

Factors Influencing the Choice of Prescribed Hearing Aid

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SUMMARY

In our paper we would like to emphasize the complexity of hearing aid prescription process. It is connected to a series of factors which impact the choice of hearing aid; type of hearing loss, degree of hearing loss according to the average hearing threshold expressed within the range from 500 Hz to 4000 Hz on a tonal audiogram, audiometric curve configuration, speech discrimination ability, patients' age at which the hearing impairment occurred, time elapsed between the occurrence of hearing impairment and prescription of a hearing aid, patients' age, physical and mental health and their cognitive function, anatomical characteristics of the auricle and external auditory canal, patient and parent motivation, cosmetic factors, financial abilities, cooperation with hearing aids manufacturers. This paper is important for everyday practice and can be used as a kind of guideline to the hearing aid prescription process.

Keywords: hearing loss; hearing aids; prescription process

INTRODUCTION

Hearing loss represents a huge medical, social and economic problem of developed countries and particularly developing countries. Around 600 million people are affected by this disability. According to the World Health Organization, hearing loss takes fifteenth place among all disorders affecting the human population [1, 2]. People with hearing impairments have problems in auditory/oral communication or when they watch TV and listen to the radio. A noisy environment is another particular problem for them. They become easily tired and irritated as a result of making constant effort to hear well. In addition, there are other problems such as buzzing (tinnitus), vertigo and balance disorders [3, 4]. A person with a hearing loss is prescribed a hearing aid to intensify the sound information. Today, due to the technical development, there are various kinds of hearing aids. There are conventional non-surgical hearing aids, for example, behind-the-ear, aural or canal hearing aids, or hearing aids in the form of a pair of glasses, or, in the past, pocket hearing aids. There is also a wide range of implantable hearing aids which are surgically implanted, such as BAHA, cochlear implants, middle ear implants and brainstem implants. This diversity of hearing aids is good because it provides the opportunity to achieve good results in different types of hearing loss. However, patients expect from a hearing aid mostly to provide more natural hearing and at the same time not to be seen. Therefore, they forget the fact that certain factors impact the choice of a hearing aid [5].

Prescribing a hearing aid

When prescribing a hearing aid, we should pay attention to the following factors:

- Degree and type of hearing loss;
- Degree of hearing loss according to the average hearing threshold expressed within the range from 500 Hz to 4000 Hz on a tonal audiogram;
- Audiometric curve configuration;
- Speech discrimination ability;
- Patients' age at which the hearing impairment occurred;
- Time elapsed between the occurrence of hearing impairment and prescription of hearing aid;
- Patients' age, physical and mental health and their cognitive function;
- Anatomical characteristics of the auricle and external auditory canal;
- Patient and parent motivation;
- Cosmetic factors;
- Financial abilities;
- Cooperation with hearing aids manufacturers.

Degree and type of hearing loss

Hearing aids are primarily indicated for sensorineural hearing impairments. They are also indicated for conductive and mixed impairments where surgeries did not result in hearing improvement, as desired [6, 7].

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Degree of hearing loss according to the average hearing threshold expressed within the range from 500 Hz to 4000 Hz on a tonal audiogram

As criteria for considering efficiency of hearing aid implementation, we normally use the level of the approximate threshold obtained by tonal liminar audiometry for the four frequencies: 500, 1000, 2000 and 4000 Hz [8].

Based on this, we can distinguish:

- Mild hearing loss 20 to 40 dB, where the patient is disabled to hear and understand silent speech as well as speech in noisy environments;
- Moderate hearing loss from 45 to 65 dB, where hearing is tiring and speech is with articulation errors. Here a hearing aid with adequate adjustments is needed;
- Severe hearing loss from 70 to 85 dB, where a hearing aid is essential for auditory communication. If this is the case with a child, the speech cannot be developed naturally. And even if the speech has been developed, it can be annulled;
- Very profound hearing loss over 90 Hz where cochlear implant insertion is indicated, especially in children [9].

Audiometric curve configuration

The appearance of the audiometric curve was important for hearing aids used earlier. The most difficult one for amplifying was a steeply descending audiometric curve. Nowadays, due to modern technology, especially programmable and digital hearing aids, the appearance of the audiometric curve is less important [10].

Speech discrimination ability

Speech discrimination ability is decreasing due to reduced audibility, sound energy distortion as a result of high-frequency hearing loss, weak central processing of auditory signals and impaired cognitive function of a patient [11]. Hearing aid implementation gives better results in cases with higher speech discrimination score. The speech discrimination score (SDS) is the percentage of words correctly identified. In principle, it is better in cases of conductive impairments. Therefore, this is one of the reasons why patients with conductive partial hearing loss react well to auditory amplification [12].

Concerning sensorineural hearing impairments, modern technology can only correct reduced audibility, whereas it cannot influence other factors. Binaural amplification contributes to better speech discrimination although the patients with an asymmetrical speech discrimination score decide on monaural amplification [13].

Patients' age when hearing impairment occurred

Patients' age when hearing impairment occurred and the time elapsed before prescribing a hearing aid influence the

adaptation period for the hearing aid. If the impairment occurred during the prelingual phase in children, it is essential to conduct a great deal of research in order to determine the exact degree of hearing loss and a habilitation program for speech development [14]. Equally important is the period elapsed from the moment of hearing loss to the moment of hearing aid prescription. If the period is shorter, the results of hearing aid implementation are better and vice versa. Physical and mental health as well as cognitive function may also influence the choice of a hearing aid and the results of its implementation [15]. The most common disadvantages in hearing aid implementation which patients complain about are problems with hearing in noisy environments and inconvenience caused by high tones. The hearing aid intensifies sound information, improves intelligibility, but will not always make speech understandable. Auditory training, lip reading and other pieces of advice can help to achieve the maximum effect [16].

Anatomical characteristics of the auricle and external auditory canal

Anatomical characteristics of the auricle and external auditory canal also influence the choice of a hearing aid. The disadvantage of the auricle or a small auricle makes wearing a BTE hearing aid impossible. In addition, changes in the external auditory canal – atresia, anatomical variations and suppuration influence the choice of canal hearing aid [17].

PATIENT AND PARENT MOTIVATION

The patient's motivation to wear a hearing aid is also an important factor. In regard to children, the parent's attitude is of great importance, whereas in the case of adults, it has to do with hearing aid options. In contact with patients, it is very important, above all, to explain the necessity of wearing a hearing aid in order to make communication possible [18].

Cosmetic factors

Appearance, especially the position of hearing aid application, is very important for a patient. In our country, the influence of social surroundings is still great. Therefore, afraid of being mocked and humiliated by their surroundings, a large percentage of patients avoid wearing hearing aids. When it comes to children, the first demand of patients and their parents as well, is whether and how much a hearing aid will be visible and noticeable.

Whether one or two hearing aids?

This is a very commonly asked question. Binaural stimulation has its own advantages because it eliminates 'head

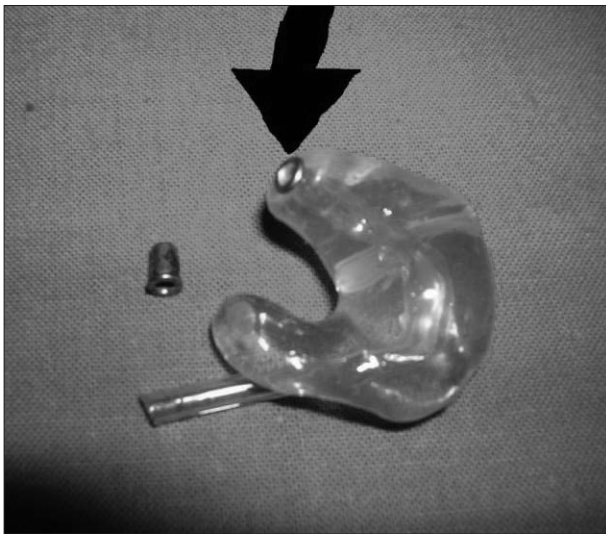


Figure 1. In-channel hearing aid and the original position of extracted foreign objects from the external auditory canal of the second patient

shadow effect' and dynamic range of listening is greater. Additionally, it improves depth perception and sound localization; it contributes to a better understanding of speech in noisy environments. In our country, binaural stimulation is obligatory in children up to age 18 [19, 20].

Financial abilities

It is obvious that hearing aid prices are very important. As a rule, quality depends on price. In our country, social insurance started providing digital BTE hearing aids three months ago. Patients pay an additional fee of 10 percent of a hearing aid price. Children up to age 18, as well as obligatory aspects of health protection, are provided with free hearing aids [21].

Cooperation with hearing aids manufacturers

Cooperation with hearing aids manufacturers implies a constant control of a patient by an ENT specialist. Also, the ENT specialist must be consulted about any change on a hearing aid or individual olives, in terms of insertion of some parts into the aid. Otherwise, it may lead to the following consequences that we have encountered so far in our work.

We had a case of a 5-year-old patient whose olives had to be changed. The girl wore hearing aids due to the hear-



Figure 2. In-channel hearing aid and the original position of extracted foreign objects from the external auditory canal of the second patient

ing loss as the consequence of meningitis she developed when aged 2 years. When her mother tried to change the olives and put them into the external auditory canal, the child burst out crying and blood appeared. Later at the medical check-up at our clinic, we discovered that the metal part from the olive had been stuck into the tympanic membrane and caused its rupture (Figure 1) [22].

Here is another example of a patient who was wearing a canal hearing aid. He had been treated unsuccessfully at some other institution for two months. Only when he came to our clinic for a medical check-up, we discovered that the ear canal was swollen and the skin macerated. After a detailed cleanup of the external ear canal, we discovered the presence of some plastic parts in the detritus of the canal. On several occasions, the patient contacted the hearing aid store for help. He later explained that whenever he had gone there, something had been inserted into the aid. It turned out that each time those parts had remained in the canal. We extracted a total of 7 plastic parts (Figure 2).

CONCLUSION

Hearing aids are prescribed to persons with impaired hearing in the aim to intensify sound information and communication possibilities. In the prescribing process numerous factors must be considered. This paper is important for everyday practice and can be used as a guideline in the hearing aid prescription process.

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Фактори који утичу на врсту слушних апарата који се преписују особама оштећеног слуха

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КРАТАК САДРЖАЈ

У овом раду желимо да истакнемо комплексност процеса преписивања слушних апарата. Само одређивање слушног апарата повезано је с многим факторима који утичу на избор врсте слушног апарата. Приликом преписивања слушног апарата требало би обратити пажњу на следеће факторе: врсту губитка слуха, степен губитка слуха према просечном прагу слуха израженом у распону од 500 до 4000 Hz тоналног аудиограма, конфигурацију аудиометријске кривуље, способност говорне дискриминације, старост пацијента у време када је дошло до оштећења слуха,

време протекло од настанка оштећења слуха до преписивања слушног апарата, узраст пацијента и његово физичко и ментално здравље и когнитивне функције, анатомске одлике ушне шкољке и спољашњег слушног ходника, мотивисаност пацијента и родитеља, козметичке факторе, финансијске могућности и сарадњу с произвођачима слушних апарата. Рад је значајан за свакодневну праксу и може да послужи као водич приликом преписивања слушних апарата.

Кључне речи: оштећење слуха; слушни апарати; преписивање слушних апарата