PRESENTING THE PROCESS OF MAKING THE CAPSULE OF INTRA-AURAL HEARING AID THROUGH DIGITIZATION

Apresentação do processo de confecção da cápsula do aparelho de amplificação sonora individual intra-aural por meio de digitalização

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ABSTRACT

Purpose: the objective of this study is to present the steps involved in making the capsule of intra-aural hearing aids through scanning. **Method:** we used the Legato otoplasty equipment in order to perform scanning and Enisiontec for sintering, both provided by the company Phonak. **Results:** the results point out to capsule-ear hearing aid, as being fully satisfying and with all the benefits documented by the manufacturer. **Conclusion:** a new technique in order to make the capsule through the scanning process has been proven effective and with high quality and keeping the faithful imprint of the ear, in addition to significant durability.

KEYWORDS: Digitalis; Hearing Loss; Ear, External

INTRODUCTION

Hearing loss is a disabling condition, which causes an impact on psychosocial, cognitive and oral and written communication development. So much has been done to ease the outcomes, as improving the individual hearing aid (HA), with currently advanced technology for a better hearing performance [1]. In dealing with hearing loss social consequences, the lack of dialogue maintenance can lead to individual isolation, reducing the ability to communicate and interact in society [2]

The hearing aid is an instrument that facilitates the p rehabilitation process. Currently, it is an instrument miniaturized and individualized with digital technology, equipped with special circuitry with controls that can be manipulated by the individual [3].

The possibility of hearing aid insertion in the external ear was entirely due to electronic component miniaturization. In the 60's, intra-aural type hearing aid was introduced in the consumer market but only later in this decade it occupied a prominent place; in the 80's, it settled as the most traded type of hearing aid. This type of hearing aid contains all the circuitry inside the capsule [4].

Although not as versatile as the BTE hearing aid, the intra-aural hearing aid has many advantages as, for example, the maintenance of function of the outer ear due to the microphone strategic location. In addition, this type of one piece amplification device is easier to be inserted and removed. For the individual users, the aesthetic factor, comfort and convenience are the attributes considered when choosing this type of hearing aid [5]. Another advantage is the emphasis on acoustic high-frequency region due to the adaptation of endoaural microphone [6].

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Conflict of interest: non-existent

The use of intra-aural hearing aid can improve speech perception, make possible the use of phone, reduce wind noise, enhance sound localization, improve aesthetics factor and diminish occlusion effect. In contrast, some problems may arise such as: probability of sense occlusion effect and acoustic feedback, limiting the possibility of inclusion of circuits such as volume control due to the restricted size. The smaller the hearing aid the more difficult to deal with this problem, the difficulty of fixing the ear and physical discomfort to the capsule.

Currently, it is possible to manufacture the capsule of intra-aural hearing aid by scanning the otoplastic image, which is the impression of the outer ear. Scanning otoplastic for making the capsule, as occurs in digital mode processes, combines sophistication, fidelity to the anatomy of the ear, by preserving its dimensions and contours, and speed in the cooking process.

Other advantages of the otoplastic scanning process for making the intra-aural capsule are: the use of hypo-allergenic material preparation, the comfort due to the use of smooth capsule, the maximum use of the ear acoustics, easy adjustment of the capsule, the possibility of reproducing capsules without the need of additional new otoplastic, due to the possibility of storing information of the external ear anatomy and size in digital file, and durability achieved by extending the lifetime of the capsule. In addition, the capsule is thinner allowing to optimize the internal space for better and easier internal components placement. The modification of acoustic ventilation is done uniformly [7]. Finally, the use of fingerprint scanner allows the audiologist to transmit electronically the data to the manufacturer, saving time and money and preventing structural changes in otoplastic thus accelerating confection process.

In general, the process of digitization of the capsule worked digitally prints are becoming more uniform and accurate. For the user, it confers the benefit of a comfortable scanned capsule use, which also allows maximum use of acoustic output and better durability. It grants the audiologist a capsule with high quality, enabling reliable and precise adaptation. The process is easily reproducible by the technician and the file may have at disposal for the desired production of the capsule [7].

The Legato is an equipment designed specifically to meet the needs of audiologists and manufacturers of intra aural hearing aid scanned capsule. This equipment is extremely easy to use and can be operated with minimal training. As a scanner, it is a highly accurate digital equipment that creates three-dimensional impressions. Another advantage is that the equipment permits left and right ear impression simultaneously. Moreover, the image can be transmitted directly from the manufacturer to the audiologist [8].

The objective of this study is to present the process of making of the capsule of individual sound amplification devices like intra-aural. This study is justified since it offers an opportunity for audiologists to know the scanning technique of intra-aural hearing aid capsule.

METHOD

The descriptive study was conducted from June to December 2009, and it was held at Hearing Health Division (DAS), of the Hospital for Rehabilitation of Craniofacial Anomalies (HRAC), University of São Paulo (USP). The methodology used was the presentation of the manufacturing process of scanning the capsule-ear hearing aids.

RESULTS

First, the registration is performed in an information store, data belongs to the individual otoplastic, detailing, as the demands of speech therapists, all characteristics of hearing aids as type, model, matrix, color and length of the capsule, circuit that options need to present the final product.

The scanning otoplastic process began with the removal of the ear impression, a process known as otoplastic: a blocker is inserted in the external auditory canal located after the second curve of the individual and the sequence is introduced into the mass of the ear mold, which is removed after drying the ear. The print quality examination was performed by the Speech-Language Pathologist (SLP) to determine any structural changes as faults and imperfections. In the laboratory, otoplastic is clipped by the prosthetic and the excess is removed, so that otoplastic is suitable for the scanning process (Figure 1). In the event of any excess material in this surgery, it is removed before the insertion in the scanning equipment. For the final product (intra-aural hearing aid) adequacy it is necessary that the otoplastic presents appropriate size, achieving proper positioning (the second full curve) in the external ear canal.

The otoplastic is scanned (Figure 2) for approximately 2 minutes on the scanning equipment (Figure 3), then the image is available in a three-dimensional digital file and stored in the individual records of the database, allowing reproductions without requiring additional printing of the ear. This digital information is transmitted to other equipment which manufactures the capsule accurately by reproducing the scanned image.

Figure 1 – Presentation of otoplastic ready for scanning
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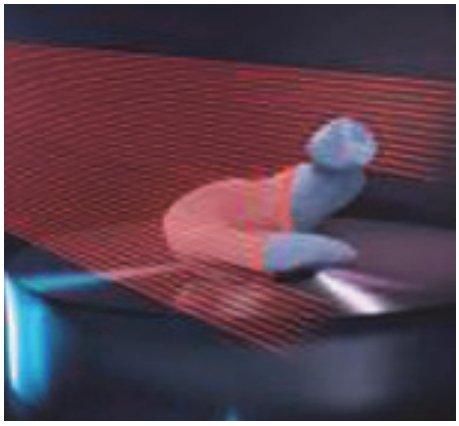

Figure 2 – Presentation Otoplastic being scanned
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Figure 3 – Presentation of equipment that performs scanning
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In this specific equipment (Figure 4) the image is worked out into 3 (three) dimensions (Figure 5) by means of special software thus giving the format of the hearing aid selected, and microchannel, and intracanal-ear. Then, the sintering occurs with the capsule production and custom faithfully reproduced the image (figure 6) and finally fall into the electronics.

Figure 4 – Presentation of the capsule manufacturing equipment
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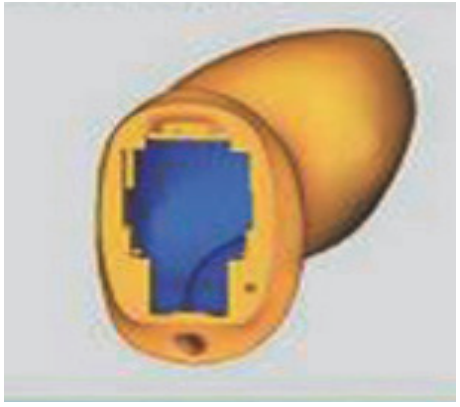

Figure 5 – Image in three dimensions is handled by software
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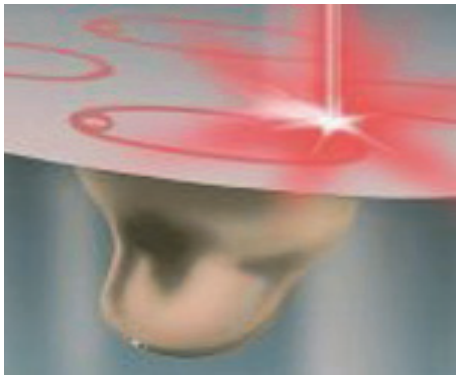

Figure 6 – Making the capsule
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Figure 7 – Presentation of the dish ready to enter the circuit of the HA
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DISCUSSION

The making of the individual hearing intra-aural capsule is performed with consistency and accuracy by scanning the otoplastic image, which is an alternative for making intra-aural hearing aids.

For the user, the benefit to the digitization process of the intra- aural hearing aid capsule is broad, with advantage related to comfort, aesthetic and acoustic. In the aspect of comfort, since the capsule is made of hypoallergenic material, the allergic problems are alleviate or extinguished, which allows a be better adaptation to the user. In the aesthetic aspect, the capsule is thinner and providing more use convenience.

In clinical practice, It is clearly seen that the size factor of the amplification device is an attribute to be considered when choosing the type of hearing aid, if possible [5]. The scanning process is advantageous as the optimization of internal space for better and easier placement of internal components can achieve the appropriate size capsule.

For the technician, the process of making digitalized intra-aural hearing aid capsule is of easy production and it enables reproductions of many units if needed. Furthermore, with the possibility of having a complete file history of capsules production, additional reproductions are possible without the need of a new otoplastic.

And finally, for the audiologist, the process of making digitized capsule also provides advantages since the final product has high quality, enabling reliable and precise adaptation.

The use of scanning otoplastic speeds the process of making prints allowing the audiologist to transmit electronically to the manufacturer, saving time, money and preventing structural changes in the otoplastic.

In the virtual universe, beyond the making of the intra-aural hearing aid capsule, one can also view digitally the adaptation of intra-aural hearing aid on the future user ear.

CONCLUSION

The otoplastic scanning technique for making intra-aural hearing aid capsule comes presented as an alternative to making intra-aural hearing aids for hearing impaired individuals, as it brings several advantages to the user.

RESUMO

Objetivo: o objetivo deste estudo é apresentar as etapas do processo de confecção da cápsula do aparelho de amplificação sonora individual intra-aural por meio da digitalização. **Método:** foram utilizadas otoplásticas e os equipamentos Legato para realizar o escaneamento e Envisiontec para sinterização, ambos disponibilizados pela empresa Phonak. **Resultados:** os resultados sinalizam para cápsula de aparelho de amplificação sonora individual intra-aurais, plenamente satisfatórias, sendo constatada todas as vantagens documentadas pelo fabricante. **Conclusão:** a nova técnica de confecção de cápsula por meio de processo de digitalização demonstrou ser eficaz com alta qualidade e mantendo a impressão fiel da orelha, além de durabilidade significativa.

DESCRITORES: Digitalis; Perda Auditiva; Orelha Externa

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