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Original Article

Cochlear implant – experience and analysis of consecutive cases done in the Hearing and Speech Institute over a period of three months

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Abstract

Purpose
The aim was to analyze demographic and perioperative data of patients who underwent cochlear implantation (CI) at the Hearing and Speech Institute in the period between November 2019 and January 2020.

Materials and methods
Files of all patients undergoing CI in the period between November 2019 and January 2020 were collected used a specially designed checklist to record demographic, preoperative, operative, and early postoperative data. Data were recorded and analyzed using proper statistical analysis.

Results
Of 80 files reviewed, the data of 73 files were included. Average age was 4.3 ± 3.3 years, and 41 (56.2%) of them were males. Positive consanguinity was seen in 37 (50.7%) cases, positive family history was seen in 29 (39.73%), 13 (17.8%) cases had wide vestibular aqueduct, four (5.5%) cases had auditory neuropathy, and two (2.74%) cases had intracochlear anomalies. The average operative time was 85 ± 24 min. A total of 66 (90.4%) right ears were operated on. Difference in the operative time between wide vestibular aqueduct cases and normal cases was insignificant, whereas difference between right vs left ear operative time was significant. Early complications were reported in seven (9.6%) cases, and majority were partial facial palsy (5.5%).

Conclusion
Condensed CI work is possible in suitable environment of team discipline and adequate equipment, with comparable performance and outcome. In addition, it provides favorable conditions for training new surgeons.

Keywords: Cochlear implant, posterior tympanotomy, sensory neural hearing loss

Introduction

Cochlear implantation (CI) has passed a long journey since the pioneer work of W House in early 1960s [1]. The core of the surgical technique nearly did not change since he presented posterior tympanotomy as a route for electrode insertion. It was not until the late 1990s when a new route was proposed [2].

Unlike the well-established surgical technique, the technology of the implanted device did not stop evolving since the first commercial implant was presented in 1972 [3]. The indications also expanded through the years together with the number of candidate patients. The expansion from bilateral severe to profound sensory neural hearing loss in postlingual patients till reaching unilateral high tone loss patients [4] made the need to master this demanding operation by a larger number of surgeons in more centers very eminent.

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Locally, the government launched a few years ago the initiative for better health to the Egyptian population. Among the initiatives was the one regarding better hearing and rehabilitation of hearing-impaired citizens, especially the newly born and infants. The availability of devices and the increase in parents' awareness raised the number of candidates, which dramatically increased the rate of CIs all over the country.

In response to this increase, we condensed our lists with CI cases, and data collection was mandatory to evaluate the effect of this condensation on our performance and outcome. The work done over a 3-month period by our CI team was reviewed and analyzed.

Materials and Methods

Our Ethics Committee approved the study. The study adhered to the tenets of the Declaration of Helsinki.

A checklist was designed and added to patients' files to collect the demographic, preoperative, operative, and early postoperative data. The checklist was designed in one page to facilitate surveying data and was restricted to the established technique adopted by the CI team in our institute.

Checklists from November 2019 till January 2020 were reviewed, and only checklists with full data were included, excluding any checklist with missing data.

Statistical data were described in frequency and percentages for categorical data and mean ± SD for numerical data. Comparison of parametric data was done using by Student *t* test. Statistical analysis was done using SPSS version 24 (SPSS Inc., Chicago, Illinois, USA).

Results

Checklists of 80 patients were reviewed; seven were excluded owing to incomplete data, so the data of 73 (91.25%) checklists were analyzed with the following results:

(1) Regarding demographic data, average age was 4.3 ± 3.3 years, with the youngest being 1.1 years old and the oldest being 25.5 years, who was the only adult (Fig. 1). Forty-one were males (56.2%).

(2) Regarding preoperative data are summarized in Table 1, comprising includes perinatal, family history, and radiological findings.

(3) Regarding operative data, 66 (90.4%) right ears were operated on vs seven left ears. Average operative time was 85 ± 24 min. The difference between operative time in cases with wide vestibular aqueduct was not significant when compared with cases with normal aqueduct (83.5 ± 23 vs 92.9 ± 29.9, respectively). However, the difference between operative time in right ear operations was significant when compared with left ears (82.4 ± 19.7 vs 109.3 ± 48.8 respectively). Intraoperative telemetry passed in 65 patients, with six cases with partial pass and only two cases showed no pass. Other operative data are summarized in Table 2.

Table 1: Preoperative data and ratios

Condition	*n* (%)	Remarks
Positive consanguinity	37 (50.70)	
Positive family history	29 (39.73)	
Jaundice	15 (20.55)	
Fever	11 (15.07)	
Cyanosis	6 (8.22)	
Incubation	13 (17.80)	
Postlingual	5 (6.80)	4 (80%) postlingual with wide vestibular aqueduct
Auditory neuropathy	4 (5.50)	
OAE pass	3 (4.10)	
Radiological		
Sclerosed mastoid	10 (13.70)	
Mastoiditis	14 (19.18)	
Wide vestibular aqueduct	13 (17.80)	
Cochlear anomalies	2 (2.74)	Incomplete partition type 3+common cavity
Compact facial recess	18 (24.66)	
Closed RW	16 (21.92)	
Hypoplastic VIII	1 (1.37)	Common cavity case

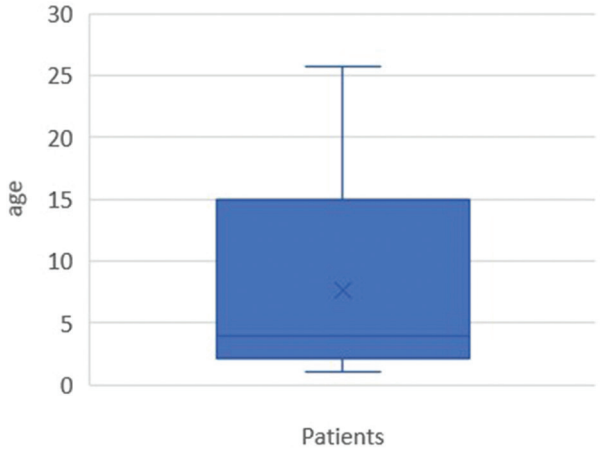

Figure 1: Box and whiskers showing age distribution of the reviewed patients.

(4) Regarding early postoperative data, seven (9.6%) cases showed complications. Four (5.5%) cases had partial facial palsy; all resolved few weeks postoperatively. Two (2.7%) cases with seroma resolved in 1 week by compression bandage, and in only one (1.4%) case with wound dehiscence, which was the subtotal petrosectomy case with microtia and congenital cholesteatoma due to postoperative wound infection, closure of dehiscence was done under general anesthesia 10 days postoperatively, and proper intravenous antibiotics were administrated, and full closure was achieved.

Discussion

Being a demanding procedure, CI always needs special precautions and preparations. The concept of mass production

Table 2: Operative data and ratios

Operative details	*n* (%)
Side	
Right	66 (90.40)
Left	7 (9.60)
Electrode	
Flex 28	51 (69.90)
Form 24	2 (2.70)
Slim straight	19 (26.00)
Compressed	1 (1.40)
Incision	
C-Shaped	13 (17.80)
Lazy S	60 (82.20)
Posterior meatal wall	
Postmeatal wall breech	2 (2.74)
Subtotal petrosectomy	1 (1.37)
Posterior tympanotomy	
Wide	47 (64.40)
Narrow	26 (35.60)
Facial canal breech	34 (46.60)
Cochlear duct entry	
Round window	69 (94.50)
Cochleostomy	4 (5.50)
Electrode insertion	
First trial	65 (89)
Reinsertion	8 (11)
Full insertion	70 (95.90)
Partial insertion	3 (4.10)

is usually not very tolerated regarding CI. The aim of our CI team in the first place was to simplify the procedure and to be able to add it to the normal operative list among other procedures with proper numbers that would eliminate waiting list.

This was achieved mainly by thorough preoperative assessment and counseling and strict adherence to unified surgical steps. This helped to reduce the operative time significantly and became very comparable to the average otologic surgery.

The data in this study showed the prevalence of factors like positive consanguinity (50.7%) as an etiology for sensory neural hearing loss in our society, which is comparable to our neighbor Arab countries, as reported by Sidenna *et al.* [5] in 2020 in a systemic review, with average consanguinity rates of 53%.

Moreover, radiological finding like wide vestibular aqueduct (17.8%) is very comparable to the study by Dewan *et al*. [6] in 2009, who reported 16% with the Valvassori criterion.

This study reported an average operative time of 85 ± 24 min compared with 169 ± 36 min in the study by Ramsden *et al.* [7] and 149.5 ± 28 min by Pradger *et al.* [8] in 2012 for minimal technique vs the standard one. Our operative time is comparable to that of Veria technique reported by Dubey *et al.* [9] in 2019 (70–90 min, mean: 80 min) without the drawbacks of this techniques like blind insertion and electrode kinking.

Regarding facial nerve exposure during surgery, it was 46.6% in this study, which was the same as the results of Mandour *et al*. in 2019 (46.58%), although they conducted their study on 307 patients in a period of 5 years with postoperative facial nerve palsy rate of 2.1%, which is lower than our rate (5.5%). They reported four cases of nerve sheath injury with 50% (two cases) of facial palsy), whereas this study did not report any injury to nerve sheath [10].

Early complications have been reduced through our CI program in the institute over the years, as Sefein in 2018 presented the complications in 112 cases done between 2014 and 2015 in our Institute, where he recorded 12 early complications (10.7%). Among the early major complications, two were misplaced electrodes and four were perilymph gushers; none were reported in this study. He recorded five facial nerve palsies (4.46%) compared with four partial facial palsies (5.5%) in our study. All facial palsies in both studies resolved after proper treatment [11].

Conclusion

Condensed CI work is possible in suitable environment of team discipline and adequate equipment with comparable performance and outcome. In addition, it provides favorable conditions for training new surgeons.

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Conflicts of interest

There are no conflicts of interest.

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