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A Classical Retro-Auricular Incision In Cochlear Implantation.

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OBJECTIVE: One of the goals of cochlear implant surgery is to improve the cosmetic and psychological trauma of such a procedure, as well as to reduce wound complications.

Authors minimized the common "C-Shaped", or similar incisions , where the mastoid and a wide surface of the retro-mastoid skull are exposed, to reduce wound complications and improve the cosmetic and psychological trauma of such a procedure.

STUDY DESIGN: Retrospective study and comparison of 2 surgical techniques.

METHOD: The standard "C-shaped" incision was replaced by a classical retro-auricular middle ear surgery incision. Postoperative major complications (flap necrosis, wound dehiscence, and wound infection with revision surgery) and minor complications (hematoma, seroma, and superficial infection) were evaluated.

RESULTS: The study included 52 patients with a classic "C-shaped " incision, and 52 patients with a classical retroauricular incision, ranging in age from 11 months to 83 years. Each patient was implanted with the Nucleus device (Cochlear, Ltd., New South Wales, Australia) by the same surgeon between January 1997 and August 2003.

Among the 52 classical retroauricular incisions, there were no major complications and 10 minor complications. The 52 classic "C-shaped" incisions resulted in 3 major and 7 minor complications. There is a significant risk of major complications with C-shaped incisions.

CONCLUSION: Providing easy exposure and a good fixation of the implant, this classic retroauricular approach shows fewer major wound complications for the patient, their family, and their environment than the larger conventional approaches, such as the common "C-shaped" incision.

In experienced hands, cochlear implant surgery has low rate of complications. The common "C-shaped," or other long scalp incisions can have serious flap complications, such as infection, necrosis, and major psychological trauma for the patient and his family [1,2,3,4]. The authors tried to minimize surgical access to reduce wound complications and improve the cosmetic appearance and psychological trauma of the procedure. Small, straight, postauricular incisions, with or without posterosuperior extension, considerably decreases complications without compromising surgical feasibility or safety [4,5,6]. In this study, we compared the outcomes of standard "C-shaped" incisions and a classic retroauricular middle ear surgery incision.

MATERIALS AND METHODS

This retrospective study included 104 patients (mean age, 32 ± 27 years; range, 11 months to 83 years) with implants placed by the senior author (M.G.) between January 1997 and August 2003. A classical C-shaped incision was used in 52 patients, from the beginning of the study until August 2001. A classical retroauricular incision technique was performed in the remaining 52 cases. Patients were implanted with Nucleus devices (Cochlear, Ltd., New South Wales, Australia, www.cochlear.com). The case distribution included 29 patients under 6 years (11 C-shaped, 18 retroauricular), 13 patients between the ages of 6 and 12 (4 C-shaped, 9 retroauricular), and 62 patients older than 12 years (37 C-shaped, 25 retroauricular). Mean follow-up was 71 ± 16 months for patients with C-shaped incisions and 28 ± 8 months for patients with retroauricular incisions. Intraoperative records (surgical time and surgical incidents) and postoperative wound complications were evaluated. Major postoperative complications were defined as follows: flap necrosis, wound dehiscence, or wound infections that required surgical revision or explantation. Minor complications included hematoma, seroma, or superficial wound infections successfully treated with oral, intravenous, or local antibiotic treatment. A sub-analysis by age of the complications was performed.

Hospitalization and device activation times were both considered. One-way analysis of variance (ANOVA) was used to compare the two techniques after verification of a normal data distribution. The data were analyzed using Statistical Analysis Software version 6.0 (SAS Institute Inc, Cary, NC).The comparison of proportion was tested by the chi-square test. The level of significance was $P < .05$.

Surgical Technique: For the retroauricular incision, 3 cm of retroauricular hairs are shaved, as for middle ear surgery. The skin is disinfected and draped as in classic retroauricular incision, and a local anesthesia is injected. The external speech processor and receiver-stimulator device templates are used to position the incision, which lies between them. The classical retroauricular middle ear surgery incision extends from 1.5 cm superior to the upper attachment of the auricle to 1 cm superior to its lower attachment. The posterosuperior angle of the incision is 2 cm posterior to the postauricular crease. The skin flap exposes the fascia temporalis and the mastoid periosteum (Figure 1).

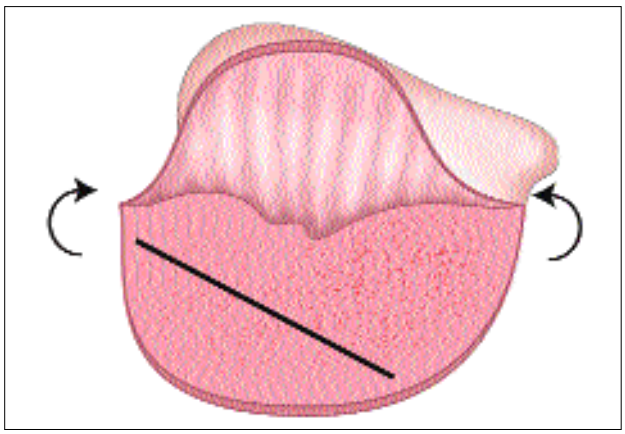

Figure 1: The classical retroauricular incision compared with the minimal straight incision (O'Donoghue et al.[6])

The posterior and superior skin is elevated by 3 cm. The musculoperiosteal incision is staggered 0.5 cm to 1 cm anteriorly relative to the skin incision, and this musculoperiosteal flap is then elevated. The posterior and superior periosteum are elevated by 2 cm and 4 cm, respectively, which creates a subperiosteal pocket appropriately sized for the receiver (Figure 2). Eleva-

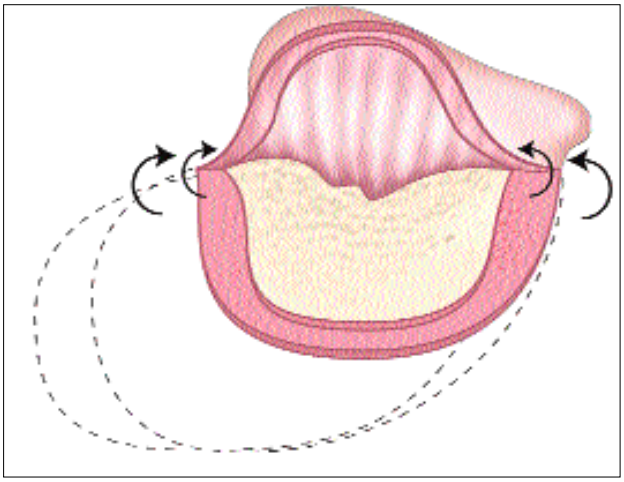

Figure 2: The posterior and superior skin is elevated by 3 cm (internal dotted line). The musculoperiosteal incision is staggered 0.5 cm to 1 cm anteriorly relative to the skin incision. The posterior and superior periosteum are elevated by 2 cm and 4 cm, respectively, creating a subperiosteal pocket adequately sized for the receiver (external dotted line).

tion of the periosteum using a standard retractor permits drilling of the bony well, allowing the receiver stimulator to be placed a few millimeters posterior to the posterosuperior wound angle. Ligature tie-down holes are drilled to fix the receiver and the electrode (Figure 3). A standard mastoidectomy, posterior tympanotomy, cochleostomy, and implant electrode fixation are performed. A secure fixation of the receiver is performed using a Vicryl 1 (Ethicon, Inc., Somerville, NJ, USA). The posterior and superior elevation of the periosteum and the skin usually permit the complete closure of the periosteum and the skin layer without problems. For the skin, a subcuticular continuous suture with Monocryl (Ethicon, Inc.) is then used.

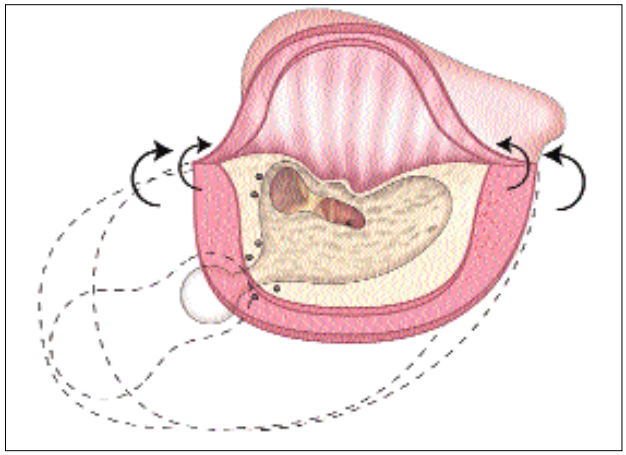

Figure 3: The drilling of the bony wall a few millimeters posterior to the posterosuperior wound angle to create a pocket for the receiver stimulator. Standard mastoidectomy, posterior tympanotomy, cochleostomy, and implant fixation.

RESULTS

The average operating time for the retroauricular incision was 117 ± 17 minutes, and 114 ± 19 minutes for the classical C-shaped incision. In both techniques, uncontrolled bleeding was not a factor in the different flap elevations, and complications of the musculoperiostal or skin flap closures were not encountered. Table

Table 1: Comparison of Wound Complications and Surgical Techniques

		"C-shaped" incision (n = 52)	Retroauricular incision (n = 52) No. of patients	Probability value
Major	Flap necrosis	3	0	
	Wound dehiscence	0	0	
	Wound infection	0	0	
	Total	**3 (6%)**	**0 (0%)**	**P = .04 (S)**
Minor	Hematoma	3	4	
	Seroma	2	3	
	Superficial infection	2	3	
	Wound dehiscence	1	0	
	Total	8 (15%)	10 (19%)	P = .21 (NS)

Number of Patients = n; Significant = S; Not Significant = NS

1 shows the complications encountered with the 2 techniques. For the retroauricular incision, there were 10 minor complications and no major complications: 4 hematomas that were spontaneously resorbed; 3 seromas, 1 spontaneously resolved and 2 requiring drainage (1 stitch removed and 1 punction); and 3 wound infections treated with local disinfectants and oral antibiotics. With the C-shaped incisions, 3 major and 7 minor complications occurred. The major complications were 3 flap necroses in the upper part of the incision requiring surgical revision (local musculocutaneous flap). One flap necrosis occurred 3 years after surgery, whereas the other 2 occurred postoperatively. Minor complications were 2 spontaneously resorbed hematomas; 2 seromas, 1 spontaneously resolved and the other requiring punction; 2 wound infections treated with local disinfectants and oral antibiotics, and 1 small flap necrosis that improved with local disinfectants and intravenous antibiotic treatment for 8 days. There was a significantly higher number of major complications with the C-shaped incision (P = .04). In children younger than 6 years, there was a significantly higher incidence of minor complications following the retroauricular incision (P = .03). There was no significant difference in complication rates for other age groups (Table 2). There was no device migration. The average hospital stay following surgery was slightly longer for the C-shaped incision cases (2.3 ± 0.6 days) compared with those with the minimal incision (2.2 ± 0.6 days), but the difference was not significant (P = .20). The average device activation time was 4.4 ± 0.5 weeks for the C-shaped incision and 4.4 ± 0.6 weeks for the retroauricular incision.

DISCUSSION

The best outcome obtained by minimal surgical access is the reduction of psychological trauma elicited by large incisions and large areas of hair shaving [6,7]. Minimal surgical access reduces the feeling of having a large foreign body in your scalp, and helps make the surgical procedure more comfortable. Most cochlear implant incisions procure wound and flap complications, and major complications may necessitate hospitalization, surgical revision, or explantation. A large incision (standard C-shaped, U-shaped inverted) significantly increases the risk of necrosis and serious complications compared with a minimal incision because of the large dead space and the large incision [4,8]. The advantages of the retroauricular incision [4,5,6] include avoiding contact between the scar and the external speech processor; not requiring the surgeon to move to the opposite side of the operating table, which may be complicated [6]; and permitting comfortable elevation of the scalp for excellent drill access to the mastoid and bony wall. This access allows placement of the receiver stimulator without compromising the rigid fixation of the implant by the subperiosteal pocket and a ligature. These advantages reduce the risk of device displacement, which is particularly important in active children and those learning to walk [9,10]. Thus, the retroauricular incision reduces the major complications encountered with

Table 2: Comparison of Age-Related Wound Complications by Surgical Techniques

		C-shaped incision	Retroauricular incision	Probability value
Minor Complications	0 to 6 years	0 (n = 11)	5 (n = 18)	P = .03 (S)
	6 to 12 years	0 (n = 4)	0 (n = 9)	
	>12 years	7 (n = 37)	5 (n = 25)	P = .45 (NS)
Major Complications	0 to 6 years	0	0	
	6 to 12 years	0	0	
	> 12 years	3	0	P = .07 (NS)

Number of patients = n; Significant = S; Not Significant = NS

large incisions, improves device access and stability, and permits good closure of the different layers.

CONCLUSION

This retroauricular incision shows fewer major wound complications, better surgical access for the patient and his or her family than large incision approaches.

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