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Intra- and postoperative electrically evoked stapedius reflex thresholds in children with cochlear implants☆

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ABSTRACT

Objectives: The aim of this study was to investigate whether there is a significant correlation between intra- and postoperative electrically evoked stapedius reflex thresholds (eSRTs) in children with cochlear implants.
Methods: Sixty-five pediatric cochlear implant users were included in this study. All patients had congenital prelingual hearing loss. The round window approach was used in all patients. The eSRTs were intraoperatively measured using the 1st, 3rd, 6th and 12th electrodes of the cochlear implant. The measurements taken during the first fitting of the device were taken again one month after surgery. We used paired-sample *t*-tests to determine the correlation between intra- and postoperative eSRTs.
Results: The eSRT analysis revealed a statistically significant difference between the intra- and postoperative thresholds. A correlation analysis did not reveal any correlation between intra- and postoperative eSRTs.
Conclusion: Intraoperative eSRT measurements were unable to predict early postoperative eSRTs.

1. Introduction

The adequacy of speech processor program effects the cochlear implant patients success and satisfaction. So children with cochlear implants need individualized programming to achieve appropriate levels of stimulation [1]. Electrode mapping is performed by identifying the dynamic range of each electrode. Usually, the upper and the lower levels are generated through behavioral methods, such as conditioning tasks (e.g., conditioned play audiometry and visual reinforcement audiometry) [1]. Many children with cochlear implants are familiar with these techniques. However, very young children and children with other disabilities in addition to hearing impairment may have difficulties complying with these test situations, and it is difficult for a child with no listening experience to provide correct loudness judgments [1,2]. In such cases, we need an objective, accurate and reliable methods for fitting [1]. Mason et al. reported that intraoperative eSRTs could be a guide for ascertaining the user's maximum electrical stimulation levels and assisting in the initial fitting of the cochlear implant [3]. The aim of this study was to investigate the relation between the intra- and postoperative eSRTs and the use of intraoperative eSRTs for the objective fitting of cochlear implants in children.

2. Materials and methods

Sixty-five children who were consecutively implanted with Med-El Sonata^{TI100} devices (Innsbruck, Austria) were included in this study. This study was approved by the local ethics committee at Gaziantep University (07/2011-25). Informed consent was obtained from the parents of each patient. A single surgeon, who is the chief of our clinic and has 25 years of experience in otology and neurotology, performed the operations.

All of the children had congenital, idiopathic, sensorineural and prelingual hearing loss. All 65 underwent general anesthesia, and no muscle relaxants were used during their operations. Before wound closure, telemetry measurements were performed to measure the voltages at the intracochlear electrodes, the ground path impedance and the coupling between the implant and the diagnostic interface box (DIB) coil. Next, eSRTs were measured using the DIB and MED-EL Maestro III programming software (Innsbruck, Austria). Stapedius muscle contractions were observed through the operating microscope after an adequate exposure was

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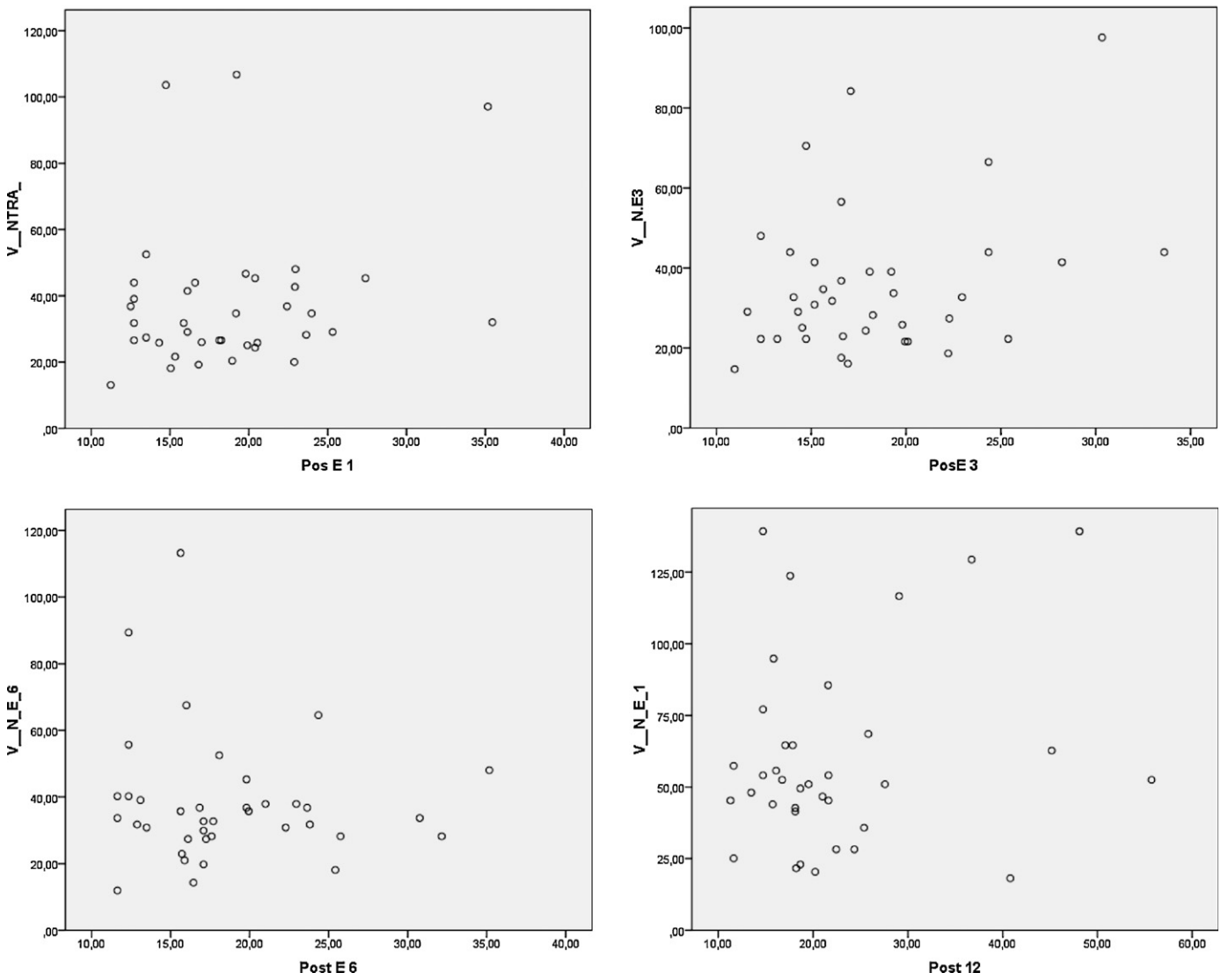

Fig. 1. The scatterplot graphs of the Pearson correlation analyses between intra- and postoperative thresholds (intra En: intraoperative thresholds and pos En: postoperative thresholds).

achieved. The eSRT measurements were performed using the 1st, 3rd, 6th and 12th electrodes of the Med-El Sonata device. The charges on these electrodes were increased in 15% increments until a reflex was elicited. Thresholds were established by decreasing and increasing the charge levels in 3% increments around this level. The burst duration of the stimulus was set at 300 ms, with 1000-ms gaps between bursts.

The implanted children received their audio processors one month postoperatively. Audio-processing programs were generated using the objective eSRT fitting technique, as outlined by Kosaner [4]. The normal acoustic admittance values were −150 and +50 daPa and 0.35–1.35 ml. Postoperative tympanometry was performed using a GSI TympStar in the contralateral ear. Postoperative measurements were performed using the same programming parameters that were used intraoperatively. The current levels were measured in qualitative units (qUs) with a repetition rate of 1000 pps, as defined by the cochlear implant programming software. The electrodes' charges were then compared to account for any differences in the stimulation pulse durations.

Statistical analyses were performed using SPSS 16.0 (Chicago). Paired-samples *t*-tests were used to evaluate the relationship between the intra- and postoperative threshold values. We found a statistically significant difference between the intra- and postoperative groups. *P* values <0.05 were accepted as statistically significant. We used a Pearson correlation analysis to analyze correlations between intra- and postoperative eSRTs.

3. Results

The mean age of the subjects was 32.13 months (12–79 months) at the time of the operation; 40 girls and 25 boys were included in the study group. Demographics for all the 65 patients were seen in Table 1.

The round window approach was used, and full insertion was achieved in all cases. The mean values and standard deviation of the intraoperative and postoperative eSRT's of 1st, 3rd, 6th and 12th electrodes for all 65 patients were shown in Table 2.

The intraoperative eSRTs were higher than those observed 1 month after surgery for all electrodes. According to the paired-sample *t*-tests, there was a statistically significant difference between the intra- and postoperative eSRTs ($p < 0.05$). The Pearson correlation analysis using SPSS 16.0 revealed no correlations between intra- and postoperative eSRTs. The *p*-values and correlation coefficient (r) values calculated using Pearson analysis