A New CT-based Categorization of Inner Ear and Internal Auditory Canal Malformations to Predict Cochlear Implant Outcomes

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INTRODUCTION

Inner ear and internal auditory canal (IAC) malformations account for approximately 20% of congenital sensorineural hearing loss and an increasing number of children with these malformations are being reported to undergo cochlear implantation. A CT-based classification of inner ear malformations based on the development of inner ear structures was originally proposed by Jackler et al. and modified by Semple et al.1,2 Figure 1 shows a new categorization method established in the current study to evaluate the relationship between inner ear and IAC malformations and cochlear implant outcomes. The current study aimed to investigate the relationship between the cochlear implant outcomes and the severity of inner ear and IAC malformations.

METHODS AND MATERIALS

A new categorization of inner ear and IAC malformations was developed in the current study. The purpose of the study was to establish a new, simple CT-based categorization that includes both inner ear and IAC malformations for predicting CI outcomes.

RESULTS

Of the 98 subjects who underwent implantation prior to the age of 20 at our hospital, CT scans revealed inner ear and/or IAC malformations in 20 cases. The CI outcomes were the best in Group 1, followed by Group 2 and Group 3. In Group 1, the CI outcomes were good in 6 cases and excellent in 5 cases, whereas all cases in Group 2 showed good CI outcomes. In Group 3, the CI outcomes were good in 3 cases and poor in 3 cases. The correct percentage of CI outcomes for Group 1, Group 2, and Group 3 was 100%, 87.5%, and 50%, respectively. As shown in Table 2, our new categorization enabled us to better discriminate between good and poor outcomes compared with existing categorization methods.

CONCLUSIONS

This study established a new CT-based categorization of both inner ear and IAC malformations to predict CI outcomes. The CI outcomes were the best in Group 1, followed by Group 2 and Group 3. Our new categorization is effective in predicting CI outcomes and is applicable to children with these malformations. The correct percentage of CI outcomes was 100%, 87.5%, and 50%, respectively. As shown in Table 2, our new categorization enabled us to better discriminate between good and poor outcomes compared with existing categorization methods.

REFERENCES


Figure 2: Two Criteria for Our Categorization Including both Inner Ear and IAC Malformations

Figure 3: Classification of Inner Ear Malformations

Table 1: Imaging Findings in the 24 Implanted Ears

Table 2: CI Outcomes of the Groups in Our New Categorization