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A RETROSPECTIVE ANALYSIS OF ELECTRODE IMPEDANCE CHANGES IN COCHLEAR IMPLANT RECIPIENTS.

Medical Science

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ABSTRACT

Objective: This study assessed the electrode impedance change in MED-EL SONATA Ti100 FLEX SOFT between implantation and switch on.
Design: It is a retrospective study.
Study sample: It includes 60 pediatrics all of whom were implanted between 2012 and 2014.
Results: It is found that the electrode impedance increased abruptly during switch on than intraoperative impedance value. It is suggested that increase in the impedance is due to fibrous tissue formation around electrodes..

KEYWORDS

Impedance ;cochlear implantation ; intra cochlear electrode ;MED-EL SONATA Ti 100 cochlear implant ; children.

INTRODUCTION:

Electrode is the integral component of cochlear implant. An important aspect of electrode is its impedance. Measurement of electrode impedance provides an indication of electrode integrity , status of electrode tissue surface[3]. Electrode impedance is primarily related to resistive characteristics of the field and tissue surrounding the electrode (Swanson , Selegman and Cartex , 1995)[3],[5]. It depends on the surface area of electrodes, morphological processor and electrochemical processors initiated by electrical stimulation[3].

Impedance increases between intra operative and initial session of speech processor being fitted (French , 1999) [1].Over first few weeks protein absorption and tissue growth occurs over the array , thereby increasing the impedance.(Newbold et al , 2010)[1].

In some implantees impedance increases due to airbubble formation while insertion of the array.

The overall objective of this study was to determine more accurately the change in electrode impedance between implantation and switch on in pediatric recipients of MED-EL SONATA Ti 100 cochlear implant. The aim of this study was to analyse the reason for increase in impedance during post-operative period till switch on.

MATERIAL AND METHODS

SUBJECTS:

Sixty cochlear implant recipients were included in the study. All subjects were implanted between 2012 and 2014 with MED – EL SONATA Ti 100 cochlear implant.

The recipients were between two to six years old. For all the CI recipients the electrode were fully inserted without any surgical complications.

IMPLANT DESIGN:

MED-EL SONATA Ti100 flex soft was implanted. It consists of seven paired and five unpaired titanium electrodes equally distributed over 26.4mm total length. The electrodes are numbered from 1 to 12 from apex to base. The electrode array is inserted through round window. The diameter of the electrode decreases in an apical direction. Electrode width also decreases from base to apical [1.8 to 0.5 mm]

ELECTRODE IMPEDANCE MEASUREMENT:

The device was activated using Diagnostic Interference box and programming software Maestro software provided by the manufacturer. (MED–EL Austria). Electrical stimulation is given through DIP Coil via the interface ; connected to the lap containing the maestro software .

Impedance was measured at the following points of time.
1. Intraoperatively
2. During switch on i.e activation of speech processor

RESULTS:

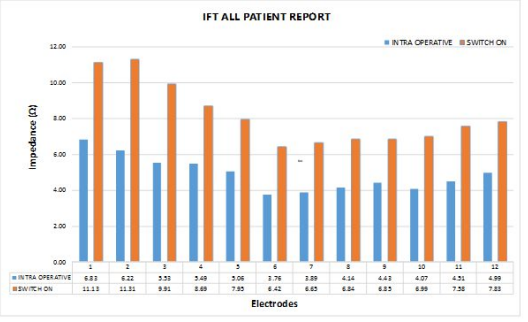

Figure 1

Figure 1 shows the overall average of electrode impedance of 60 recipients during implantation and switch on. The lowest impedances were found intra operatively, the impedance values then increased post operatively till switch on.

This increase in impedance during the switch on is due to the protein absorption and tissue growth over the electrodes [1].It is also been found that the electrode impedance where higher for apical electrodes than basal due to its small diameter, surface area [4].

Statistic analysis of electrode impedance showed that there is siginificant difference of 0.006 between implantation and switch on.

CONCLUSION:

The main findings of this study were that, on average, 1. Electrode impedances increased during switch on 2. Increase in impedance was due to protein absorption of electrode and tissue growth over electrode and. 4. It also showed that the impedance was low for basal electrodes than apical and this is due to small surface area of apical electrodes.

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