fig. 4).

The cochleostome is sealed using periosteum which is placed lateral to the electrode. In cases of CSF gushers, the sealing is done during the gushing as it enables better sealing at higher pressures.

Results

In all the 1400 cases which required implantation, the Veria technique proved to be a simple, less time consuming procedure with controlled drilling facilitating better protection for the anatomical structures in the middle ear keeping the mastoid air cell system intact. This technique enabled better visualisation of the cochlea and cases of cochlear anomalies and rotations could be dealt with better. Faster healing of the wound facilitated earlier introduction of the speech processor.

Discussion

The reason for which the mastoidectomy-posterior tympanotomy approach was introduced was to create a safe pathway for the electrode, which avoids any contact with the canal skin. The endaural approach and the transcanal technique is more effective and less complicated as compared to the conventional technique as shown in the table below [2].

Endaural (canal) approach	Mastoidectomy-posterior tympanotomy
1. Ready, offered by nature	1. Laborious, dangerous
2. Wide visibility-accessibility, possible safe inspection of the anatomy	2. Keyhole visibility, restricted accessibility, limited possibility for safe inspection of the anatomy
3. No removal of healthy bone	3. Removal of healthy bone

Table a continued

Endaural (canal) approach	Mastoidectomy-posterior tympanotomy
4. No change of the anatomy of the air-cell system	4. Dramatic change of the anatomy of the air-cell system
5. No scar formation in the mastoid, no affection of aeration	5. Possible scar formation and creation of non-aerated cavities (potential infection foci)
6. No impact on growth in children	6. Impact on growth in children
7. All anatomic variations of the cochlea can be handled	7. Difficult to handle cases with anatomic variations of the cochlea
8. Cases with hypoplastic mastoid cavity easily handled	8. Cases with hypoplastic mastoid cavity difficult to handle
9. No foreign body material left in the mastoid, mastoiditis can be treated as in non-implanted individuals	9. Foreign body material (electrode shaft) left in the mastoid, possible influence in treating mastoiditis
10. Pathway for the active electrode has to be additionally created	10. Pathway for the active electrode ready
11. Facial nerve injury is minimal or non-existent	11. Facial nerve injury more

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