



Optimum Design of Columella for Improving the Sound Conduction Efficiency of Reconstructed Human Middle Ear

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Abstract. In this paper, optimum design of columella used in sound conduction reconstruction of human middle ear was carried out to improve the sound conduction efficiency. It was clarified that there is a relationship between hearing ability and stapes displacement including frequency characteristics. In tympanoplasty, the linkage of auditory ossicles may be reconstructed using the column article called the columella. It was also confirmed that stapes displacement changes according to the shape of columella or its mounting position to malleus. Then, a new method is proposed for estimating the hearing restoration effect prior to the tympanoplasty operation. That is, the hearing restoration effect can be estimated by a comparison of the differences in the stapes displacement between the reconstruction model and a healthy subject. In this study, as a part of the optimum design of the columella with the aim of better sound conduction efficiency, the correlation of columella junction area to the auditory ossicles and hearing restoration effect was clarified.

Keywords: Columella, Optimum design, Human middle ear, Conduction reconstruction