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Exploring Patient Acceptance of Treatment Options for Single-Sided Deafness: A Comparative Study of Intervention Options

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Abstract

Background: Single-sided deafness (SSD) is a condition characterized by one ear having normal or near-normal hearing while the other ear experiences significantly impaired hearing. While there is no cure for permanent SSD, there are devices that can assist in restoring hearing sensation in the deaf ear.

Objective: To assess the acceptance of available treatment options in patients with Single sided deafness (SSD).

Methodology: The research involved 35 patients with single-sided deafness (SSD) who tried three different rehabilitative devices: Bone Conduction Device (BCD), Contra-Lateral Routing Of Signal (CROS), and Ultra power digital programmable hearing aids. Patients were also given the option to not use any hearing aid. They rated their satisfaction with each option on a 100-point scale. Additionally, patients were asked to choose which intervention they preferred, if any, and to explain their choice. Factors for not choosing a hearing aid were also explored.

Results: The research findings indicated that patients with profound unilateral sensorineural hearing loss expressed the highest satisfaction with the BCD softband (average score 83.97± 4.53), followed by the CROS hearing aid (74.71± 4.19) and the unaided condition (61.91± 6.35). In contrast, the ultra-power digital programmable hearing aid received the lowest satisfaction score (19.2± 4.28). Only 8 out of 35 patients chose to use a hearing aid. Among the 27 who did not opt for a hearing aid, reasons included concerns about appearance (13.63%), difficulty adapting (4.54%), financial limitations (22.72%), discomfort or irritation (9.09%), limited perceived benefit (13.63%), and a combination of these factors (36.36%).

Conclusion: Patients with single-sided deafness (SSD) encounter challenges related to their hearing abilities. While the study indicates that these patients recognize the potential advantages of various intervention choices, they tend to refrain from adopting them due to a variety of factors.

Keywords: Single Sided Deafness, Unilateral Hearing Loss, BCD, CROS, Ultra-Power Digital Hearing Aid

Introduction

Single-sided deafness (SSD) is a condition where individuals have normal or near-normal hearing in one

ear, while the other ear experiences significant hearing loss. Baguley et al. (2006) reported that the occurrence of permanent, single-sided, acquired profound loss is between 12 to 27 per 100,000 individuals.

There is currently no cure for permanent SSD, leading to considerable difficulties in everyday listening situations for individuals with SSD or unilateral hearing loss (UHL) (Dwyer et al., 2014). However, there are devices available that can help restore hearing sensation in the deaf ear. Recent technological advancements have introduced various invasive modalities, such as Bone Anchored Hearing Aids, transcutaneous devices, and even cochlear implants (CI), which are being recommended for SSD (Rasmussen et al., 2012; Kamal et al., 2012). Rehabilitation for patients with single-sided deafness can also be effectively carried out using specialized air conduction devices, such as Contralateral Routing of Signal (CROS) or Bone Conduction Devices (BCD). However, both options have shown limited satisfaction and a restricted ability to overcome localization difficulties in individuals with SSD (Bishop and Eby, 2010; Baguley et al., 2006).

Although there is limited information available regarding the acceptance of the various available treatment options, it is believed that these rehabilitative devices can reduce the day-to-day difficulties faced by individuals with SSD. This need for improved understanding led to the current study, which aimed to assess patient acceptance of the available treatment options.

Materials and Method

This prospective study aimed to explore treatment options and assess their acceptability among patients with SSD. The study included SSD patients with sensorineural hearing loss, aged 16 to 45 years, with a pure tone average of >90 dB hearing loss in the affected ear and <25 dB in the contralateral ear, who were able to fully understand the instructions. Patients were asked to try three different interventions on separate days: Bone Conduction Device (BCD) with a softband, Contralateral Routing of Signal (CROS), and a Digital Programmable Behind-the-ear hearing aid with an ultra-power receiver. They rated their satisfaction with each intervention on a scale of 1 to 100, where 1 represented the worst hearing and 100 represented the best. They also rated their satisfaction with the unaided condition (without any device).

Additionally, patients were asked if they wanted to choose any of these devices and to explain their choice if they did. Reasons for not using these devices, such as cosmetic concerns, adaptation issues, financial constraints, discomfort, limited perceived benefit, or multiple factors, were also assessed. Statistical analysis was performed using SPSS version 23.0, with descriptive statistics presented as mean and standard deviation (SD). Inferential statistics included paired T-tests to compare satisfaction levels with and without treatment, with a p-value of less than 0.05 considered statistically significant.

Results

Thirty-five participants (29 males, 6 females) with a mean age of 22.91 ± 5.88 years took part in the study. These patients with single-sided deafness (SSD) were asked to rate their satisfaction (Figure 1) with three different rehabilitative devices after using each one for a day. They were also asked to rate their satisfaction with the unaided condition. The results showed that patients were most satisfied with the Bone Conduction Device (BCD) softband compared to the conventional Contralateral Routing of Signal (CROS) hearing aid and the Ultra-power Digital Programmable Behind-the-ear (BTE) hearing aid. The average scores were 83.97 ± 4.53 for the BCD softband, 74.71 ± 4.19 for the CROS hearing aid,

19.2 ± 4.28 for the ultra-power BTE hearing aid, and 61.91 ± 6.35 for the unaided condition, out of a total score of 100. The findings revealed that satisfaction scores were significantly higher with the BCD and CROS devices compared to the unaided condition. However, satisfaction scores were significantly lower with the ultra-power BTE programmable hearing aid compared to the unaided condition. Furthermore, the BCD device showed significantly better satisfaction results than the CROS device.

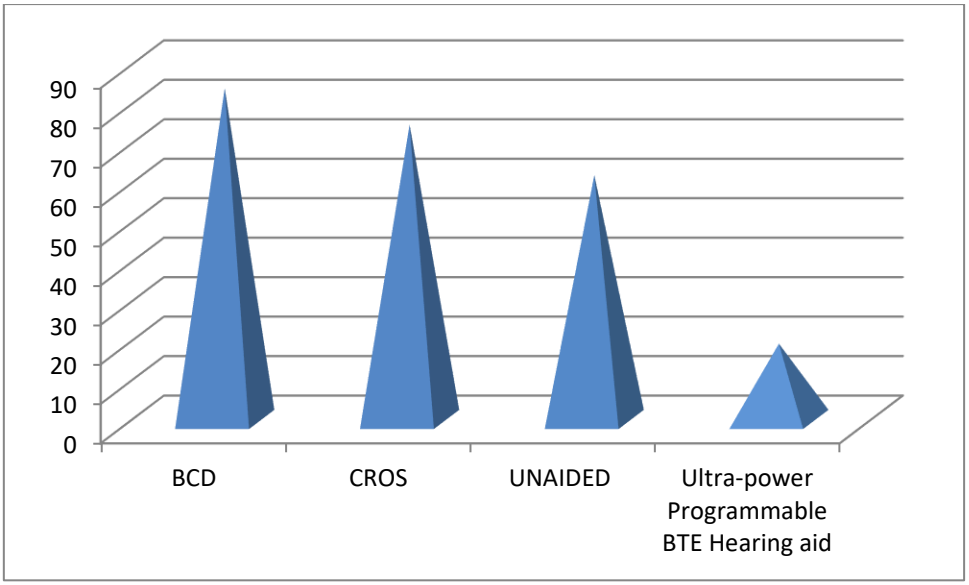

Figure 1: Satisfaction Level of SSD Patients With and Without Different Treatment Options

Out of the 35 patients, 8 chose to use a hearing aid. The remaining 27 patients, who did not select any of the devices, were examined for the factors contributing to their decision. Patients were asked to indicate whether they experienced cosmetic issues, adaptation problems, financial constraints, discomfort or irritation, perceived limited benefit, or had concerns involving more than one of these mentioned factors. Results showed that out of the 27 patients, 3 (13.63%) cited cosmetic issues as their reason for not using a device, 1 (4.54%) reported adaptation issues, 5 (22.72%) cited financial constraints, 2 (9.09%) experienced discomfort or irritation, 3 (13.63%) perceived limited benefit, and 8 (36.36%) had concerns involving multiple factors.

Discussion

The research assessed the acceptance of treatment options for individuals with unilateral hearing loss (UHL) and compared them with the unaided condition. Patients expressed greater satisfaction with Contralateral Routing of Signal (CROS) and Bone Conduction Device (BCD) softband, which helped alleviate the disability experienced by these individuals compared to using an ultra-power programmable hearing aid or remaining unaided. Between the two satisfactory rehabilitative devices, BCD was favored over the CROS hearing aid.

Patient dissatisfaction with the CROS hearing aid included poor performance and the need for an ear mold fitted in the ear canal, which negatively impacted hearing in the better ear. Similar findings were reported by Lin et al. (2006), who showed low acceptance of CROS and significantly better speech recognition in noise, as well as increased satisfaction with BAHA. Additionally, Bishop and Eby (2010) concluded that BAHA provides better support for individuals with UHL in reducing hearing handicap

compared to CROS aids because BCD devices directly stimulate the cochlea of the impaired ear. Choi et al. (2019) also reported that Bone Conduction Devices (BCDs) offer superior sound localization capabilities. By delivering sound directly to the functioning cochlea, BCDs allow users to more accurately perceive the direction of sounds. In contrast, CROS systems can sometimes cause confusion in sound localization, as rerouting sound to the opposite ear can distort spatial cues. BCDs are generally more comfortable for long-term use since they do not require an in-ear device, whereas CROS systems involve wearing devices on both ears, which can be cumbersome and less comfortable, especially for extended periods. Additionally, BCDs transmit sound vibrations directly through the bone to the functional cochlea, bypassing the non-functional ear, which results in clearer and more natural sound quality. In comparison, CROS systems transmit sound wirelessly from the non-hearing ear to the hearing ear, often leading to signal degradation. BAHA provides superior outcomes compared to CROS aids when the contralateral ear has normal hearing. However, if both the contralateral ear and the hearing-impaired ear have hearing loss, CROS tends to yield better results (Harford et al., 1966). Although these rehabilitative aids do not offer binaural hearing, they can reduce the head shadow effect and alleviate the disability experienced by individuals with UHL (Hol et al., 2005). Additionally, Jacob et al. (2012) found that 70% of respondents found BAHA less satisfactory due to irritation from wind noise.

Patients were least satisfied with the ultra-power digital hearing aid, citing insufficient improvement in hearing and difficulty understanding spoken words. This aligns with Kim (2019), who noted that individuals with SSD often find CROS or BAHA more beneficial, leading them to forgo BTE hearing aids. In this study, only 8 UHL patients chose to use hearing aids, with primary reasons for rejection including economic issues and multiple other factors. Kim (2019) also highlighted that reasons for not using hearing aids included perceived lack of benefit, cost, and the development of coping mechanisms. Similarly, Purcell et al. (2016) reported that discomfort and lack of benefit were the most common reasons for UHL individuals not using hearing aids.

Conclusion

Patients with profound unilateral sensorineural hearing loss often encounter significant auditory challenges. This study found that these patients perceive the devices as beneficial, as indicated by their average scores: 83.97 ± 4.53 with a BCD softband, 74.71 ± 4.19 with a CROS hearing aid, and 19.2 ± 4.28 with an ultra-power hearing aid, compared to a score of 61.91 ± 6.35 without any aid, on a 100-point scale. Despite these advantages, many patients tend to decline these devices for various reasons. It is essential for healthcare providers to identify and address these concerns during discussions with SSD patients. Tailored counseling and education can help patients make informed decisions about hearing aids and overcome obstacles to their acceptance and use.

Conflict of Interest: There is no conflict of interests between the authors

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