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Hearing Aids for Ménière's Syndrome: Implications of Hearing Fluctuation

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Abstract

Background: Hearing fluctuation imposes the biggest challenge in the fitting of hearing aids for patients with Ménière's syndrome.

Purpose: This study shows that the problem maybe be overcome by allowing the patients to test their own hearing and to program their own hearing aids to adjust for hearing fluctuation.

Research Design and Study Sample: A group of 40 participants diagnosed with Ménière's syndrome were fitted with Widex Senso Diva hearing aids and were provided with a portable Senso Programmer 3 (SP3) that allowed them to measure their own hearing thresholds at up to 14 different frequencies and to program their own devices.

Intervention: The participants were instructed to test their hearing three times a day for 8 weeks and to program their hearing aids according to the measured thresholds.

Data Collection and Analysis: All participants recorded some degree of hearing fluctuation during the 8-week trial.

Results and Conclusions: Among participants, 70 percent continued to program their hearing aids on a regular basis and reported great satisfaction with amplification because they are now able to adjust their own devices when their hearing fluctuates.

Key Words: Fluctuating hearing loss, hearing aids, Ménière's syndrome, portable hearing aid programmer, self-programmable hearing aids, Sensogram

Abbreviations: BTE = behind the ear; CIC = completely in the canal; CROS = contralateral routing of signal; ENT = ear, nose, and throat; ITC = in the canal; SP3 = Senso Programmer 3

Sumario

Antecedentes: Las fluctuaciones de la audición imponen los mayores retos en la adaptación de un auxiliar auditivo en pacientes con el síndrome de Méniére.

Propósito: Este estudio muestra que el problema puede vencerse permitiendo que el propio paciente evalúe su audición y que programe sus propios auxiliares auditivos de forma que ajuste las fluctuaciones auditivas.

Diseño y Muestra del Estudio: Se adaptaron auxiliares auditivos Widex Senso Diva a un grupo de 40 participantes con diagnóstico de síndrome de Méniére, y se les proporcionó un programador Senso 3 (SP3) que les permitió medir sus propios umbrales auditivos en hasta 14 frecuencias y programar sus propios dispositivos.

Intervención: Los participantes fueron instruidos para evaluar su audición tres veces al día por 8 semanas y programar sus auxiliares auditivos de acuerdo a los umbrales medidos.

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Colección y Análisis de Datos: Todos los participantes registraron algún grado de fluctuación auditiva durante este ensayo de 8 semanas.

Resultados y Conclusiones: Entre los participantes, 70 por ciento continuaron programando sus auxiliares auditivos en forma regular y reportaron gran satisfacción con la amplificación, dado que ahora eran capaces de ajustar sus propios dispositivos cuando su audición fluctúa.

Palabras Clave: Hipoacusia fluctuante, auxiliares auditivos, síndrome de Méniére, programador portátil de auxiliares auditivos, auxiliares auditivos auto-programables, Sensograma

Abreviaturas: BTE = retroauricular; CIC = completamente en el canal; CROS = enrutado contralateral de la señal; ENT = oídos, nariz y garganta; ITC = en el canal; SP3 = Programador Senso 3

INTRODUCTION

Ménière's syndrome is a very disruptive condition affecting an individual's social, family, and working life (Stewart and Stewart, 1999). The unpredictability of the symptoms of dizziness and hearing fluctuation generates an overall sense of insecurity, which leads individuals to withdraw from social contact and, in many instances, to take forced retirement. Described in 1861 by Prosper Ménière, the syndrome that carries his name is characterized by a combination of hearing loss, ear fullness, tinnitus, and vertigo (Schuknecht, 1993; Paparella and Sajjadi, 1999).

The fluctuation of hearing and tinnitus levels in patients with Ménière's syndrome is well accepted in the literature (Gibson, 1999; Mateijsen et al, 2001). Most patients with Ménière's seek treatment for their vestibular symptoms because these symptoms are the most distressing and life disruptive. Hearing loss has been the most overlooked of the symptoms. The patients usually come to the audiologist looking for treatment of their tinnitus but not for their hearing loss (McNeill, 2005).

In 1995, Koefoed-Nielsen and Courtois pointed out that in most audiology clinics, hearing aids are not considered an option for people with Ménière's. The reasons for this opinion are usually attributed to poor speech recognition scores in the ear with Ménière's disease, unilateral hearing loss, hearing fluctuation, and recruitment. Hearing loss, when present, warrants amplification, but the fitting of hearing aids to patients with Ménière's syndrome imposes a great challenge to the audiologist. Our attempts to fit hearing aids to this population have been frustrating over the past 20 years. A typical trend that we have observed is that the patient would have a hearing aid fitted with immediate satisfactory results. However, a few days later the patient would return dissatisfied reporting that the hearing aid sounded either too loud or too muffled or distorted. Invariably this change in benefit appeared to be related to a change in the audiogram configuration, typical of the hearing fluctuation in Ménière's.

McNeill et al (2002) found that in the third stage of the disease (the "burnt out" stage according to Kumagami et al, 1982), the fitting of a hearing aid is usually quite successful. Despite this reported success, many professionals in the field still do not consider such a possibility. Their survey of 25 ear, nose and throat (ENT) specialists showed that patients who presented with a moderate-to-severe hearing loss, as in the third stage of Ménière's disease, are discouraged to try amplification because of the usually poor speech recognition scores they have obtained on standard audiological assessment. The authors' clinical experience, however, shows that after they are acclimated with a successfully fitted hearing aid, this population significantly improves in speech recognition.

More recently, Baguley et al (2005) and Valente et al (2006) also considered the difficulties imposed by fluctuating hearing loss, and they described different strategies to fit hearing aids to this population such as using new hearing aid technology, including the programming of different memories in the hearing aid to cater for hearing fluctuation as well as contralateral routing of signal (CROS) fittings in the case of unilateral Ménière's.

McNeill (2005), however, argued that multimemory programmable hearing aids brought some hope but not the solution for this population, because in most instances it has not been possible to find a pattern in the variation of the hearing levels during conventional clinical testing. This lack of pattern means that even the most sophisticated multimemory hearing aids may provide little benefit. The hearing usually fluctuates by different degrees at different frequencies, which makes it difficult and sometimes impossible for the patient to adjust the hearing aid to an appropriate level that provides speech intelligibility and comfort simply by use of a volume control or by accessing different memories.

Attempts to successfully provide different memories in a hearing aid to cater for the hearing fluctuations in patients with Ménière's have been complicated by the inability to establish a pattern of variation based on audiograms performed at different sessions. The final result has been that many individuals with Ménière's no longer wear their hearing aids despite many visits

to the audiology clinic and their genuine need for amplification.

In recent times, Widex released a hearing aid that seems to offer a solution to this problem. The Senso Diva hearing aid can be programmed with a portable programmer called Senso Programmer 3 (SP3). The SP3 is designed for the clinician and allows the measurement of in situ hearing thresholds in up to 14 different frequency bands. These thresholds, along with information from a feedback test, are used to automatically program the hearing aid.

In 2005, McNeill reported a case study of a patient with fluctuating hearing loss due to Ménière's syndrome who was fitted with Widex Senso Diva hearing aids, given a SP3, and taught to measure his own in-situ thresholds (Sensogram) in order to reprogram his own aids as his hearing changed. The Senso Diva hearing aid along with the SP3 allowed this patient to test his own hearing several times a day, providing a much more detailed picture of the hearing fluctuation (McNeill, 2005). The results of this case encouraged us to undertake a larger study.

METHODS

Subjects were recruited to participate in this study through a newsletter distributed by the Ménière's support group of New South Wales (Australia). The subjects were required to have their Ménière's syndrome diagnosed by an ear, nose, and throat (ENT) specialist and to be willing to try a hearing aid. Some of them had tried amplification in the past and some had not.

The 40 volunteers, 22 females and 18 males from age 30 to 79, were selected and fitted with the Senso Diva hearing aids. The aids were fitted in the clinic with a custom mold or shell to suit the hearing loss at the time of fitting. The fitting protocol was based on the standard Widex fitting procedure using the expanded Sensogram (Ludvigsen, 2001). The Sensogram is an in situ hearing threshold measurement used as the basis for hearing aid fitting. It takes into account the ear canal volume and transducer. Because the same transducer that is used to provide the gain in the hearing aid is used to measure the threshold, it is considered an accurate basis for hearing aid fitting. The Sensogram is measured with the hearing aid in situ by using the Widex Compass software through either the HiPro or the Noah Link, or by using the SP3.

The "basic Sensogram" allows the measurement of thresholds in four basic frequency bands: 500 Hz and 1, 2, and 4 kHz. The software extrapolates the thresholds to the intermediate frequencies. In the "expanded Sensogram" the clinician has the ability to measure 13 frequency bands within the behind the ear (BTE) model and 14 frequency bands within the in the canal (ITC) and the completely in the canal (CIC) models.

We used the expanded Sensogram because—in our experience—there can be up to a 15 dB difference between the threshold predicted by the software from the basic Sensogram and the thresholds measured at the intermediate frequencies. In this study, the audiologist performed an expanded Sensogram using Compass software and Noah Link, thereby measuring the in situ hearing thresholds at up to 14 frequency bands depending on the model of hearing aid chosen. Fine-tuning of the hearing aids was performed as required, following the proprietor's software fine-tuning guide.

The patients were then introduced to the SP3. They were taught how to connect it to the hearing aid and to perform their own expanded Sensogram." The patients' ability to carry out this procedure was checked in the clinic, where the patients were asked to repeat the measurements made by the audiologist earlier in the session.

The SP3 was given to the patients, who were instructed to perform their own Sensogram and to program their hearing aids at home three times a day for 8 weeks. The "feedback test" was not part of the protocol for home measurements because the audiologist had already performed it in the clinic. The feedback test does not depend on the hearing levels measured but on the shell or ear mold (venting, canal length, tubing) and the microphone or receiver. The test needs to be redone only in the event of modification of any of those parts. All fine-tuning is stored in the hearing aid even after a new Sensogram is performed so that changes in hearing thresholds do not affect the basic settings of the hearing aid.

The patients were strictly instructed not to change any other parameter in the hearing aids and not to use any functions in the SP3 other than the expanded Sensogram that they had been shown by the audiologist. Sensograms that showed the hearing thresholds at up to 14 different frequency bands were collected for all 40 patients. At the end of the 8-week trial, all participants were given the option to purchase Widex Senso Diva hearing aids and the SP3.

RESULTS OF HEARING AID TRIAL

All 40 participants complied with the task of measuring their own hearing on a regular basis. It should, however, be noted that, for some of them, it was not practically possible to do this three times a day every day during the 8 weeks trial.

The minimum number of Sensograms provided by a participant was 25, and the maximum was 381, providing a total of 5,316. The Sensograms were entered on a Microsoft spreadsheet, and the magnitude and configurations of hearing fluctuation for each participant was plotted in a single graph. Figure 1 shows the mean and the standard deviation at each frequency measured for each individual participant.

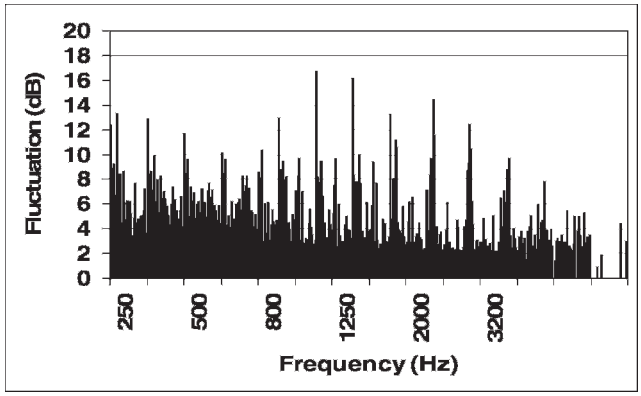

Figure 1. Hearing fluctuation of the 40 participants.

Considering that test–retest reliability of psychophysical hearing assessment in subjects with sensorineural hearing loss is 10 dB (+/−5), we established a deviation of up to 2.5 dB of the mean audiometric threshold. Therefore, only threshold fluctuations of more than 2.5 dB in the graph were considered significant. At the end of the trial, 28 participants decided to keep the Senso Diva hearing aids and the SP3. Their hearing fluctuation is depicted in Figure 2.

Of the 40 participants, 9 decided not to continue programming their hearing aids, and 4 decided not to wear hearing aids at all. Figure 3 shows the hearing fluctuation of the 8 participants who decided to wear the hearing aids on a fixed program, and Figure 4 shows the fluctuation of hearing of the 4 who decided not to wear hearing aids. These 4 participants returned both the hearing aids and the SP3 at the end of the 8-week trial. They reported finding the exercise of measuring their own hearing very useful in understanding their condition. However, they had unilateral Ménière's syndrome with normal hearing in the opposite ear and did not find the need to wear a hearing aid. Of the 8 who decided not to program their aids, 4 returned the Senso Diva and the SP3 and went back to their old hearing aids, and 4 continued to wear the Senso Diva but returned the SP3.

Three months after returning the SP3, one of the participants came back to the clinic because his hearing started to fluctuate further. He decided at that time to acquire the SP3 to enable him to adjust his Senso Diva hearing aid as his hearing changed.

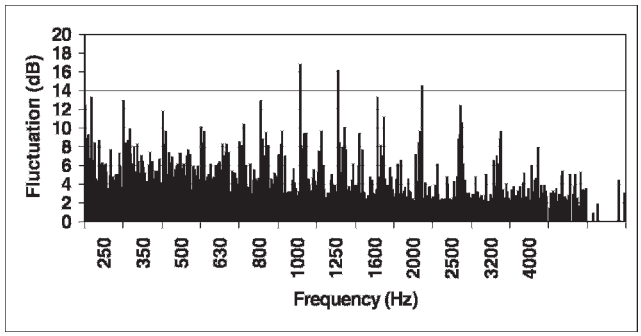

Figure 2. Hearing fluctuation of 28 participants who continued to program their own aids after the trial.

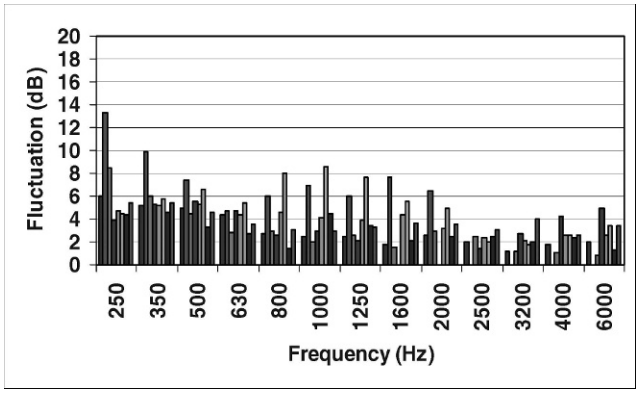

Figure 3. Hearing fluctuation of 8 participants who decided not to continue programming their own hearing aids after the trial.

Of the 8 participants who initially decided not to continue programming their own aids, 6 had Ménière's syndrome in both ears and wore bilateral BTE hearing aids with a volume control; 2 had unilateral Ménière's and wore only one hearing aid without a volume control (one CIC and one ITC). Analysis of their Sensograms showed that the standard deviation of the participants' hearing fluctuation was not greater than 6 dB, except for one participant who had a fluctuation of 12.5 dB. This subject, however, returned the hearing aids for financial reasons.

At the time of this report, none of the group of patients who had been wearing their hearing aids in a fixed program returned to the clinic to ask for the SP3 programmer. However, six of them had the possibility of adjusting the volume on their devices.

As alluded to earlier, 28 participants reported great satisfaction with their ability to adjust their hearing aids through the SP3 according to their hearing fluctuation. This group decided to purchase the hearing aids and the SP3. They all wear their hearing aids full time and report being very reliant on amplification for their

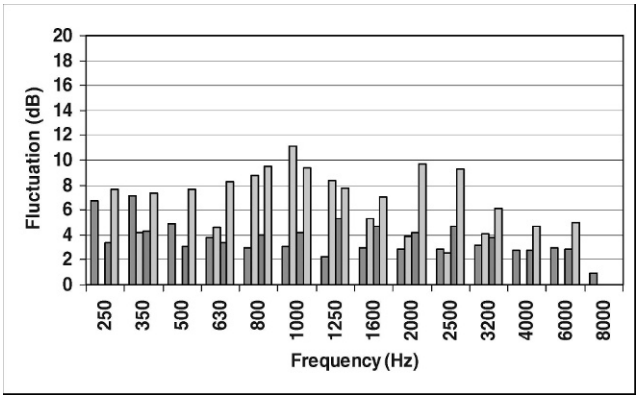

Figure 4. Hearing fluctuation of 4 participants who decided not to wear any hearing aid after the trial.

daily activities. All of them find the need to reprogram their hearing aids through the SP3 whenever the hearing aid does not "sound right." The timeframe between reprogramming of the aids varies from once a day to less than once a month among these patients.

DISCUSSION

The hearing fluctuation observed according to the patients' own measurements showed more variation than we would have predicted on the basis of the current literature. It would not have been possible to assess the extent of the hearing fluctuation using routine audiological assessments. Audiograms performed in the clinic would not have been sufficient to demonstrate how much hearing fluctuation may occur in 24 hours such as seen in Figure 1.

The extent of hearing fluctuation demonstrated by the patient's own measurements shows the impossibility of successfully fitting a conventional hearing aid to patients with Ménière's syndrome. It also justifies our previous experience of failure to successfully fit multimemory hearing aids for this population.

One limitation of this study, however, was the 8-week timeframe given to the patients to measure their hearing and to assess fluctuation. The unpredictable pattern of Ménière's syndrome is such that one may go for weeks, months, or years without any noticeable fluctuation in symptoms. It is, therefore, possible that the participants who returned the SP3 because they did not perceive any significant fluctuation during the period of the study may find the need to reprogram their hearing aids later on.

Nevertheless, this study clearly indicates that the hearing aid plus portable programmer system is useful to patients with Ménière's because it allows them to test their own hearing and to adjust the hearing aids as hearing levels fluctuate. We also found that this sense of control over their hearing helps to reduce stress levels. It is well known that stress can be detrimental to the other symptoms of Ménière's disease (Hessen Soderman, 2004; Tran Ba Huy, 2005).

Our results to date indicate that giving patients the ability to record their hearing fluctuation has empowered them to better understand their problems and, in some cases, has allowed them to correlate changes in their life style, such as diet and stress, with changes in their hearing levels. This increased understanding of the fluctuation of their symptoms associated with Ménière's has helped them to identify influences or triggers that can change their hearing levels.

This study has demonstrated that 70% of the group of patients with fluctuating hearing loss continue to wear their hearing aids and to program their devices on a regular basis. Our conclusion so far is that a system that allows patients to measure their own hearing and to program their own hearing aids is a useful tool in the management of fluctuating hearing losses as in Ménière's syndrome. A more portable system using wireless technology would be desirable, and we hope it will be available in the near future.

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