



Manchester University
NHS Foundation Trust

Cochlear Implants for Adults

Manchester Royal Infirmary



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Introduction

History

The Manchester Adult Cochlear Implant Programme was established in 1988. The Cochlear Implant Team consists of a number of different professionals, who work together as a multidisciplinary team.

The adult cochlear implant team

- Surgeons
- Audiologists
- Clinical Scientists (Audiology)
- Hearing Therapists and Speech Therapists
- Psychologist
- Administrative staff

The normal ear

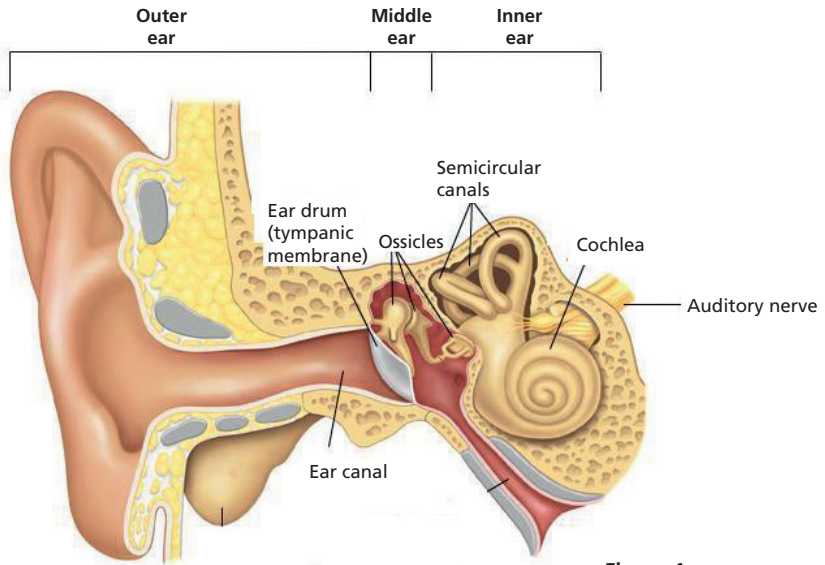


Figure 1.
A cross section of the ear

In order to understand how a cochlear implant works, it is important to understand how a normal ear hears sound. Figure 1 illustrates the anatomy of the ear.

hair cells change this movement into electrical impulses. These electrical impulses are transmitted from the hearing (auditory) nerve to the brain where they are interpreted as sound.

Sound waves are collected by the outer ear and sent down the ear canal to the eardrum. The sound waves cause the eardrum to vibrate which sets the three tiny bones (the 'ossicles') in the middle ear in motion. The motion of these bones causes fluid in the inner ear (the 'cochlea') to move. The movement of the inner ear fluid causes tiny hair cells in the cochlea to move. The

The cochlear implant

A cochlear implant is an electronic device which replaces the function of the damaged cochlea by electrically stimulating the auditory nerve to produce a sensation of sound.

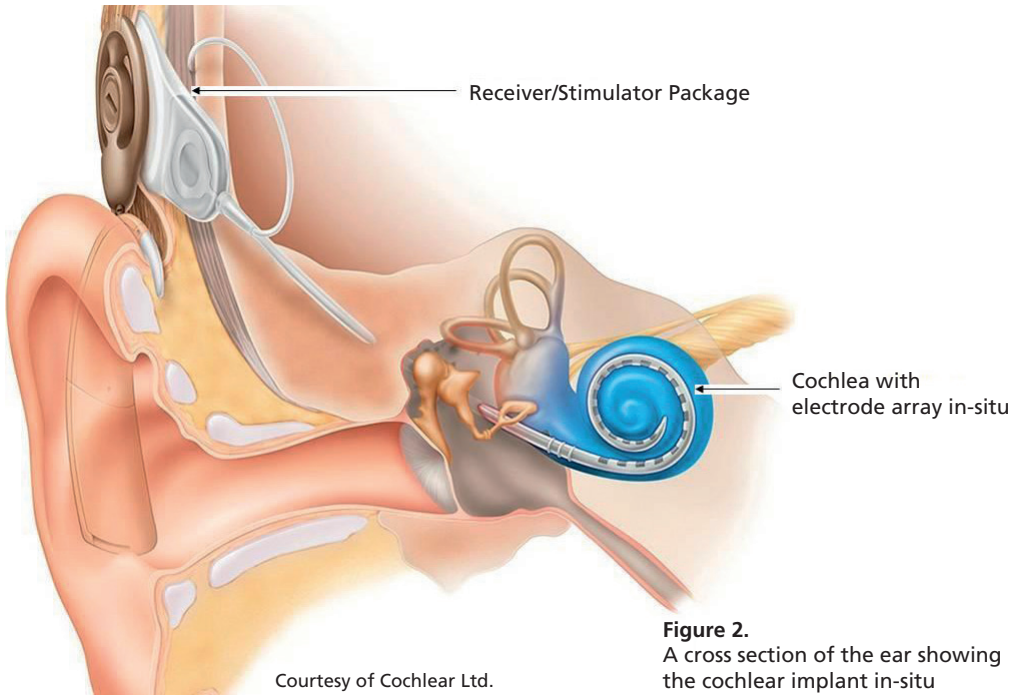
A cochlear implant can help a severely or profoundly deaf person to become more aware of everyday sounds and understand speech better with lip-reading. Some cochlear implant users can understand speech even without lip-reading. At first, the new sensation of sound produced by the cochlear implant will be very different from any previous experiences of sound. It can take several months to get the most benefit from the implant. Learning to hear with the implant takes place over this time. Better outcomes are associated with full time use of the implant.

A cochlear implant has both internal and external parts. The internal part is called the receiver / stimulator. This is connected to an electrode array which is inserted into the cochlea during an operation which lasts approximately 2 hours. The external sound processor and magnetic coil transmit sound to the internal

implant. The implant is activated approximately 4 weeks after surgery. The external device includes:

- A speech processor, which encodes the signal into an electrical signal. The speech processor is worn behind the ear or on the side of the head.
- A microphone (part of the speech processor), which picks up the sounds.
- A transmitter coil, which transmits the signal to the internal components. The coil is held in place on the head by a magnet.

How does a cochlear implant work?



Sound is received by the microphone on the speech processor. The speech processor then processes the signal and sends the signal to the transmitter coil. The coil sends the signal across the skin to the internal implant (receiver/stimulator) where it is converted to electrical signals. This signal then travels down the electrode array to stimulate the

hearing nerve fibres in the cochlea and the auditory nerve. These signals are interpreted by the brain as sound.

Cochlear implantation in Manchester

There are different types of cochlear implants to consider. The implant team will recommend the best one

in your case taking into account your lifestyle and preferences.

Figure 3.

Cochlear® behind the ear or off the ear speech processors and internal implant (centre)



Figure 4.

Med-el® off the ear and behind the ear speech processors and internal implant (centre)



Electroacoustic Stimulation (EAS)

Some patients may benefit from an EAS implant type. This implant is used for people who have some low frequency hearing and poor high frequency hearing. It combines stimulation from a cochlear implant and a hearing aid or the natural low frequency residual hearing.

The assessment procedure

Referral criteria

Referrals should be made either to the Co-ordinator of the Adult Cochlear Implant Programme or one of the implant surgeons (www.mft.nhs.uk/cochlear for further information). A copy of the current referral guidelines can be requested from the Cochlear Implant team. There is no maximum age limit for referral.

Suitable adult patients to refer include:

1. Those with a progressive hearing loss. Adults who have had some benefit from hearing aids in the past, but whose hearing has deteriorated to the point where hearing aids are no longer useful or, where the benefit of hearing aids is severely limited.
2. Those with a sudden acquired hearing loss. Adults with a sudden hearing loss should be referred to the programme immediately. Due to the risk of ossification (bony growth in the cochlea) after meningitis, adults who have lost their hearing due to meningitis are placed in a

fast-track option which enables surgical priority if necessary. Sudden hearing loss due to head trauma should also be given priority in referral.

Assessments for cochlear implantation

In order to determine whether a cochlear implant may be of benefit, various assessments must be carried out. Several visits may be needed to determine if a cochlear implant is the right choice. The following list of assessments is not exclusive, but it does outline many of the visits that patients will make before surgery.

1 Initial appointment

The history of hearing loss will be determined at this session. This will include questions about the duration and cause of deafness. Other factors are also assessed. These factors include communication skills; use of hearing aids and how long they have been used tinnitus balance; employment status and general health. A hearing test will be performed at this session to determine whether an implant may be suitable or whether a different hearing aid may be more appropriate.

Prior to receiving a cochlear implant, we will do some hearing and lip-reading tests and we may ask the patient to complete some questionnaires. This gives us a baseline for measuring progress with the implant.

2 Scans

There are two types of scan that may be required prior to a cochlear implant.

- a. A computer tomography (CT) scan. This is similar to an X-ray but provides more detailed information about the inner ear and in particular the cochlea.
- b. A magnetic resonance imaging (MRI) scan to gain more information about the inner ear before surgery. In some cases of severe/profound deafness the cochlea becomes ossified. This means that bony growth may form inside the cochlea that prevents insertion of a cochlear implant. The MRI scan will reveal any bony growth or ossification.

3. Information session

Suitable candidates for cochlear implantation will be invited to attend a group or a 1:1 information session. The session provides information about what to expect to hear with an implant, as well as an opportunity to meet an implant user. This helps the development of realistic expectations as well as providing information about the commitment required from someone considering a cochlear implant.

4. Meeting with a cochlear implant surgeon

Following completion of all the assessments including a case discussion at the multidisciplinary team meeting an appointment will be arranged with one of the cochlear implant surgeons. If a cochlear implant is recommended the type of device and the ear to implant will be discussed. The patient will be asked to sign a consent form and will then be listed for surgery.

Cochlear implant surgery

In general, cochlear implant surgery is relatively straightforward and lasts approximately two hours. The procedure is usually done as a day case. In some cases an overnight stay will be recommended.

There are some risks associated with cochlear implant surgery and the surgical procedure will be discussed in detail at the information session and the consultant appointment.

A clinic follow up appointment is arranged about a week after the surgery. At this time patients will have an x-ray to check the position of the implant. The stitches are dissolvable and do not need to be removed. The booklet "Care advice for patients following adult cochlear implantation" will explain what happens after the implant operation.

PLEASE NOTE: The implant operation involves fitting the internal equipment only. It is not possible to hear with the device until the external speech processing equipment is fitted usually about a month after the operation.

Visits after the operation

Fitting the speech processor

The external equipment (speech processor and transmitting coil) is fitted about a month after the implant operation. This is what we call the 'switch on' appointment.

Measurements are made during the 'switch on' to determine the levels of current required to produce hearing sensations. At this stage the patient will only be aware of beeping sounds coming from the computer. This process may take up to an hour. These measurements are made by a computer and are stored in the speech processor. This is called the 'programme' or 'map'.

The speech processor is then switched on and the patient will be aware of sounds around them. At first the sound may not be very meaningful and certainly nothing like sound the patient may remember. However, gradually over the following weeks and months, the patient will adjust to this new sensation of sound.

Adjusting to the new sensation of sound

Following the fitting of the speech processor, a course of rehabilitation. This includes a fine tuning the programme in the speech processor. In addition the therapy staff will help with understanding the sound from the cochlear implant as well as advising about the equipment and accessories that are issued with the speech processor.

Patients need to attend for a series of programming and rehabilitation appointments over the first few weeks of implant use, typically about 4 appointments in the first 6 weeks.

Appointments are then usually arranged at 3 months, 9 months, 21 months and then be arranged every 2 years.

Additional appointments including conversation groups can be arranged if more time is needed to adjust to the new sensation of sound. Some people adjust to the new sensation of sound quite quickly, others may need more time to adjust. Patients are encouraged to practice with some listening exercises at home that will help them to get used to the sound.

We have no way of knowing exactly what the sound sensation will be like with the cochlear implant for any individual. We do know that everybody has a different experience and it is important for us to monitor a patient's progress carefully over the first few months of implant use to ensure they are getting the best from their device.

Assessments with the cochlear implant

To help us monitor progress with the cochlear implant, we need to do a series of assessments. These hearing and lipreading assessments are performed at 1 week, 3 months, 9 months, 21 months and when clinically necessary after the switch on.

Contact details

The Richard Ramsden Centre for Hearing Implants

Peter Mount Building
Manchester Royal Infirmary
Oxford Road
Manchester
M13 9WL

Appointments

Tel: (0161) 701 6931

Spares and Repairs

Tel: (0161) 276 8079

Email: auditory.implant@mft.nhs.uk
Further information can be found on
our website
www.mft.nhs.uk/cochlear

Links/Further reading

Manufacturer Links:

www.bionicear-europe.com
www.cochlear.co.uk
www.medel.com

British Cochlear Implant Group

www.bcig.org.uk

The Royal National Institute for Deaf people:

www.rnid.org.uk

Notes

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No Smoking Policy

Please protect our patients, visitors and staff by adhering to our no smoking policy. Smoking is not permitted in any of our hospital buildings or grounds, except in the dedicated smoking shelters in the grounds of our Hospital site.

For advice and support on how to give up smoking, go to www.nhs.uk/smokefree.

Translation and Interpretation Service

It is our policy that family, relatives or friends cannot interpret for patients. Should you require an interpreter ask a member of staff to arrange it for you.

تنص سياستنا على عدم السماح لافراد عائلة المرضى او اقاربهم او اصدقائهم بالترجمة لهم. اذا احتجت الى مترجم فيرجى ان تطلب ذلك من احد العاملين ليرتب لك ذلك.

بماری یہ پالیسی ہے کہ خاندان ، رشتہ دار اور دوست مریضوں کے لئے ترجمہ نہیں کر سکتے۔ اگر آپ کو مترجم کی ضرورت ہے تو عملے کے کسی رکن سے کہیں کہ وہ آپ کے لئے اس کا بندوبست کر دے۔

ইহা আমাদের নীতি যে, একজন রোগীর জন্য তার পরিবারের সদস্য, আত্মীয় বা কোন বন্ধু অনুবাদক হতে পারবেন না। আপনার একজন অনুবাদকের প্রয়োজন হলে তা একজন কর্মচারীকে জানান অনুবাদকের ব্যবস্থা করার জন্য।

Nasze zasady nie pozwalają na korzystanie z pomocy członków rodzin pacjentów, ich przyjaciół lub ich krewnych jako tłumaczy. Jeśli potrzebują Państwo tłumacza, prosimy o kontakt z członkiem personelu, który zorganizuje go dla Państwa.

Waa nidaamkeena in qoys, qaraaboamasaaxiiboaysanu tarjumikarinbukaanka. Haddiiaad u baahatotarjumaankacodsoxubinka mid ah shaqaalahainaykuusameeyaan.

我们的方针是，家属，亲戚和朋友不能为病人做口译。如果您需要口译员，请叫员工给您安排。



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