

Cochlear implants

If you have severe to profound deafness and get little or no benefit from hearing aids, a cochlear implant may help you to hear. This factsheet explains what a cochlear implant is, how it works, who can receive one and how it is fitted.

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Note: This factsheet provides information on cochlear implants for **adults**. To find out about cochlear implants for children, contact the National Deaf Children's Society (<u>see page 11</u> for contact details).

What is a cochlear implant?

A cochlear implant is a small electronic device that may help you to hear if you have severe to profound sensorineural deafness in both ears and you don't get adequate benefit from the most powerful hearing aids. Sensorineural deafness is caused by damage inside the cochlea (the hearing organ in the inner ear).

Unlike a hearing aid, which works by making sounds louder, a cochlear implant does the job of the damaged parts of the cochlea. When sound waves enter the cochlea of a person who is hearing, thousands of tiny sensory cells, known as hair cells, trigger electrical signals in the hearing nerve. The hearing nerve then passes these signals to the brain, which recognises them as sound.

If you have severe to profound deafness that is sensorineural, most of the hair cells in the cochlea are damaged or missing. A cochlear implant does the job of these hair cells, by stimulating the hearing nerve with electrical signals, which are then passed to the brain and recognised as sound.

As we explain in this factsheet, a cochlear implant isn't suitable for everyone.

If you are interested in having a cochlear implant, you will need to be carefully assessed by a team of specialists to see if you could benefit from one.

A cochlear implant can never restore hearing to normal levels, because an electronic device can't do as good a job as a natural cochlea. However, most adults experience an improvement in their ability to hear speech and everyday sounds.

How does a cochlear implant work?

A cochlear implant has both an external part, which is worn outside the body, and an internal part, which is placed under the skin during an operation – see the diagram on page 3.

The external part contains:

- A microphone, which picks up sound waves and passes them to the sound processor.
- A sound processor, which converts signals from the microphone into digital signals that are then passed to the transmitter coil.
- A transmitter coil, which receives the digital signals from the sound processor and transmits them to the internal parts of the implant.

The transmitter coil is placed flat against the skin, slightly behind the ear. The sound processor can be positioned either behind the ear (in a device that looks like a hearing aid) or in a single unit with the transmitter coil.

The internal part contains:

- A receiver/stimulator with a magnet - this is fitted under the skin, behind and above the ear. The magnet holds the external transmitter coil directly over the implanted receiver.
- A set of electrodes this is placed inside the cochlea.



A cochlear implant with a sound processor that fits behind the ear.

Inner ear Transmitter coil-Auditory (hearing) nerve Cochlea Electrodes inside cochlea Eardrum Speech processor and microphone (behind ear) Middle **Outer ear** ear

Diagram of a cochlear implant

The receiver picks up the digital signal from the transmitter coil on the outside of the skin and sends it to the electrodes inside the cochlea.

The electrodes take over the job of the damaged or missing hair cells in the cochlea and send electrical signals along the hearing nerve to the brain. The brain learns to recognise these signals as sounds.

Could a cochlear implant help me?

To be considered for a cochlear implant, you usually must:

- have severe to profound sensorineural deafness in both ears
- get limited benefit from high-powered hearing aids
- have a medical assessment to see whether a cochlear implant is suitable for you
- be willing to go to regular appointments (in particular in the first year), where a specialist will program the device to make sure you get maximum benefit
- have realistic expectations and a good understanding of what is entailed.

Your age isn't taken into consideration when doctors are deciding whether an implant will be suitable for you. In the UK, the oldest person to be fitted with a cochlear implant (so far) was 99! What is important is that you are in good health and are able to have a major operation.



"I lost my hearing five years ago, aged 39, due to sudden acquired hearing loss. This was the result of a rare disease that affected my inner ears. Before that, I was hearing all my life.

At first I used hearing aids, but as my hearing continued to deteriorate, it got to the stage where they were no longer any use to me.

I got my cochlear implant in the summer of 2014. It was like meeting up with an old friend you haven't seen in a long time and rediscovering the things you have in common and what you can remember about them.

I was surprised and amazed at the sounds I could remember and suddenly hear so clearly again – like the sound of my dog, Jake's, paws as he walked across the laminate floor in the lounge. It's the everyday sounds that I now find truly amazing."

Richard Turner, London

If you've lost your hearing after having developed spoken language, you stand to gain significant benefit from an implant.

If you were born deaf, or became deaf at a young age, you may gain some benefit from a cochlear implant if you have used hearing aids consistently in the past, are keen to hear and are willing to take part in listening practice and hearing rehabilitation.

Adults usually only have one cochlear implant. However, people who are blind or have other disabilities that mean they rely more on their hearing should be given two cochlear implants – one in each ear.

If you have a cochlear implant, you'll need plenty of support from your family, friends and professionals, especially as you learn to use it.

How much does a cochlear implant improve hearing?

While there are complex tests that will show whether a cochlear implant could work for you, it's difficult to predict before the operation exactly how successful it will be as the results can vary.

How much benefit you may get depends on issues such as:

- when you became profoundly deaf
- your hearing history and listening experience
- your ability to speak and understand speech
- the condition of your cochlea

- any other medical conditions
- how much you practise using your cochlear implant
- your motivation and commitment.

Most people who have a cochlear implant find that they can hear speech and environmental sounds such as footsteps, birdsong, leaves rustling and dogs barking. Some people will always need to watch faces and lipread as well as listen. Others find that their hearing improves so much that they are able to understand speech without lipreading, enjoy music and use the phone.

As a general rule, the longer you have an implant and the more you use it, the more benefit you'll get from it.

We know from people with cochlear implants who could hear before they became deaf that the sensation of sound produced by an implant is different from 'normal' hearing. They initially describe the sound with words like 'mechanical', 'robotic' and 'synthetic'. However, this perception changes over time – most people don't notice this artificial sound quality after a few weeks.

How can I get an assessment for a cochlear implant?

If you have severe to profound deafness and want to find out whether a cochlear implant could help you, your GP, audiologist (hearing specialist), or your ear, nose and throat (ENT) specialist can refer you to a cochlear implant centre for an assessment.

What does the assessment involve?

The assessment involves having a range of tests that are complex and take some time – they may take place on separate occasions with different specialists. The tests are important because they show whether the operation is possible and whether an implant is likely to be the best option for you.

The British Cochlear Implant Group, a professional body representing all the cochlear implant centres in the UK, provides the following information about the tests for adults.

Medical examination

A consultant ENT surgeon will talk to you about your medical and hearing history, examine your ears and assess your overall medical fitness. You will have an MRI (magnetic resonance imaging) scan or a CT (computerised tomography) scan, to see if it is possible to insert the electrodes into your cochlea. MRI scanning involves the use of powerful magnets, so make sure you tell the team if you have any metal fragments or implants in your body.

Hearing tests

You'll have a number of hearing tests, including tests of your ability to hear speech. Make sure you bring your hearing aid(s) with you (if you have any). You may have a hearing aid trial if the team feels you may benefit from different hearing aids. It's important to find out whether high-powered hearing aids can offer sufficient benefit before considering a cochlear implant.

Auditory brainstem response (ABR) test

This special hearing test involves recording the electrical activity of your hearing pathway. It's useful for assessing people with profound deafness. The specialist will place small recording pads onto your head and clicks or tones will be played to you through headphones or earphones. The response of your hearing pathway will be recorded automatically.

Hearing aid benefit and lipreading assessment

You may be asked to take part in an evaluation of your lipreading skills. This will tell the team how much you rely on lipreading to understand speech and how much your hearing aid(s) support your lipreading. The team will also test your ability to understand speech without lipreading, to evaluate how much your hearing aids help you. They will use these test results later on to compare them with the benefits of a cochlear implant, should you go on to have one.

Questionnaires

You may be asked to complete a number of different questionnaires. They are an opportunity for you to tell the team how you feel about your deafness, how you think it affects your quality of life, and what you are expecting from a cochlear implant. All replies are treated completely confidentially.

Counselling

Cochlear implant teams need to be sure that you fully understand everything that is involved in having a cochlear implant and make sure that your expectations are realistic. You'll have the opportunity to discuss all aspects of cochlear implantation with various members of the team. You may be seen on a one-to-one basis or in a group setting. These discussions aim to help you make up your mind whether or not you want an implant and whether you would really benefit from one.

You can get more information about these tests from your nearest cochlear implant centre - visit the British Cochlear Implant Group website for contact details: <u>bcig.org.uk/type/</u> <u>contact-centre</u>

What happens next?

When the results of your tests are ready, the professionals in your team will discuss with you whether they think you will benefit from a cochlear implant and whether it's the best option for you.

The team will make sure you have realistic expectations and, if you wish, they can put you in touch with other people who have opted for or against a cochlear implant, so you can learn from their experiences. There's no pressure to have a cochlear implant if you decide you don't want one.

Some people may get on better with hearing aids than a cochlear implant, or decide that it's not for them at that moment in time.

If you do decide to have a cochlear implant, you'll have more appointments with the professionals in your team. They will explain what is involved and will discuss which cochlear implant systems are available for you and how they can be set up to give you the best results.

What's involved in cochlear implantation?

The process has two stages:

- the cochlear implant operation
- the programming of the sound processor.

The cochlear implant operation

Before the operation, you'll have a general anaesthetic to put you to sleep. You may have a small amount of hair shaved behind your ear. The surgeon will make a small cut behind your ear and drill through the bone, into the middle ear and into the cochlea. The bone behind the ear is sometimes hollowed out slightly to make a 'bed' to hold the receiver and internal magnet, so that it doesn't make much of a 'bump'. Next, the surgeon will very gently thread the set of electrodes into the cochlea. The team may then test the implant to make sure it is working well, and, if everything is satisfactory, the surgeon will stitch up the wound and put a bandage around your head. You may be able to go home later that day. If not, you'll stay in hospital for one night after the surgery. The bandage will be changed for a small dressing before you go home.

Occasionally, people can feel dizzy after the operation and it's sometimes necessary to stay in hospital a little longer. According to the British Cochlear Implant Group, most people feel better very quickly and don't have significant pain after the operation.

Initial activation of the sound processor

You'll be asked to visit the hospital again, approximately four weeks after the operation, to have the cochlear implant activated and programmed so you get maximum benefit from it.

It's important to understand that sound through a cochlear implant isn't the same as natural sound or sound through a hearing aid. When it is first activated, the sound you hear may sound strange, but it will become more natural sounding over time and with listening practice.

The more you use your cochlear implant, the quicker you will get used to it and the more benefit you will receive.

Are there any risks involved?

All operations carry risks and your ENT surgeon will tell you about the particular risks of having a cochlear implant. Please note that all the risks shown are small and all implant centres take steps to minimise these as much as possible.

Possible risks include:

- the risks associated with having a general anaesthetic and an ear operation
- you may feel dizzy for a while after the operation
- you may develop tinnitus (noises in the ear(s) or head), or your tinnitus may become worse – this usually calms down after the implant is activated
- a small risk of permanent damage to the balance organ in the ear that is operated on
- a slight risk of damage to the nerve for the sensation of taste
- a slight risk of damage to your facial nerve, which can affect the muscles of the face, but this is extremely rare.

People with cochlear implants may also be at a slightly increased risk of picking up bacterial meningitis, so your doctor will recommend that you have a meningitis vaccination before you have the implant. Once you have a cochlear implant, your doctor should also treat any middle ear infections promptly. If you have previously had meningitis, there is a chance that the cochlea has filled up with a bony growth. This may make an operation difficult but will usually have been discovered beforehand, from the scans during your assessment.

What happens after the implant is activated?

You'll need to visit the cochlear implant centre regularly, especially during the first year, as the settings of your cochlear implant will need to be checked and altered to provide a meaningful sound sensation. This is an important process and will maximise the benefit you'll get.

Remember, it does take time to learn to listen with a cochlear implant. You may need hearing rehabilitation (especially if you have been deaf from a young age and haven't heard for a long time). This will involve a lot of 'homework' – for example, carrying out listening exercises at home.

After that, you'll be offered a review appointment once a year to monitor your progress and to fine-tune your processor. This continues for the rest of your life. Your implant centre will support you if any other problems arise, and will provide spares and replacements if your implant develops any faults.

Living with a cochlear implant

Cochlear implants are designed to be safe and effective. However, it's also essential that you take care when using them. Cochlear implant manufacturers provide specific advice for their devices. Your implant centre will explain the precautions and warnings that have been issued for your particular device. It's important that you stick to this advice to prevent harm to you and avoid damage to the implant or sound processor. This may involve following special instructions for some medical treatments and therapies, medical scanning, cosmetic procedures and recreational activities.

A few medical treatments (mainly those that involve heat, current and vibrations in the region of the cochlear implant) aren't suitable for people with cochlear implants. Your implant centre will give you more specific advice and information.

 To find out more about daily life with a cochlear implant, visit <u>bcig.org.uk</u>

What is a hybrid device?

A hybrid device is a cochlear implant with an integrated hearing aid. It is suitable for people who have severe to profound highfrequency hearing loss (which prevents them from understanding speech, even when using hearing aids), but enough lowfrequency hearing after cochlear implant surgery to hear some amplified sound.

People with a hybrid device hear high frequencies through the cochlear implant and low frequencies through the integrated hearing aid.

What cochlear implant research does Action on Hearing Loss fund?

In the 1980s, we collaborated with surgeons at the Royal National Throat, Nose and Ear Hospital to develop the external processor that drives the cochlear implant. The first child in the UK was given a cochlear implant in 1989 – today, there are more than 15,000 children and adults benefiting from cochlear implants throughout the country.

The cochlear implant research we fund focuses on:

- demonstrating the benefits of cochlear implants
- refining the methods used to determine whether someone is suitable for an implant
- finding ways to improve how cochlear implant users hear speech, especially in noisy environments
- developing rehabilitation tools, such as training programmes, to help people learn to interpret the sounds they hear through the implant.
- To find out more about the research we fund, visit <u>actiononhearingloss.org.uk/</u> <u>biomedicalresearch</u>

Our policy statement on cochlear implants

At Action on Hearing Loss, we believe that more adults could benefit from cochlear implants than are currently doing so. We believe that the National Institute for Health and Care Excellence (NICE) should review and update its current guidance on cochlear implants.

We believe that awareness of cochlear implants as a treatment option should be raised among the public, and that NHS organisations and audiologists should offer a referral for cochlear implantation to everyone who could benefit.

We are working to raise awareness of the benefits of cochlear implants for adults, and to influence NHS organisations to improve the provision of cochlear implant services.

To read our full statement on cochlear implants, visit <u>actiononhearingloss.org.uk/</u> <u>policystatements</u> and click on 'Health and social care'.

Where can I find out more about cochlear implants?

New research into cochlear implants appears regularly. Before you decide whether a cochlear implant is the right choice for you, collect as much up-to-date information as possible.

British Cochlear Implant Group (BCIG)

A professional body representing all the cochlear implant centres and specialist medical practitioners throughout the UK. BCIG provides information for professionals, people with cochlear implants, potential patients and their families.

Email: <u>info@bcig.org.uk</u> Website: <u>bcig.org.uk</u>

Cochlear Implanted Children's Support Group (CICS)

An independent voluntary group run by parents whose children have cochlear implants, to help others whose children have implants and those who are considering cochlear implantation for their child. Visit the CICS website: <u>cicsgroup.org</u>

National Association of Deafened People

A national charity that provides information and support for deafened people and their families.

Dalton House 60 Windsor Avenue London SW19 2RR

Telephone: **0845 055 9663** Email: <u>enquiries@nadp.org.uk</u> Website: <u>nadp.org.uk</u>

National Cochlear Implant Users Association (NCIUA)

A national association that represents cochlear implant users in the UK and provides information.

Online contact form: nciua.org.uk

National Deaf Children's Society (NDCS)

A national charity that works to remove the barriers to the achievement of deaf children throughout the world.

Ground Floor South Castle House 37–45 Paul Street London EC2A 4LS

Helpline tel/textphone: **0808 800 8880** Email: <u>ndcs@ndcs.org.uk</u> Website: <u>ndcs.org.uk</u>

The Ear Foundation

A charity that helps people who are deaf and their families make the best use of technology to improve hearing, communication and spoken language. Information on cochlear implants can be found on the charity's website.

Marjorie Sherman House 83 Sherwin Road Lenton Nottingham NG7 2FB

Telephone: **0115 942 1985** Email: <u>info@earfoundation.org.uk</u> Website: <u>earfoundation.org.uk</u>

Information you can trust

The Information Standard certifies us as producers of high-quality, evidence-based information.

The information in this factsheet has been been reviewed by the **British Cochlear Implant Group**, a professional body representing all of the cochlear implant centres in the UK.

For a list of references for this factsheet, please email us at references@hearingloss.org.uk

Did you find this factsheet helpful?

We'd love to know what you think of this factsheet – please email us at reviewpanel@hearingloss.org.uk

If you'd like to join our Readers' Panel, to help us create new publications and improve existing ones, please let us know.

Further information from Action on Hearing Loss

Our expert information covers everything you need to know about:

- hearing loss and deafness
- tinnitus
- ear problems and treatments
- hearing aids and cochlear implants
- useful products and technology
- communication tactics and support
- benefits and grants
- your rights.

Visit our website <u>actiononhearingloss.org.uk</u> or call our Information Line (<u>see last page</u>) for information, support and publications. You can also find out about services in your area, our hearing research, and how you can get involved.

Please help us support others

We provide our leaflets, factsheets and Information Line service free of charge to anyone affected by deafness, tinnitus or hearing loss in the UK. We rely on the generosity of our supporters to help us do this. We would be very grateful if you would consider making a donation – of as little or as much as you can afford.

Please send a cheque, payable to Action on Hearing Loss, to:

Freepost RTLX-CZKX-BTTZ Action on Hearing Loss 1-3 Highbury Station Road London N1 1SE (No stamp needed)

Donate online at <u>actiononhearingloss.org.uk/icanhelp</u> Or make a donation over the phone by credit or debit card:

€ 0203 227 6182 **0203 227 6185**

Thank you.

Our purpose is to help people confronting deafness, tinnitus and hearing loss to live the life they choose. We enable them to take control of their lives and remove the barriers in their way.

To find out more about what we do and how you can support us, go to **actiononhearingloss.org.uk**

Action on Hearing Loss Information Line

Telephone:**0808 808 0123**Textphone:**0808 808 9000**SMS:**0780 000 0360**
(standard text message rates apply)Email:**information@hearingloss.org.uk**

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