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Welcome to the twenty-fourth issue of Hearing Review.

The papers in this issue include one that discusses the first validated disease-specific quality of life instrument for patients with acoustic neuromas. The results of another paper suggest that early identification and early implantation of children with sensorineural hearing loss is highly beneficial, as it enables them to develop expressive, receptive vocabulary and also to develop stable phonological, morphological and syntactical skills for school life.

Notably, researchers from Serbia demonstrate that adopting a watchful waiting approach is recommended in less severe forms of acute otitis media in children. This approach significantly reduces the use of antibiotics and their potential adverse effects.

I hope you find the papers in this issue useful in your practice and I welcome your comments and feedback.

Kind regards,

Valerie Looi

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Validation of a disease-specific quality-of-life instrument for acoustic neuroma: the Penn Acoustic Neuroma Quality-of-Life Scale

Authors: Shaffer BT et al

Summary: This paper describes the design and validation of the first disease-specific quality of life instrument for acoustic neuroma, the Penn Acoustic Neuroma Quality-of-Life (PANQOL) scale, in a cohort of 143 patients with acoustic neuromas. The PANQOL scale demonstrated high test-retest reliability and internal consistency measures. PANQOL domain scores correlated significantly with related Short Form-36 Health Survey (SF-36) domain scores and with related visual analogue scale questions given with the preliminary instrument. PANQOL face domain scores showed significant differences across the House-Brackmann grading system scores and correlated inversely with tumour size. The PANQOL scale proved superior to the SF-36 in the discrimination of acoustic neuroma cases from controls.

Comment: As acoustic neuromas (ANs) are benign tumours, quality of life (QOL) should be critical in determining a treatment approach. Despite this, there is no current validated disease-specific QOL assessment for AN. The 26 items for the questionnaire validated in this study (PANQOL) were generated from a combination of a literature review, interviews, and pilot testing with patients. It uses a 5-point response scale, and assesses impairment at the 3 levels of the World Health Organization's framework (i.e. impairment, activity limitations & participation restrictions). The questions are included in the article. They are classified into the domains of: anxiety, facial dysfunction, general health, balance, hearing loss, energy, and pain, and individual domains as well as a total score are calculated. Demonstrating excellent test-retest reliability, validity and sensitivity, it may be of interest for clinicians, and could contribute to the holistic evaluation of a patient with an AN.

Reference: *Laryngoscope*. 2010;120(8):1646-54.

<http://onlinelibrary.wiley.com/doi/10.1002/lary.20988/abstract>

Independent commentary by Dr Valerie Looi. Her primary areas of research are in the field of cochlear implants, along with the music perception of those with a hearing impairment. She is particularly interested in developing a music training programme for cochlear implant users.

Research Review publications are intended for NZ Medical Professionals.

Comparison of bimodal and bilateral cochlear implant users on speech recognition with competing talker, music perception, affective prosody discrimination, and talker identification

Authors: Cullington HE et al

Summary: This paper describes a series of pitch-related tasks that were administered to 13 bimodal and 13 bilateral adult cochlear implant (CI) users, all of whom had good speech perception in quiet. The study aimed to determine whether bimodal users perform better than bilateral CI users on tasks requiring good pitch perception. The bimodal group performed better than the bilateral group on most parts of the tests, but the differences were not statistically significant. There was a lack of correlation between test results, and only a weak correlation between the bimodal users' hearing threshold levels in the aided ear and their performance on these tasks.

Comment: In numerous overseas countries, it is becoming standard practice to implant children bilaterally, rather than unilaterally. This gives rise to the question, though – What if the child has aidable (useable) residual hearing in one ear? Is bilateral implantation still the best approach, or should bimodal stimulation (i.e. CI with a HA) be trialled? Previous research has shown that children who have received bimodal stimulation have better generative language skills, possibly as the low-frequency acoustic information from the HA can provide additional cues such as prosody, fine-temporal information, fundamental frequency information etc. This can provide benefits for speech in noise, music, and other pitch-related speech tasks; this study assessed four such tasks. Although bilateral implantation is not yet a common consideration in New Zealand, the article also provides good insight into the advantage of bimodal stimulation for unilateral recipients who have residual hearing in their contralateral ear. Although speech perception may not be possible through the HA (alone), when used in conjunction with the CI, a synergistic effect is often reported.

Reference: *Ear Hear.* 2011;32(1):16-30.

<http://journals.lww.com/ear-hearing/pages/articleviewer.aspx?year=2011&issue=02000&article=00003&type=abstract>

Hearing and quality of life in a south European BAHA population

Authors: Barbara M et al

Summary: These Italian researchers describe the outcome of bone-anchored hearing aid (BAHA) implantation in 24 patients with bilateral and unilateral hearing loss. They were assessed with several questionnaires, including the Handicap Hearing Inventory, Client Oriented Scale of Improvement (COSI), Open and General Glasgow Benefit Inventory and Entific Medical System QoL, along with a complete audiological test battery.

Comment: The last edition of HRR discussed the use of BAHAs for single-sided sensorineural deafness (SSD), in addition to the more routine conductive losses. In this study, the QOL was assessed for BAHA recipients in Europe who either had a unilateral profound loss (SSD), or bilateral conductive losses (BCHL), using a range of questionnaires. The BAHA provided substantial benefit for the BCHL recipients for speech perception in both quiet and noise, as well as directional speech perception and sound localisation. For the SSD group, BAHA benefits were also observed (except for speech perception in quiet where 100% was obtained with and without the BAHA), but to a lesser extent. Importantly, for the SSD group, sound localisation was improved for the implanted ear, without any detriment noted for the contralateral ear. Sound localisation is the most commonly reported problem for those with SSD. 80% of the patients used the device every day, and benefits were specifically reported for music listening, socialisation, when in groups, and pride in being able to hear.

Reference: *Acta Otolaryngol.* 2010;130(9):1040-7.

<http://informahealthcare.com/doi/abs/10.3109/00016481003591756>

Auditory, speech and language development in young children with cochlear implants compared with children with normal hearing

Authors: Schramm B et al

Summary: These researchers describe the speech and language development of 5 deaf children who received their first cochlear implant (CI) by 16 months of age and the second CI by the age of 31 months. Their results are compared with those from 5 normal hearing (NH) children.

Comment: This German study aimed to compare the auditory skill development of early-implanted children and NH children. The 5 children all received MED-EL CIs, a device now available in New Zealand in the Southern CI program. Hearing development was assessed by parents using the *LittlEARS™* Auditory Questionnaire (LEAQ), which parents complete for their child. It assesses verbal and auditory behaviours in the pre-verbal developmental phase, as observed in the child's natural environment. There are 35 yes/no questions, and is completed every 3 months up to 24 months of hearing age (and/or until all 35 questions are affirmatively answered). This questionnaire is applicable to both NH and hearing impaired children, and may be a useful tool for not only audiologists, but anyone involved with infant speech/language development. More information on the LEAQ is available in MED-ELs rehabilitation catalogue: <http://www.medel.com/data/BRIDGE-catalogue/index.html>. Overall, the results indicated that the implanted children progressed at a faster rate post-implantation than their NH peers, with the three children identified before 5 months and implanted before 11 months reaching the maximum score on the LEAQ by 2 years post-implant. The article also provides some interesting data on the trajectory of auditory skill development for both the NH and CI children.

Reference: *Int J Pediatr Otorhinolaryngol.* 2010;74(7):812-9.

<http://tinyurl.com/5uh48vd>

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Acute otitis media: To follow-up or treat?

Authors: Stevanovic T et al

Summary: These researchers assessed the necessity of antibiotic treatment in patients with acute otitis media (AOM), using a cohort of 314 children aged between 2 months and 6 years.

Comment: The prescription of antibiotics for AOM is still a highly debated issue, with no accepted consensus or treatment protocol. Disadvantages of antibiotics include the potential for adverse reactions, increased treatment cost, and multi-bacterial resistance. This study used a wait-and-see approach unless the child presented with a purulent infection, secretion in the middle ear cavity and/or a body temperature above 38.5°C. At follow-up appointments, antibiotics were introduced if symptoms had deteriorated, the child experienced prolonged ear pain, and/or if their body temperature was above 38.5°C. If symptoms were unchanged or had improved from the initial assessment, a wait-and-see approach was maintained.

The results suggest that this protocol was justifiable; of the 237 in the initial wait-and-see group, 81% of cases spontaneously resolved. None of the children in the study developed serious complications requiring urgent surgery, suggesting that the risk of development of acute complications from AOM with a wait-and-see approach is not entirely justified, and that initiating antibiotics later on, if symptoms worsened, also leads to recovery.

The authors recommended that purulent ear inflammation with a tense tympanic membrane, significant pain and/or elevated body temperature should be treated with antibiotics. However, less severe cases should be followed-up after 3 days.

Reference: *Int J Pediatr Otorhinolaryngol.* 2010;74(8):930-3.

<http://tinyurl.com/4usrn17>

Auditory development in early amplified children: factors influencing auditory-based communication outcomes in children with hearing loss

Authors: Slinger YS et al

Summary: This study sought to determine how certain factors, primarily age at fitting of amplification and degree of hearing loss, affect auditory-based outcomes in young children with mild to profound bilateral hearing loss.

Comment: Previous research has indicated that infants identified before 6 months of age who received intervention, develop language skills significantly better than those identified later. All of the 44 children in this study had bilateral, congenital sensorineural hearing losses, and were assessed on a range of speech perception, production and spoken language tasks. 16 children used cochlear implants. Age of fitting of amplification accounted for the largest percentage of variance for speech perception, and was a significant predictor of language and speech production. Every month of delay in fitting delayed speech perception outcomes by ~0.75 months, expressive language by 0.3 months, and receptive language by 0.17 months. Degree of hearing loss was also a significant predictor for speech production and language skills; for every 10dB additional loss, speech production reduced by 1/3 of a standard deviation, with expressive language delayed by 5.2 months, and receptive language by 5.9 months. Cochlear implant use was the other significant predictor, associated with increasing speech production by 0.64 standard deviations, and improving receptive and expressive language skills by 12 & 18 months, respectively. Interestingly, parent interaction, auditory training and a multi-lingual home had only minor effects.

Reference: *Ear Hear.* 2010;31(2):166-85.

<http://tinyurl.com/4vzhzyj>

Designing of a digital behind-the-ear hearing aid to meet the World Health Organization requirement

Authors: Bento RF et al

Summary: This article describes the development of a digital hearing aid (HA) designed to be inexpensive for developing countries to purchase and maintain.

Comment: Unfortunately, audiology is somewhat behind other health care areas such as medicine or optometry in providing services to underdeveloped nations. There are limited services and resources for hearing screening, prevention, education, diagnosis, intervention and/or rehabilitation. Volunteer organisations are not as prolific or as well established as other health fields, with Ears Inc in Australia being the only registered & established audiology volunteer service in this region (that I am aware of): <http://www.earsinc.org/>.

This article provides an interesting overview of developing a HA for distribution in developed countries, and the issues and factors that must be considered. The prevalence of sensorineural hearing loss in these countries is higher, with a larger proportion of cases resulting from preventable causes (e.g. infection, trauma, birth or perinatal issues from poorer health standards, noise exposure etc.). According to the WHO, total world production of HAs is <10% of global need, and most HAs are expensive and appropriately designed for developing countries. The WHO minimal performance requirements for such HAs include that they should be fully operational between 5–45°C, in humidity levels between 0–80%, allow gain reduction for frequencies <750Hz via a preset or easy-to-use function, and have a volume wheel with at least a 30dB range. External parts should not have sharp edges, and be made from durable and hypoallergenic materials. There should be no on/off switch, in order to minimise the number of moving parts and hence repairs. Above all, they must be affordable and have low maintenance costs. The HA developed in this study, meeting the WHO criteria, cost US\$140.13 to produce, and would be even less with mass production.

Reference: *Trends Amplif.* 2010;14(2):64-72.

<http://tia.sagepub.com/content/14/2/64.abstract>



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Positive experiences reported by people with Ménière's disorder: A quantitative study

Authors: Stephens D et al

Summary: In this evaluation of responses to a postal survey completed by members of the Finnish Ménière's Association, the researchers identified 8 aspects of self-reported positive experience in Ménière's disorder.

Comment: Often the treatment approaches to Ménière's disorder give little consideration to the patient's participation restrictions and activity limitations. An earlier study by Stephens et al. (2007, *Otology & Neurotology*, Vol 28, pp. 982-987, DOI: 10.1097/MAO.0b013e318068b2dd) reported that ¾ of 181 participants reported at least 1 or more positive experiences resulting from having Ménière's. These included that it gave them a broadened perspective, that they valued relaxation, they learnt to take care of their own needs, and they made new friends. That same study identified that the positive experiences reported could be classified into 6 themes: Personal development; Leisure, Lifestyle & general health; Managing the disorder; Ménière's disease-specific responses; Ménière's society; and Interrelationships with others.

The current 27-item questionnaire of positive experiences associated with Ménière's disorder (which are listed in the article) identified 8 main factors that accounted for 59% of the variance in responses. These were: Personal development; Patient association; Perspective on one's disease; Acceptance of limitations; Beneficial life-effects; Use condition to self-advantage; Condition not always present; and Tinnitus treatment. As would be expected, a significant relationship was found between positive factor ratings and the overall impact of Ménière's disorder on the individual.

Reference: *Acta Otolaryngol.* 2010;130(9):1013-8.

<http://informahealthcare.com/doi/abs/10.3109/00016481003629341>

Factors associated with hearing aid fitting outcomes on the IOI-HA

Authors: Hickson L et al

Summary: A total of 1653 adults fitted with hearing aids (HAs), 78% of whom were fitted bilaterally and 81% had digital aids with at least 2 listening programs, participated in a survey designed to provide guidance about factors that warrant particular attention in the clinic in order to improve outcomes.

Comment: This large-scale study of client opinion involved 15 different private audiology clinics in Australia. The International Outcome Inventory-Hearing Aids (IOI-HA) and the EARtrak survey (www.eartrak.com) were administered at 6 months post-HA fitting, covering satisfaction with the HAs, ratings of the HA for specific situations as well as the different HA features, and the service delivery.

Results were generally positive, with 78% of participants being satisfied with their HAs and 92% saying they'd recommend it to a friend. However, listening in group situations was still the biggest concern, with only 34% being satisfied with their HAs for this situation, despite 98% saying that the situation was relevant to them. It would seem that this is still an area audiologists need to address; e.g. by teaching clients about specific features on their HAs that may assist, counselling on realistic expectations and communication strategies, investigating other assistive devices, and/or supplementary training where required. The other area audiologists may need to consider are concerns related to attributes of the HA; comfort with loud sounds, whistling/feedback, and sound localisation received the lowest satisfaction ratings. These satisfaction ratings were also significantly correlated with IOI-HA scores. One other interesting and unexpected finding was that unilateral/bilateral fitting was not correlated with IOI-HA scores; that is, outcomes were not better for those fitted with bilateral HAs.

Reference: *Int J Audiol.* 2010;49(8):586-95.

<http://informahealthcare.com/doi/abs/10.3109/14992021003777259>

Successful and unsuccessful users of bilateral amplification: Differences and similarities in binaural performance

Authors: Köbler S et al

Summary: These researchers assessed the value of incorporating a series of tests into the diagnostic protocol, prior to rehabilitation, for those using bilateral or unilateral amplification. The study involved normally-hearing subjects and two groups of hearing-impaired persons; each of the hearing-impaired groups had 11 successful and 11 unsuccessful users of bilateral amplification.

Comment: In a nice follow-on from the previous study's finding regarding bilateral amplification not being associated with outcomes on the IOI-HA, this study looked at developing a test battery for assessing those who are unsuccessful with bilateral amplification. Tests included speech in noise, psychoacoustical modulation transfer functions (PMTFs), a binaural masking level difference (BMLD) test, dichotic listening tests, and the Speech, Spatial & Qualities questionnaire (SSQ – Gatehouse & Noble, 2004).*

Results showed no significant difference between the unilateral vs. bilateral groups for speech in noise, BMLD or the PMTFs. However, on the dichotic listening task, the bilateral group performed similarly to the NH listeners, who were significantly better than the unilateral group, for both the free recall (FR) and direct recall (DR) conditions. In the FR, the listener has to report both signals heard (requiring them to monitor both ears and remember one signal), whereas in the DR, they are asked to only report the signal for a predefined side. Significantly better scores for DR over FR suggest cognitive dysfunction; however, FR over DR or reduced scores in both conditions suggests an auditory deficit. Hence the results from this study suggest a deficit in binaural processing and central auditory factors for the unilateral group, not seen for the bilateral group. Specifically, the authors suggest that the unilateral group may have diminished corpus callosum function.

* The SSQ is downloadable at:

<http://www.ihr.mrc.ac.uk/products/index.php?page=12>

Reference: *Int J Audiol.* 2010;49(9):613-27.

<http://tinyurl.com/4qzbtxu>

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