

# MAKING CONNECTIONS

**BONE CONDUCTION HEARING IMPLANTS**



The University of Southampton Auditory Implant Service (USAIS) welcomes referrals for consideration for bone conduction hearing implants (BCHI) for patients who have a range of hearing losses that may be conductive, mixed or sensorineural.



## WHAT IS A BCHI?

BCHIs include Bone Conduction Hearing Devices (BCHDs) and Middle Ear Implants (MEIs). USAIS offer a range of surgical and non-surgical options depending on the severity and type of hearing loss, age and other medical factors.

### How does it work?

All implantable devices consist of a surgically implanted component and an external sound processor.

Bone conduction hearing devices convert sound waves into sound vibrations which are delivered directly to the inner ear through the skull bone using the principle of bone conduction. These can be fitted surgically or non-surgically.

Middle ear implants are surgically implanted devices which send a signal directly to the middle ear bones, and from there, onwards to the inner ear.

### Who could benefit from a BCHI?

A BCHI is suitable for people with a range of hearing losses who cannot use or do not receive adequate benefit from air conduction hearing aids.

NHS funding is provided for hearing losses that meet the criteria outlined in the Clinical Commissioning Policy. Patients should have tried air conduction hearing aids for a minimum of 4 weeks, except when anatomically unable to complete a trial.

### Potential benefits of a BCHI include:

- Ability for consistent use of the device
- More comfortable for people who experience ear infections
- No need for ear moulds, so reduced ear infections and ear canal problems
- Better overall sound awareness for unilateral deafness
- Improved sound quality for people who have a large conductive element to their hearing loss



## WHAT HAPPENS DURING AN ASSESSMENT?

During the assessment, advice will be given about the most suitable device(s) for the hearing loss. The assessment is carried out by a multidisciplinary team. The patient will be asked to attend a number of appointments at USAIS to determine if they would be likely to benefit from a BCHD or MEI.

### Initial appointments include:

- Audiology assessment  
This involves a number of tests of hearing both with and without hearing aids (if the patient is able to wear hearing aids). In most cases, the patient will be required to trial a non-surgically fitted device to see if they benefit from bone conducted sound
- Medical assessment  
This is to address the medical aspects of the hearing loss and discuss surgical options. A CT scan may be required
- Communication support (for children and young people) in order to plan support with local professionals

The assessment period includes opportunities for the patient and their family or significant others to find out everything they need to know to help them decide if they would like a BCHI. The assessment process allows us to determine which device(s) are most suitable for you.



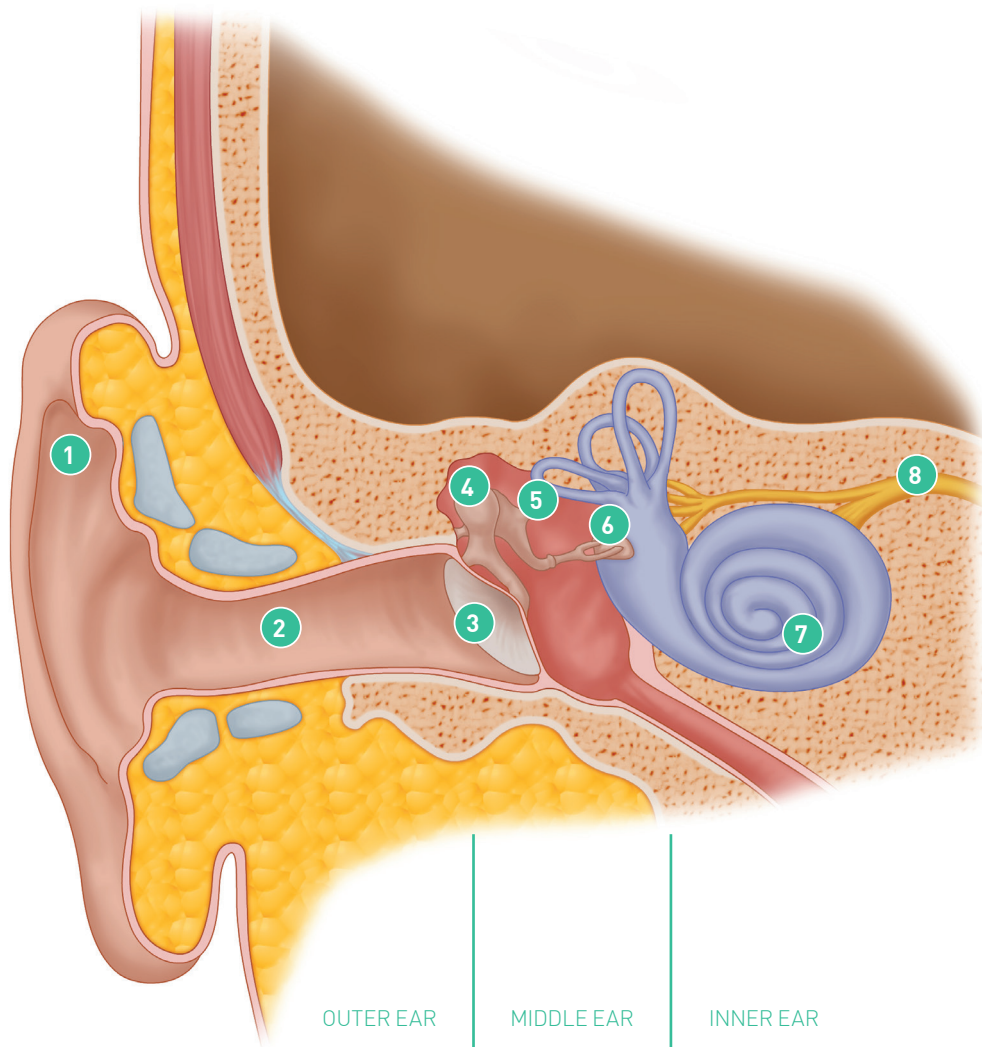
## HOW THE EAR WORKS

In normal hearing, sounds are heard via air conduction. This means that sound vibrations in the air travel down the ear canal and move the ear drum which causes the middle ear bones to vibrate. The movement of the middle ear bones causes the fluid in the inner ear (cochlea) to move, stimulating the hearing nerve.

Bone conducted sound bypasses the ear canal and middle ear, and instead, sound vibrations reach the inner ear via vibration of the skull.

### KEY

1. Pinna
2. Ear Canal
3. Eardrum
4. Middle ear bones
5. Middle ear bones
6. Middle ear bones
7. Cochlea
8. Hearing (auditory) Nerve

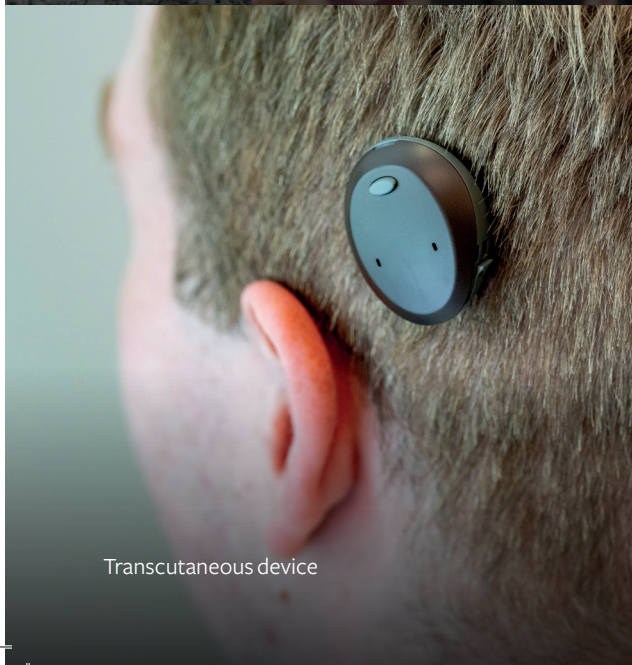




Percutaneous: abutment fixture



Percutaneous: device worn on abutment fixture



Transcutaneous device

## BONE CONDUCTION HEARING DEVICES

There are several different types of bone conduction hearing device. The surgical options are percutaneous implants and transcutaneous implants. There are non-surgical options as well.

### Who is a BCHD suitable for?

- People with conductive or mixed hearing loss or single sided deafness (SSD) and have hearing thresholds which fall within the manufacturers fitting guidance
- People who are unable to wear air conduction hearing aids, for example due to atresia (closed ear canal), chronic ear infections or outer ear skin conditions
- People who do not benefit from a CROS hearing aid (for SSD cases)
- People who have a large conductive element to their hearing loss and gain limited benefit from air conduction hearing aids (for conductive and mixed hearing losses)

## MIDDLE EAR IMPLANTS

### What is a Middle Ear Implant (MEI)?

A middle ear implant is an internal implant which is inserted under general anaesthesia. During the surgery, an attachment is placed onto one of the structures in the middle ear.

An external sound processor connects to the implant using a magnet. The sound processor picks up sounds around you and sends a digital signal across the skin to the internal implant. This vibrates the structures in the middle ear which moves the fluid in the inner ear and stimulates the hearing nerve.

### Percutaneous BCHD: What is it?

A percutaneous BCHD consists of a titanium fixture, which is inserted during surgery, and this fixture integrates into the skull bone over a period of time. A part called an abutment is attached to the titanium fixture. The bone conduction sound processor clips on to the abutment to transfer vibrations, through the skull, to the cochlea.

### Transcutaneous BCHD: What is it?

The bone conduction implant is inserted under the skin during surgery and an external sound processor connects to the implant using a magnet. The sound processor picks up sounds around you and sends a digital signal across the skin to the internal implant. The implant will then generate vibrations which travel through the skull to the cochlea.

### Non-surgical options

If you do not want surgery, or surgery is not a suitable option for you, there are non-surgical options as well. This is either using a softband or hardband with a sound processor attached or by using a sound processor which attaches behind the ear using a sticky pad. The principle is the same as a surgical fitting, the sound vibrations are still transferred from the sound processor to the skull. Children will all be given a non-surgical option until they reach a suitable age to be offered a surgical fitting.

### Who is an MEI suitable for?

- People with sensorineural hearing loss who are unable to use conventional air conduction hearing aids, for example, due to chronic outer ear skin conditions such as eczema
- People who do not suffer from middle ear infections or middle ear fluid
- People who have hearing thresholds within the manufacturers fitting guidance
- People who have non-progressive hearing loss



Non-surgical option: device worn on a softband



Non-surgical option: device worn on a softband



MEI: demonstration of implant location



### **Find out more**

Visit: [ais.southampton.ac.uk](http://ais.southampton.ac.uk)

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