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A Preliminary Analysis of The Effect After Cochlear Implantation in the Unilateral Hearing Loss

Authors : Haiqiao Du, Qian Wang, Shuwei Wang, Jianan Li

Abstract : Purpose: The aim is to evaluate the effect of cochlear implantation (CI) in patients with unilateral hearing loss, with a view to providing data support for the selection of therapeutic interventions for patients with single-sided deafness (SSD)/asymmetric hearing loss (AHL) and the broadening of the indications for CI. Methods: The study subjects were patients with unilateral hearing loss who underwent cochlear implantation surgery in our hospital in August 2022 and were willing to cooperate with the test and were divided into 2 groups: SSD group and AHL group. The enrolled patients were followed up for hearing level, tinnitus changes, speech recognition ability, sound source localization ability, and quality of life at five-time points: preoperatively, and 1, 3, 6, and 12 months after postoperative start-up. Results: As of June 30, 2024, a total of nine patients completed follow-up, including four in the SSD group and five in the AHL group. The mean postoperative hearing aid thresholds on the CI side were 31.56 dB HL and 34.75 dB HL in the two groups, respectively. Of the four patients with preoperative tinnitus symptoms (three patients in the SSD group and one patient in the AHL group), all showed a degree of reduction in Tinnitus Handicap Inventory (THI) scores, except for one patient who showed no change. In both the SSD and AHL groups, the sound source localization results (expressed as RMS error values, with smaller values indicating better ability) were 66.87° and 77.41° preoperatively and 29.34° and 54.60° 12 months after postoperative start-up, respectively, which showed that the ability to localize the sound source improved significantly with longer implantation time. The level of speech recognition was assessed by 3 test methods: speech recognition rate of monosyllabic words in a quiet environment and speech recognition rate of different sound source directions at 0° and 90° (implantation side) in a noisy environment. The results of the 3 tests were 99.0%, 72.0%, and 36.0% in the preoperative SSD group and 96.0%, 83.6%, and 73.8% in the AHL group, respectively, whereas they fluctuated in the postoperative period 3 months after start-up, and stabilized at 12 months after start-up to 99.0%, 100.0%, and 100.0% in the SSD group and 99.5%, 96.0%, and 99.0%. Quality of life was subjectively evaluated by three tests: the Speech Spatial Quality of Sound Auditory Scale (SSQ-12), the Quality-of-Life Bilateral Listening Questionnaire (QLBHE), and the Nijmegen Cochlear Implantation Inventory (NCIQ). The results of the SSQ-12 (with a 10-point score out of 10) showed that the scores of preoperative and postoperative 12 months after start-up were 6.35 and 6.46 in the SSD group, while they were 5.61 and 9.83 in the AHL group. The QLBHE scores (100 points out of 100) were 61.0 and 76.0 in the SSD group and 53.4 and 63.7 in the AHL group for the preoperative versus the postoperative 12 months after start-up. Conclusion: Patients with unilateral hearing loss can benefit from cochlear implantation: CI implantation is effective in compensating for the hearing on the affected side and reduces the accompanying tinnitus symptoms; there is a significant improvement in sound source localization and speech recognition in the presence of noise; and the quality of life is improved.

Keywords : single-sided deafness, asymmetric hearing loss, cochlear implant, unilateral hearing loss
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