

University of Southampton Auditory Implant Service (USAIS) Self-funded cochlear implantation and Single-Sided Deafness

1. What is Single-Sided Deafness?

Single-Sided Deafness is when there is normal hearing in one ear and a severe-to-profound sensorineural hearing loss in the other ear.

Single-Sided Deafness makes it harder to hear someone speaking on the deafened side. It can also affect a person's spatial hearing and localisation of sound due to loss of interaural time difference cues (*the difference in time it takes sound to reach each ear, which helps with localisation*), binaural squelch (*hearing with both ears helps cut out background noise*) and binaural summation (*with two ears we can hear slightly quieter sound than is possible with each ear separately*).

2. USAIS self-funded cochlear implant criteria for Single-Sided Deafness

- Adult
- Acquired unilateral severe-to- profound sensorineural hearing loss
- Duration of deafness in deafened ear commensurate with likely benefit
- Trial with standard hearing aid, CROS, bone conduction hearing device

Cochlear implants are also of interest to tinnitus sufferers as they have been known to provide some tinnitus relief on the side of the hearing loss after implantation.

3. USAIS approach to consideration of a cochlear implant for Single Sided Deafness:

A sequential interventional approach that takes into consideration the degree of potential versus invasiveness/risk associated with current interventions for Single-Sided Deafness.

The different interventions include:

- **Monaural Treatment Options for Single-Sided Deafness**

With monaural (or one-sided) solutions, sounds from both sides are and presented to the hearing ear.

- **A standard hearing aid**
- **A CROS (contra lateral routing of signals) hearing system** which send sounds from a microphone on the deafened side to a microphone (hearing aid) in the hearing ear
- **A bone conduction hearing device.** There are different devices that can be considered and matched to meet individual needs*. There are non-surgical devices (bone conduction hearing device fitted on a headband, adhesive pad or surgically implanted devices. The underlying premise is the same. Sound on the deafened side is sent through the head (vibrations through the skull) to the functional working cochlea on the hearing side. It is standard practice to trial a non-surgical device, before consideration of an implanted device.

** Clinical Commissioning Policy: Bone conducting hearing implants (BCHIs) for hearing loss (all ages). July 2016. Reference: NHS England: 16041/P*

These systems can help reduce the 'head shadow effect' (not being able to hear when someone speaks on the side of the hearing loss). This in turn can help with speech understanding and awareness of sound.

Sound localization is however generally not improved, because this ability relies on input from both ears. Also background noise picked up from the microphone on the deafened side and sent to the hearing ear can reduce speech understanding in some situations.

A trial with above interventions (unless contra-indicated for medical or audiological reason) is required ahead of consideration for a cochlear implant.

- Cochlear Implants for Single-Sided Deafness

In contrast to monaural treatments, a cochlear implant can potentially improve hearing in the deafened ear itself. A cochlear implant is a surgically implanted electronic device providing sound to a person with severe to profound deafness. The device consists of a sound processor, worn externally behind the ear, and an implant surgically placed under the skin. The cochlear implant bypasses the non-functioning hair cells in the affected cochlea and stimulates the hearing nerve of the deafened ear directly.

While the cochlear implant surgery is more invasive than monaural treatments, the main difference with a cochlear implant is that the person will be using the hearing nerve from the deafened ear as opposed to the sound being transferred to the better ear. This has potential to help with hearing speech in noise and sound localisation in addition to reducing the head shadow effect. Cochlear implants are also of interest to tinnitus sufferers as they have been known to provide some tinnitus relief on the side of the hearing loss after implantation. There is also no guarantee that the tinnitus in the deafened ear will be resolved. In a small number of cases tinnitus may worsen with cochlear implantation, usually temporarily immediately following implantation surgery and before activation (usually 4 weeks after surgery).

- USAIS Cochlear Implants for Single-Sided Deafness patient care pathway

