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REVIEW ARTICLE

Postauricular incision versus modified endaural incision (Wahba's incision), in cochlear implantation

Yasser Ahmed Fouad, Ibrahim Mohamed Saber, Mohamed Kamal Mobashir, Mohamed Elsayed Elshora, Mohammed Elsayed Elmaghawry

Department of Otorhinolaryngology, Faculty of Medicine, Zagazig University.

Address: Koliat Al Tob st, Shaibet an Nakareyah, Markaz El- Zagazig, Ash Sharqia Governorate 44519, Egypt.

Corresponding Author:
Ibrahim Mohamed Saber
ibrahimsaber25@yahoo.com

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ABSTRACT

Objectives: To compare the traditional postauricular incision with the modified endaural incision (Wahba's incision), in cochlear implantation (CI) surgery. **Material and method:** This is a retrospective case series study on 256 cases who performed CI surgery from 2010 to 2020 in a tertiary hospital and had a follow-up period of more than 2 years. They were divided into two grou ps. The first group included 146 patients who were implanted through the Wahba's incision. The second group included 112 patients who were implanted through the traditional postauricular incision. Both groups were compared retrospectively. **Results:** The average duration of CI was longer in the group implanted through Wahba's incision than the group implanted through postauricular incision (145 ± 42 and 130 ± 35 respectively). The rate of early postoperative surgical related complications was less in the group implanted through Wahba's incision than the group implanted through the postauricular incision (2.73% and 6.25% respectively). The rate of late postoperative surgical related complications was less in the group implanted through Wahba's incision than the group implanted through the postauricular incision (4.79% and 10.71% respectively) . However, all these differences were statistically insignificant (P values were > 0.05).**Conclusion:** Modified endaural incision "Wahba's incision" is an effective alternative to the traditional postauricular incision that aims at decreasing the rate of surgical related complications.

INTRODUCTION

Cochlear implantation (CI) started by William House and John Doyle in the 1960s with implanting a single-channel device. They used the traditional postauricular C-shaped incision in the surgery (1). Later, multichannel implants were manufactured with relatively larger sizes than the original implant. Consequently, many modifications for the traditional incision and flaps design were created to accommodate for the larger implant (2).

Endaural incision (EAI) was first described in ear surgery by Lempert, in the 1930s (3) (4). Extended EAI was first described in CI surgery since the 1980s at Hannover and Melbourne (5) (6). The rational of using this incision in CI was based on making the skin incision away from the receiver-stimulator part of the implant to decrease the rate wound related complications. However, skin breakdown and other wound related complications were reported with this incision in CI (2) (7) (8).

Nowadays, as the CI devices became smaller, many CI surgeons prefer using the standard small postauricular skin incision and taking a separate anterior based periosteal flap, Palva flap, to expose the mastoid bone and to make a subperiosteal pocket for the receiver-stimulator (2) (9).

In previous publications we described the modified EAI for CI, (Wahba's incision), which was first designed by Hassan Wahba's (10) (11) . This incision differs from the extended EAI used in the past at Hannover and Melbourne in many points aiming at reducing the risks of device extrusion and wound related complications that were reported in the classic extended EAI (2) (7) (8).

This study aims at comparing the modified EAI, (Wahba's incision), with the standard postauricular incision regarding the surgical technique, results, and surgical related complications.

PATIENT AND METHOD

Study Design

This is a retrospective study conducted on the recorded cases of CI in a tertiary hospital Zagazig University Hospital, during the period from 2010 to 2020. The follow-up period was at least 2 years after surgery. Cases with incomplete medical records or incomplete follow-up period and revision cases were excluded from the study. The cases were divided into two groups. The first group included cases who were operated through the modified EAI, (Wahba's incision). The second group included cases who were operated through the traditional postauricular C-shaped incision.

SURGICAL TECHNIQUE

1- Modified EAI, (Wahba's incision)

The used surgical technique was previously described in literature (11).The incision consists of three parts (figure 1-2):

The 1st part is anterior to the anterior edge of the conchal cartilage, at the cleavage between the conchal cartilage and the membranous ear canal. It does not cut through the skin of the membranous or bony ear canal.

The 2nd Part starts at the upper end of the first part and passes upward between the tragus and the root of the helix. Both the 1st and 2nd parts of Wahba's incision involve the skin and the subcutaneous SC tissue only. They do not extend deep to the periosteum.

The 3rd part extends upward and backward till a point 2 cm above the root of helix, at the same vertical line passing through anterior edge of the concha. There is no extension backward beyond the auricle. It involves only the skin and the SC tissues and stops just before the temporalis fascia.

After making the skin incision, Dissection of the auricle, skin and SC tissue from the deep fascia and periosteum is performed. Then, the standard anterior based periosteal Palva flap is incised in a different plain and away from the skin incision line (Figure 3).

2- The traditional postauricular incision:

A C-shaped skin incision is performed 1/2 cm behind the retroauricular skin crease. The length is 3 to 4 cm. It starts below the level of the hairline and ends at the level of the mastoid tip (figure 4). Then the skin and subcutaneous tissues are dissected anteriorly until the retroauricular sulcus and 3 to 4 cm posteriorly. Then, the standard anterior based periosteal Palva flap is incised and dissected anteriorly as usual (figure 5).

RESULTS

258 cases of cochlear implantation were implanted in Zagazig University Hospital from 2010 to 2020 with documented follow up visits of at least 2 years after surgery. 146 cases were implanted by the Wahba's incision, and 112 cases were implanted by the traditional postauricular incision. Table 1 shows the demographic characteristics of the patients in each group and the type of the used device/electrode.

Table 2 shows the surgical related outcomes of the patients in each group. The average duration of surgery of CI through Wahba's incision was 145 ± 42 while the average duration of surgery of CI through the postauricular incision was 130 ± 35. This difference was statistically insignificant (p value = 0.7924). Regarding the surgical related

complications, the rates of early surgical related complications were 2.73% and 6.25% in the group implanted through the Wahba's incision and the group implanted through the postauricular incision respectively. The rates of late surgical related complications were 4.79% and 10.71% in the group implanted through Wahba's incision and the group implanted through the postauricular incision respectively. The differences in the surgical related complications were statistically insignificant (p value > 0.05).

Table 1. Demographic characteristics of the patients and the type of the used device/electrode

	Wahba's incision	Postauricular incision	P value
Number of cases	146	112	
Pediatric (< 18 years)	129 (88.35%)	97 (86.6%)	0.7060
Main age of pediatric (< 18 years)	2.9 ± 1.7	3.2 ± 2.1	0.2346
Adult (> 18 years)	17 (11.65%)	15 (13.4%)	0.7060
Main age of Adult (> 18 years)	29.8 ± 14.7	34.9 ± 12.6	0.3258
Device/Electrode			
Advanced Bionics	52 (35.61%)	39 (34.82%)	1.00
Med-El	80 (54.79%)	63 (56.25%)	0.6247
Cochlear	14 (9.58%)	10 (8.92%)	1.00

Table 2. Surgical related outcomes of the patients

	Wahba's incision	Postauricular incision	P value
Duration of surgery (minutes)	145 ± 42	130 ± 35	0.7924
Early complications			
Hematoma	3	4	
Wound Infection	1	3	
Total	4 (2.73%)	7 (6.25%)	0.2172
Late complications			
Hematoma / Seroma	3	5	
Migration	2	4	
Extrusion	2	3	
Total	7 (4.79%)	12 (10.71%)	0.0922

Figure 1: The shape of skin incision in Wahba's incision

Figure 2: The shape of the incision at the end of surgery.

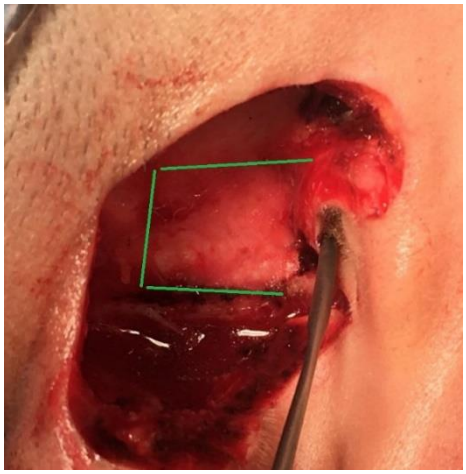

Figure 3: The design of the anteriorly based Palva flap in case of Wahba's incision. The suction probe is pointing to the cartilaginous external auditory canal. The green lines are the borders of Palva flap.

Figure 4: The shape of skin incision in the traditional postauricular incision

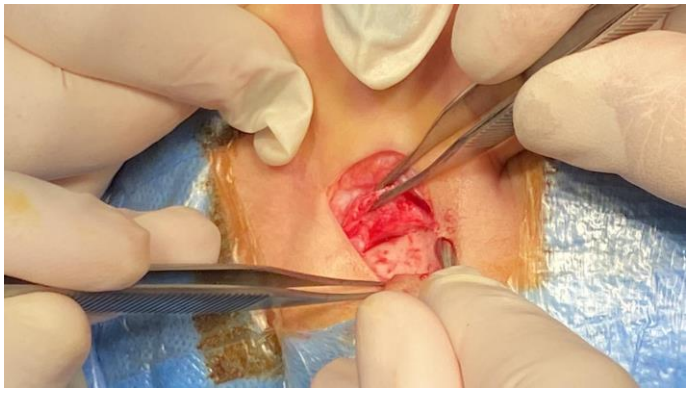

Figure 5: The anteriorly based Palva flap in case of traditional postauricular incision.

DISCUSSION

The modified EAI, (Wahba's incision), differs from the classic EAI described by Lempert and Shambaugh (4) (12) in the following points: Firstly, the 1st part of Wahba's incision is situated laterally at the cleavage between the conchal cartilage and the membranous ear canal, while the first part of the classic EAI starts deep at the bony cartilaginous junction. Secondly, the skin of the ear canal is not involved in Wahba's incision in contrast to the classic EAI. Thirdly Wahba's incision is shorter in length and does not extend backward behind the auricle. Fourthly, all parts of Wahba's incision involve the skin and the SC tissue only, with no extension deep to the periosteum, which is incised in different site to make the Palva flap.

The periosteal flap in Wahba's incision is incised away from the skin incision line and elevated as a separate layer in a different plain. Consequently, in Wahba's incision, two flaps are created: The first flap is inferiorly based and involves the skin and the whole auricle. The second flap is anteriorly based and involves the periosteum of the Palva flap. These two different flaps provide more protection to the implant and may reduce the risks of wound break down that was reported in the classic extended EAI for CI (2) (7) (8). Nowadays, most of the CI surgeons used double-layered flap for exposure during CI (13).

We think that the main advantage of the EAI incision over the postauricular C shaped incision is making the incision line far away from the site of the receiver site without crossing over the pathway of the electrode. This principle is usually applied during designing the surgical incision for any surgery involves foreign body implantation (14)). The same principle was considered in CI at Hannover and Melbourne by Webb et al (6). They reported that the extended EAI results in less wound related complications than the inverted U-shaped incision in CI (6).

Theoretically, modified EAI (Wahba's incision), gathers the advantage of the EA incision, by making the skin incision far away from the implant, and the advantage of the standard postauricular incision, by allowing for creation of the anterior based Palva flap which provides a good access to both the mastoid bone and the subperiosteal pocket used for drilling the receiver-stimulator seat. However, in this study we did not find significant differences between the two incisions regarding the postoperative surgical related complications,

Many authors stopped doing classic extended EAI, and shifted to the standard small postauricular incision (7) (8) (13). They reported higher rates of wound related complications with the standard extended EAI that was used in the 1980s. However, in this study the rate of postoperative wound related complications after CI with Wahba's incision was less than that with the standard postauricular incision, although the difference was statistically insignificant. In other words, according to this study, Wahba's incision provided modifications of the extended EAI making the results of this incision comparable with the results of the standard postauricular incision in CI.

CONCLUSION

Modified endaural incision "Wahba's incision" is an effective alternative to the traditional postauricular incision that aims at decreasing the rate of surgical related complications.

Declaration of Conflicting Interests

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