

# Audiological and psychological consequences of single-sided deafness

BY RACHEL KNAPPETT

The loss of sound input from one ear has a significant impact on our perception of our acoustic environment. This impact is compounded in adverse listening conditions. **Rachel Knappett's** article explores the audiological impact of this hearing loss and the psychological consequences. Rehabilitation of an individual's SSD requires the recognition and acknowledgement of these consequences as part of a package of measures to address the handicap faced.

Single-sided deafness (SSD) refers to asymmetrical hearing loss, which can be sensorineural, conductive or mixed, although the term SSD is usually applied to unilateral sensorineural hearing loss. Patients' ability to cope with acquired SSD is highly variable and consideration should be given to the psychological and social factors that drive handicap.

Regardless of aetiology, in all of these patients there will be a loss of the benefits of binaural hearing. The origin and nature of these benefits have been discussed in detail [1]. Echo suppression may be greatly reduced or absent which leads to reduced speech intelligibility in reverberant environments, and localisation is not possible due to the lack of access to interaural time differences and interaural level differences. For people with two functioning ears, there is an improvement in signal detection that results from binaural masking level differences [2] (these do not occur for SSD patients since the signal and noise are heard in one ear only. The degree of hearing loss in the better ear is also an important factor in overall functional impairment [3]).

At Cambridge University Hospitals (CUH), a single-sided deafness clinic has been established to fully investigate hearing handicap in these patients and to provide structured counselling, and consideration of technology solutions such as CROS aids, BAHA and other assistive listening devices. Our experience is that the emotional burden associated with SSD can be significant and there is some evidence to support this; Sano *et al.* (2013) investigated self-reported symptoms in patients with unilateral, sudden, idiopathic, sensorineural hearing loss and found that anxiety, along with tinnitus and hearing discomfort affected their quality of life [4]. Similarly, Carlsson (2011) found a correlation between both troublesome tinnitus and vertigo and poor quality of life in a study of 360 patients with sudden unilateral sensorineural hearing loss [5].

Many patients appreciate the opportunity to reflect on their 'journey' to SSD; often this has been emotionally exhausting and although they are grateful for the medical intervention, coming to terms with the consequences of SSD can take some time. For some, it involves changing many aspects of their life and taking on a new identity. Feeling vulnerable walking along a busy street, lack of confidence in meetings at work and being unable to hear a loved one you care for at night time are examples of the new challenges faced by some of these patients.

In audiology, structured information counselling can provide them with a more in-depth understanding of what has changed within the peripheral and central auditory systems, which is often a first, important step in coming to terms with SSD. Hearing and tinnitus handicap should be measured

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using appropriate metrics – routine hearing aid benefit questionnaires fail to draw out the specific difficulties that SSD patients have. Therapeutic interventions include CROS, BAHA, hearing therapy and discussion of other assistive listening devices (ALDs). The Hospital Anxiety and Depression Scale (HADS) is a useful screening tool to identify those patients who need a referral for psychological input. Where possible and appropriate, referrals should be made to local sensory services for equipment to keep SSD patients safe and independent in their homes. The ‘Access to Work’ scheme may provide vital equipment to allow people to continue working.

Audiologists are certainly best equipped to provide rehabilitation to these patients; they have the technical knowledge and skills to provide appropriate amplification, make recommendations for additional equipment and services and to offer some emotional support – there is a tendency for patients to be more open and honest about how they are coping with their audiologist than with their surgeon.

Brian CJ Moore, PhD, FMedSci, FRS, is Professor of Auditory Perception in the Department of Experimental Psychology, University of Cambridge and has published many papers on the

benefits of binaural hearing and the impact of single-sided deafness, but he himself also has one ‘dead ear’. He shared with me how this has affected him:

“Firstly, I obviously I have zero ability to localise sounds. Secondly, I cannot hear soft sounds from my deaf side. I have tried CROS devices, which are helpful in some situations such as dinner with four to five people and low background noise, but it is much harder in greater levels of background noise and I go out of my way to avoid this. There is a trend for restaurants to be noisier, which means going to them is upsetting and stressful instead of peaceful and relaxing. Another effect of not being able to localise is that I often misinterpret what sounds are and have to ask my wife – this is mildly frustrating but can be amusing. I can still enjoy simple music, such as solo guitar / cello / violin and even piano but I cannot pick out individual instruments in a full orchestra, which I greatly miss. I have given up singing in a choir and playing guitar in a jazz band because I cannot pick out the other instruments.”

According to a SSD patient see in CUH Audiology Department, “SSD is a surprise, before I had it I had no idea what it would be like. It is tiresome and affects almost every aspect of my life. Most obvious is the failure to

locate the source of sound... With one ear, two sounds of a similar volume become hopelessly conflated and I can’t understand either. I can’t filter out anything, so once there is much background noise any signal gets lost in it. For some reason I don’t understand, clattery noises, such as picking up cutlery, sound very loud and drown out words completely. Of course I can’t hear someone speaking to me on my dead side. Others find SSD difficult to fathom, as I do, and they therefore find it difficult to adjust to me.”

### Conclusion

Our understanding of the auditory and psychological consequences of SSD has increased over the last few years and while we may not be able to resolve all the difficulties that patients with SSD have, the combination of technology solutions and information counselling that we provide can help patients to accept their hearing loss and to manage the resulting handicap.

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**Declaration of Competing Interests**  
None declared

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Rachel Knappett started working at Addenbrookes Hospital in 2001 as a trainee audiologist. After qualifying in 2005, she set up a transition service for teenage patients and won the BSA Ruth Spencer prize for this in 2010. In 2013, having gained further qualifications in tinnitus management, Rachel became a specialist audiologist. She now works mostly with complex adults, including patients with tinnitus and single sided deafness, providing rehabilitation and taking an active role in research.