



Manchester Royal Infirmary

Manchester Adult Cochlear Implant Programme

Information for Patients and Professionals



Contents

Introduction	3
The normal ear	4
The cochlear implant	5
The assessment procedure	8 - 10
Cochlear implant surgery	10 & 11
Visits after the operation	12 & 13
Contact details and further reading	14

Introduction

History

The Manchester Adult Cochlear Implant Programme was established in 1988 and on average 45 new adult patients are implanted each year. The Cochlear Implant Team consists of a number of different professionals, all of whom have their own areas of expertise.

The adult cochlear implant team

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

The normal ear

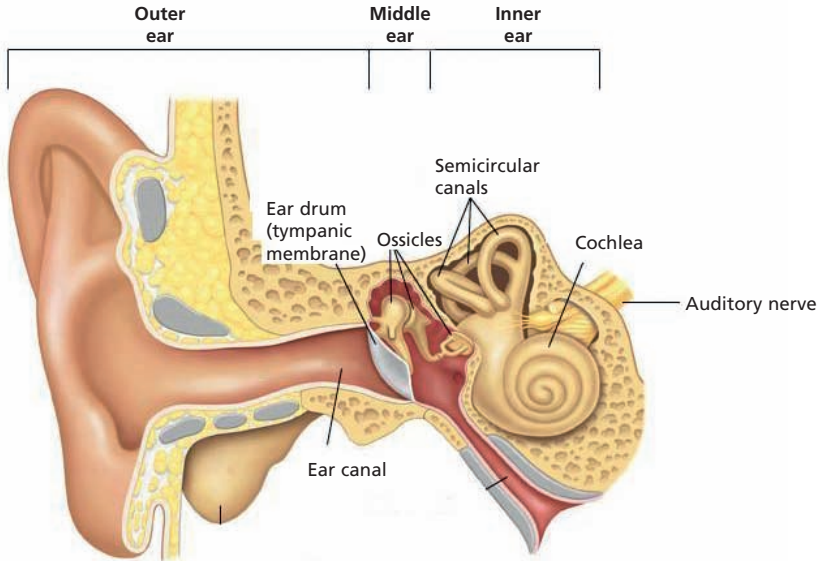


Figure 1.
A cross section of the ear

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

Sound is transmitted as sound waves that 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 hair cells change this movement into electrical impulses. These electrical impulses are transmitted to the hearing (auditory) nerve and up to the brain where they are interpreted as sound.

In some cases of severe or profound hearing loss, the hair cells in the cochlea may become damaged or may be missing, and as a result, the auditory nerve cannot be stimulated and sound is not heard or becomes distorted.

The cochlear implant

A cochlear implant is a device which attempts to replace 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 retrain the ear to make sense of the sounds.

A cochlear implant consists of internal and external components. The internal component (the receiver/stimulator and electrode array) is inserted during an operation which lasts approximately 2 hours. The external components allow the internal component to receive sound and are generally fitted approximately 4 weeks after surgery. The external components include:

- A **speech processor**, which encodes the signal into an electrical signal. The speech processor is worn behind the ear.
- 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 ?

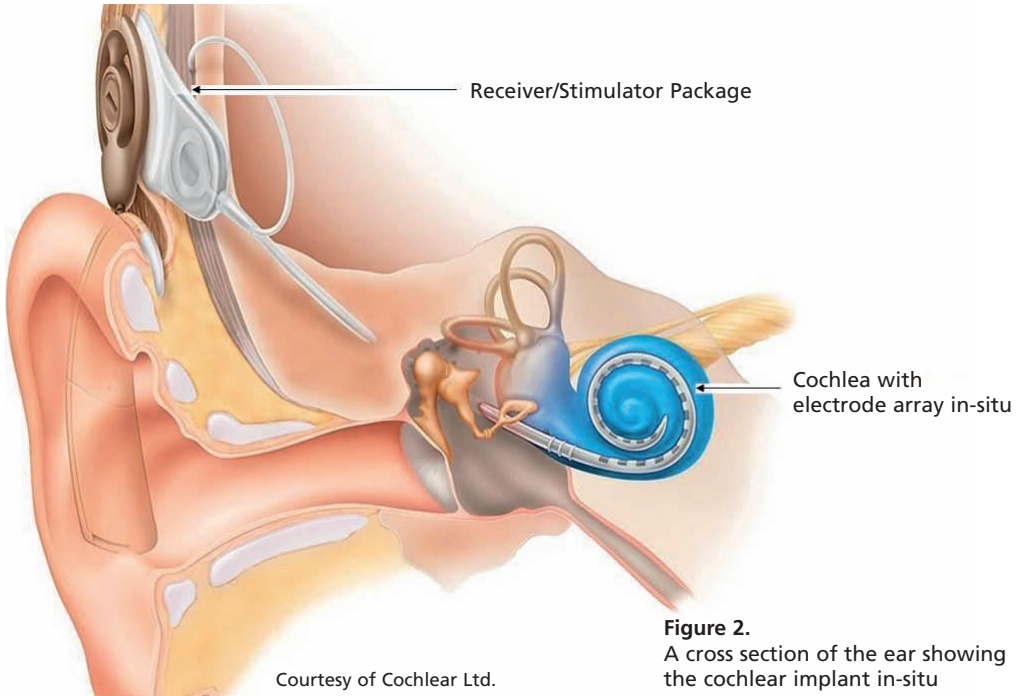


Figure 2.
A cross section of the ear showing the cochlear implant in-situ

Sound is received by the microphone which is worn behind the ear. 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

The implant team manage implant devices from three manufacturers and will recommend which cochlear implant system would be best in each person's case. The three systems currently being managed are:

Figure 3.
Advanced Bionics®



Figure 4.
Cochlear®



Figure 5.
Med-el®



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.



Figure 6.
Position of cochlear implant and speech processor

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 (see www.cmft.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 (it is helpful for the hearing aid record book to be brought to this appointment); tinnitus; 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 stronger hearing aid may be more appropriate. If candidates are already using hearing aids, speech discrimination testing will be performed.

Prior to receiving a cochlear implant, we will do some tests to measure hearing and lip-reading and we will 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). Usually everybody has 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 may be required 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 information session where various aspects of cochlear implantation will be discussed. This will include 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 consultant

Following completion of all the assessments, an appointment will be arranged with an ENT consultant and a member of the Adult Team. If a cochlear implant is recommended and if the decision is made to proceed with implantation, a formal decision will be made at this visit about which ear to implant and the patient will be listed for surgery.

Cochlear implant surgery

In general, cochlear implant surgery is relatively straightforward and lasts approximately two hours. Patients are required to be admitted to the hospital the day before the implant operation. Normally a minimum of one night's stay after the surgery is to be expected, depending on how the patient is feeling following the surgery.

The surgical procedure will be discussed in detail during both the information session and the consultant appointment. There will be an opportunity to discuss this with one of the members of the surgical team. Before being admitted to hospital, an information leaflet about the hospital stay is provided.

What does the surgery involve?

- The hair is shaved around where the incision is to be made
- A shallow bed is drilled out in the bone behind the ear
- A hole is drilled into the cochlea and the electrode array is inserted
- The electrode array and the receiver/stimulator are secured in place
- The wound is stitched up

The head is then tightly bandaged and it will remain like this for most of the hospital stay. This can make it difficult to wear glasses. Some people take the arm off one side of their glasses before they come in to hospital.

After the operation, an X-ray is performed to check the position of the cochlear implant. There will be a bump behind the ear where the receiver package is. A follow-up appointment is arranged approximately one week after surgery at the Manchester Royal Infirmary. The stitches will be removed (unless dissolvable stitches have been used) a week after the surgery, by the Practice Nurse at the local GP surgery or at the Manchester Royal Infirmary. At the time of discharge, details of the medical staff to contact, in the unlikely event that you have problems at home, will be given. This would normally be the ENT Department, Manchester Royal Infirmary during working hours or a member of ENT on-call staff or the Accident and Emergency Department if outside hours.

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 2 hours, as each electrode is measured individually. 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, there is an intensive course of rehabilitation. This includes adjustments to the programme in the speech processor and sessions with a hearing therapist to help with understanding the sound from the cochlear implant.

During the first week, there are normally two sessions arranged at the Implant Centre. After the first week, further sessions at the Implant Centre are arranged for one session a week for the first month. Appointments are then usually arranged at 3 months, 9 months, 21 months and then be arranged every 2 years.

Additional appointments 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. 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 cochlear implant.

Assessments with the cochlear implant

To help us monitor progress with the cochlear implant, we need to do a series of assessments. These assessments are performed at 1 week, 3 months, 9 months, 21 months and annually after the switch on. These assessments include tests to determine a patient's ability to hear sounds and speech, as well as completing some questionnaires.

Contact details

Manchester Adult Cochlear Implant Programme
Ellen Wilkinson Building, Phase 2 (Wing B)
University of Manchester, Oxford Road,
Manchester, M13 9PL

Tel: 0161 275 3364 (voice/minicom)

Fax: 0161 275 3795

E-mail: deborah.mawman@manchester.ac.uk

Further information can be found on our website
www.cmft.nhs.uk/cochlear

Links/Further reading

- Manufacturer Links: www.bionicear-europe.com
www.cochlear.co.uk
www.medel.com
- The British Cochlear Implant Group: www.bcig.org.uk
- The Royal National Institute for Deaf people: www.rnid.org.uk
- AG Bell Association: www.agbell.org

Notes

Translation and Interpretation Service

Do you have difficulty speaking or understanding English?

আপনি কি ইংরেজীতে বুঝতে কিংবা বুঝাতে পেরেছেন ? (BENGALI)

क्या आपको अंग्रेजी बोलने या समझने में कठिनाई है ? (HINDI)

તમે ભાષા કારણે વાતચીત કરવામાં મુશ્કેલી આવે છે ? (GUJARATI)

ਕਿ ਤੁਹਾਨੂੰ ਅੰਗ੍ਰੇਜ਼ੀ ਬੋਲਣ ਜਾਂ ਸਮਝਣ ਵਿਚ ਦਿਕਤ ਹੈ ? (PUNJABI)

Miyey ku adagtahay inaad ku hadasho Ingriisida aad sahamto (SOMALI)

هل لديك مشاكل في فهم اوالتكلم باللغة الانجليزية ؟ (ARABIC)

你有困難講英語或明白英語嗎？ (CANTONESE)

کیا آپ کو انگریزی سمجھنے اور سمجھانے میں دقت پیش آتی ہے؟ (URDU)

☎ 0161 276 6202/6342