

Systematic Review of Cochleostomy versus Round window Insertion of Electrodes in Cochlear Implant patients

Thesis

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(قَالُوا سُبْحَانَكَ لَا عِلْمَ لَنَا
إِلَّا مَا عَلَّمْتَنَا إِنَّكَ أَنْتَ
الْعَلِيمُ الْحَكِيمُ)
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List of Abbreviations

CF	Characteristic frequency
CNC	Consonant-vowel-consonant
CUNY	City University of New York
EAS	Electro acoustic stimulation
FDA	Food and drug administration
FEM	Fixed effect method
Fig	Figure
HINT	Hearing in noise test
HP	Hearing preservation
IHC	Inner hair cell
LOC	Lateral olivocochlear
LSO	Lateral superior olive
MLNT	Multisyllabic lexical neighbourhood test
MOC	Medial olivocochlear
MPTA	Mastoidectomy with posterior tympanotomy approach
MSO	Medial superior olive
NYU	New York University
OCB	Olivocochlear bundle

OHC..... Outer hair cell
OR..... Odds ratio
R/S Reciever stimulator
RD Risk difference
REM Random effect method
RR..... Risk ratio
SE..... Standard error
TEM..... Transition electron microscopy

INTRODUCTION

A cochlear implant is an electronic device designed to improve or enable hearing for people with hearing impairment disabilities. Unlike typical hearing aids, which are worn externally, cochlear implants constitute an external device and an internal implant. Also, hearing aids simply amplify sounds to enhance sound perception, whereas cochlear implants bypass the outer and middle ear to electrically stimulate acoustic nerves within the auditory system (**Moctezuma A et al., 2011**).

From what once seemed impossible and outrageous, after decades of research and development, modern cochlear implants had advanced to enable the comprehension of sound and speech for those with hearing disabilities. They allow the possibility of communication, development of language skills, and media enjoyment such as music and television. The discovery that electrical current could convey meaningful sound to the brain was an unthinkable breakthrough (**Moctezuma A et al., 2011**).

The expanding indication criteria for cochlear implantation because of the improved postoperative hearing results lead to a worldwide increase in patients with residual hearing who are fitted with a cochlear implant. In the last decade, several research groups have explored various methods of implanting different electrode arrays in the cochlea to

preserve the residual hearing and combine acoustic and electric speech processing. The different electrode arrays (hybrid), specifically developed for this purpose, vary in several aspects, shorter length, more flexible, and thinner. Although much attention has been given to minimize trauma by optimizing the electrode design, a minimal traumatic opening of the cochlea and insertion of the electrode is essential for hearing preservation (**Havenith et al., 2013**).

Historical Overview:

Table (1) shows a brief summary of the cochlear implant development through the years. An overview of the history provides an understanding of the slow progression and breakthrough.

Year	Event
1800	Allesandro Volta used electrical current to stimulate his inner ear.
1950	Lundberg performed the first direct stimulation of auditory nerve.
1956	Jack Urban and Dr. William House designed a workable/wearable implant.
1972	Dr. William House builds the first wearable signal processor.
1977	Adam Kissiah proposed the fundamental design of cochlear implant (US patent 4063048) Implantable Electronic Hearing Aid, December 13.
1978	Dr. Graeme Clark and Dr. Brian Pyman operate the

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	first multi-channel cochlear implant.
1980	US Food and Drug Administration (FDA) began regulation of cochlear implants.
1984	The first approved commercial device by the FDA for adults implant: House/3M.
1985	Cochlear Corp. Nucleus® 1 system approved by USFDA.
1989	Medical Electronics Corporation (MED-EL) founded by Ingeborg and Erwin Hochmair.
1990	FDA approved implant for children above 2 years old.
1996	Advanced Bionics Corporation (AB) implant approved by USFDA.
2000	FDA approved implant for children above 12 months of age.

AIM OF THE WORK

Systematic review of the literature in trial to answer the question whether cochleostomy or round window approach is better as regard electrode insertion depth and post operative residual hearing.