

Modified Endaural Incision, Wahba's Incision, in Cochlear Implantation Surgery

Yasser Ahmed Fouad¹, Lobna Elfiky², Mohamed Mobashir¹, Ibrahim Saber^{1*}

¹Otorhinolaryngology Department, Faculty of Medicine, Zagazig University, Egypt

²Otorhinolaryngology Department, Faculty of Medicine, Ain-Shams University, Egypt

*Corresponding author: Ibrahim Mohamed Saber, Mobile: (+20) 01063661992, E-Mail: ibrahimsaber25@yahoo.com

ABSTRACT

Background: Endaural incision was first described by Lempert, in 1938, for mastoidectomy surgery, it was described in cochlear implantation (CI) surgery since the 1980s at Hannover and Melbourne. In our study we described a modification of this incision.

Objectives: Description and evaluation of the surgical outcomes of the modified endaural incision "Wahba's incision" in cochlear implantation surgery and comparing it with the traditional post auricular incision.

Patients and method: Retrospective study of 95 cases of CI, all cases were implanted in one institute by the same surgical team from 2010 to 2018 with minimum follow up period of 3 years. All cases were implanted by the Wahba's incision.

Results: The average duration for CI using Wahba's incision was higher than postauricular incision. The rate of postoperative hematoma – migration – extrusion – wound dehiscence after CI using Wahba's incision was less than postauricular incision.

Conclusion: Modified endaural incision "Wahba's incision" is a safe and effective incision for CI that aims at reducing the incidence of wound related complications of CI surgery.

Keywords: Wahba incision, Modified Endaural incision, Cochlear implantation.

INTRODUCTION

Endaural (EA) incision was first described by Lempert, in 1938, for mastoidectomy surgery in cases of chronic middle ear diseases. He described an incision made of three parts that avoids cutting the cartilage of the auricle to obviate the possible subsequent development of perichondritis. The first incision, Lempert one, was described starting in superior posterior wall of external auditory canal (EAC) at the junction of the membranous and the osseous part of the EAC. The second incision, Lempert two, was described starting from the beginning of the first incision, then it is carried outward adjacent to the tragus through the incisura⁽¹⁾.

Endaural incision was described in cochlear implantation (CI) surgery since the 1980s at Hannover and Melbourne⁽²⁻⁴⁾. The described incision was similar to the first and second Lempert incision, but the second incision was extended posteriorly till finishing about 80 mm behind the postaural sulcus⁽³⁾, also the incision was involving the skin, subcutaneous (SC) tissue, muscle, and periosteum simultaneously to create an single inferiorly based flap that includes the auricle⁽³⁻⁵⁾.

It is better for preventing foreign body extrusion to make a separate flap of fascia, or

periosteum, to cover the package away from skin incision⁽⁶⁾.

This principle necessity making the skin incision at different site periosteal incision. Most surgeons use 2 separate flaps in cochlear implantation by making the skin incision and periosteal incision at different sites⁽⁷⁾.

In our study we described a modification of the incision by doing the transverse incision, Lempert one, more laterally, at the medial edge of the conchal cartilage lateral to the cartilaginous part of the external auditory canal. Additionally, this modified incision involves creation of two separate flaps. The first inferior based flap involves the auricle and post auricular skin and subcutaneous (SC) tissue. The second anterior based flap, Palva flap, involves the periosteum covering the mastoid part of the temporal bone. The idea of the incision was taken from Professor Hassan Wahba (1900-2018), thus we named it Wahba's incision.

Objectives of the study description and evaluation of the surgical outcomes of the modified endaural incision "Wahba's incision" in cochlear implantation surgery and comparing it with the traditional post auricular incision.

PATIENTS AND METHODS



Figure (1): The incision consists of three parts

The incision consists of three parts:

1st part: Anterior edge of conchal cartilage starting down ward at the junction of meatal cartilage with conchal cartilage, then going upward at the cleavage between conchal cartilage and membranous part of EAC.

2nd Part: Like Lempert 2; passing between the tragus and root of helix,

Both 1st and 2nd parts of the incision involve the skin and the SC tissue only, with no extension deeper to the periosteum.

3rd part: extending till a point 2 cm above the root of helix, at the same vertical line passing through anterior edge of the concha. The incision involves skin, SC tissue, and superior auricular muscles, then stops just before temporalis fascia.

In our case series, we started the incision by the 3rd part then 2nd part, from upward to downward (figure 2). Then we performed the 1st part, from downward to upward, to meet the second incision.

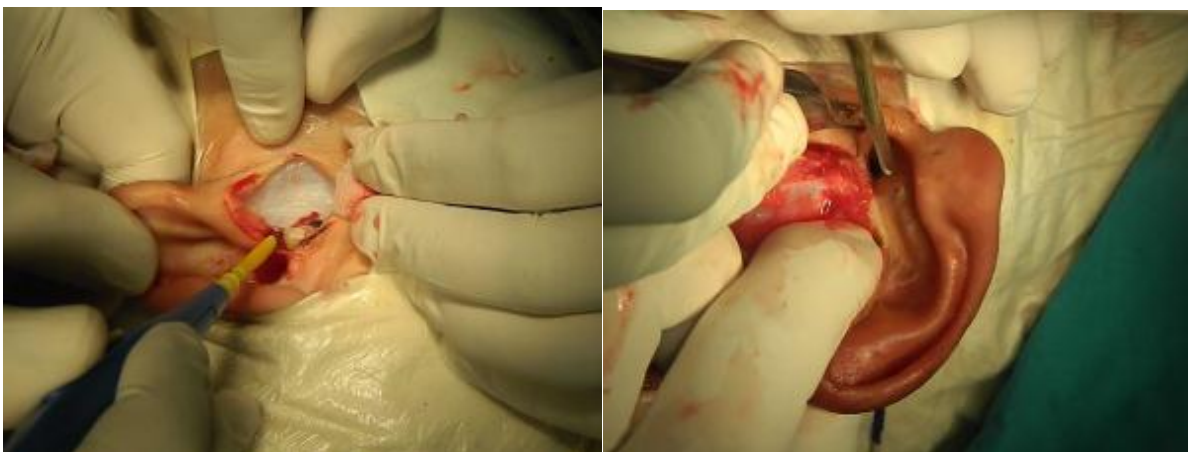


Figure (2): The 3rd part of the incision is done first then doing the 2nd part. The incision involves skin, SC tissue, and superior auricular muscles, then stops just before temporalis fascia.



Figure (3): First part of the incision is done from downward till joining the second part.

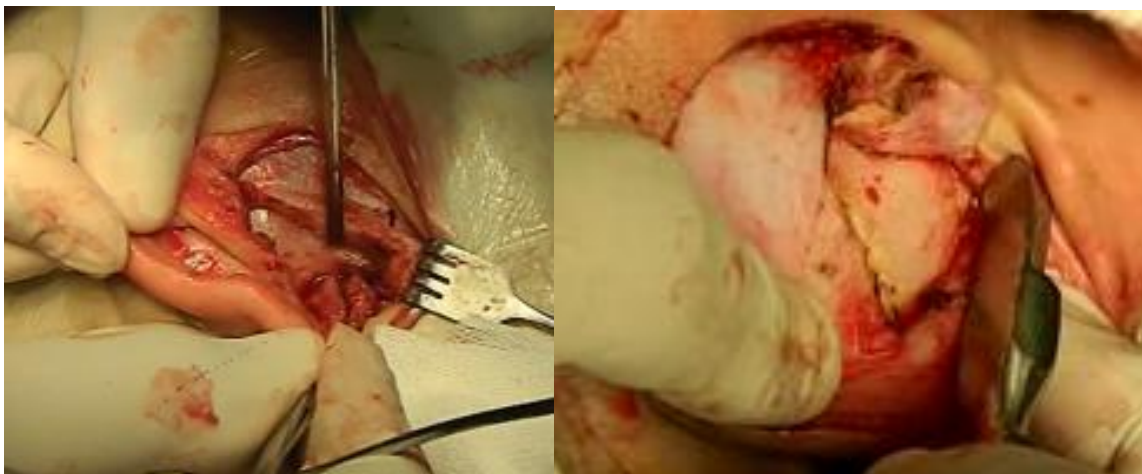


Figure (4): the incision is completed, dissection of the auricle from deep musculoperiosteal layer is performed till the whole mastoid bone is felt under its covering periosteum. The probe in the cartilaginous part of EAC.



Figure (5): Palva's flap is done as usual.

Ethical consent:

An approval of the study was obtained from Zagazig University Academic and Ethical Committee. Every patient signed an informed written consent for acceptance of participation in the study. This work has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.

RESULTS

The average duration for CI was one and half hour in Whaba's incision. The rate of postoperative early surgical related complications was 2 cases had haematoma (2.1%). The rate of postoperative late surgical related complications was one case had device migration (1.05%) and one case had wound dehiscence (1.05%).

DISCUSSION

The first description of endaural incision was by Lempert in 1938. He described an incision made of three continuous parts. The first incision was starting in superiorposterior wall of EAC at the junction of the membranous and the osseous part. The second incision was starting from the beginning of the first incision and was carried outward along the superoposterior wall of the membranous EAC then continued into and through antauricular, suprameatal membranous triangle adjacent to the tragus, up to the apex of this triangle where the helix and the tragus almost meet at the incisura. The third incision was described connecting the outer ends of the first two incisions, aiming at discarding and removing the entire membranous triangular flap⁽¹⁾.

The removal of this triangle was described in canal wall down mastoidectomy; however, in other middle ear surgeries the endaural incision was described involving only the first and second Lempert incisions and avoid doing the third incision^(8,9). Extended endaural incision in CI was first described involving the same first and second Lempert incision^(2,3,5). However, the second Lempert incision was extended backward above and behind the auricle till finishing about 80 mm behind the postaural sulcus⁽³⁾. All of these studies^(1-5,8,9) described the standard endaural incision that involves cutting skin, SC tissue, and periosteum at the same level.

Our technique differs from the standard extended endaural incision in three points; the first point of difference is that we made the first part of the incision, the horizontal incision, more laterally than the first Lempert incision. It became between the medial edge of the conchal cartilage and cartilaginous part of the EAC. Then it extends upward adjacent to the crus of the helix to continue as the second vertical incision of Lempert.

The second point of difference is that we made small extension backward to finish at the point 2 cm above and at the same level of the retroauricular sulcus. This extension aims at facilitating eversion of the auricle downward and backward to expose the mastoid bone.

The third point of difference is that we made the incision cutting the skin and subcutaneous tissue and anterior auricular muscles and veins stopping at the level of temporalis fascia and the mastoid periosteum, which will be cut at different sites. This modification creates two flaps, the first skin and auricle flap is inferior based and the second periosteal flap is anteriorly based.

The main advantage of the endaural incision in cochlear implantation is making the incision line away from the implant, this principle should be respected during incision design for any foreign body implantation⁽⁶⁾. **Stephan et al.**⁽⁴⁾ considered endaural declared that the extended endaural flap guarantees a more secure healing of the wound than inverted U shaped incision.

However, many authors stopped doing extended endaural incision, and shifted to the retroauricular incision. They noted high rate of wound break down with the standard extended endaural incision^(10,11).

Modification of the standard extended endaural incision, Whaba's incision, aims at getting the benefit of EA incision by making the incision away from the electrode pathway and avoiding the wound related complication of the standard extended endaural incision. This was entailed by reducing the length of the incision, creation of two separate flaps that cover the implant, avoiding opening the EAC skin, making the wound away from the bacteria flora of the EAC skin.

The comparison between this incision and the post auricular incision, the most commonly used incision nowadays, in cochlear implantation needs further studies.

CONCLUSION

Modified endaural incision "Wahba's incision" is a safe and effective incision for CI that aims at reducing the incidence of wound related complications of CI surgery, because the incision line is designed away from the implant.

Conflict of interest: The authors declare no conflict of interest.

Sources of funding: This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Author contribution: Authors contributed equally in the study.

REFERENCES

1. **Rathod K, Patel A, Patel N *et al.* (2020):** A comparative study of post-aural approach and end-aural approach for type-1 tympanoplasty. *BJKines-NJBAS.*, 12(2): 7-15.
2. **De Varebeke S, Govaerts P, Cox T *et al.* (2012):** Fixation of cochlear implants: An evidence-based review of literature. *B-ENT.*, 8(2): 85-94.
3. **Lee J (2019):** Healing acceleration of mastoidectomy through the external auditory canal incisionless approach. *Euro Arch Oto Rhino Laryngol.*, 276(11): 2983-90.
4. **Stephan S, Reinisch J (2018):** Auricular reconstruction using porous polyethylene implant technique. *Facial Plastic Surgery Clinics*, 26(1): 69-85.
5. **Clark G (2003):** Surgery. In: *Cochlear Implants: Fundamentals and Applications*. New York: Springer-Verlag, Pp. 595 -653. <https://link.springer.com/content/pdf/bfm%3A978-0-387-21550-1%2F1.pdf>
6. **Fouad Y, Roland J (2018):** Periosteal Flap in Cochlear Implantation, How I Do It? *J Internat Advanc Otol.*, 14(1): 140-145.
7. **Abisay V, Martin E, José E *et al.* (2022):** Temporomandibular Joint Surgery for Internal Disorders: Decompression of the Superior Joint Space. *J Maxillofac Oral Surg.*, 22: 1-11.
8. **Gibbin K, Raine C (2003):** Cochlear implantation—United Kingdom and Ireland surgical survey. *Cochlear Implants International*, 4(1):10-21.
9. **Goldrich D, Patel S, Goldrich M (2020):** Otologic Trauma. *Oper Tech Otolaryngol Head Neck Surg.*, 31(4): 353-64.
10. **Fouad Y (2020):** Advances in surgical and anesthetic techniques for cochlear implantation. In *Advances in Rehabilitation of Hearing Loss*. London: IntechOpen, DOI: 10.5772/intechopen.88380
11. **Webb R, Laszig R, Lehnhardt E *et al.* (1991):** Surgical complications with the cochlear multiple-channel intracochlear implant: experience at Hannover and Melbourne. *Ann Otol, Rhinol Laryngol.*, 100(2):131-6.
12. **Sorrentino T, Côté M, Eter E *et al.* (2009):** Cochlear reimplantations: technical and surgical failures. *Acta oto-laryngol.*, 129(4):380-4.