

# The Auditory Brainstem Implant

Manchester Royal Infirmary



# What is an auditory brainstem implant (ABI)?

An auditory brainstem implant (ABI) is a device that may allow a person to hear if they have had damage to the cochlear nerves of both ears. Usually these nerves carry an electrical signal to the brain from the cochlea in the inner ear after it has been stimulated by sound.

The ABI consists of an external sound processor and an internal part with an electrode. It is identical to a cochlear implant except that the stimulating electrode array is placed on the surface of the brain in an area called the brainstem, where the cochlear nerve usually attaches (called the cochlear nucleus). Its aim is to deliver some access to sound in certain cases of profound or total deafness.

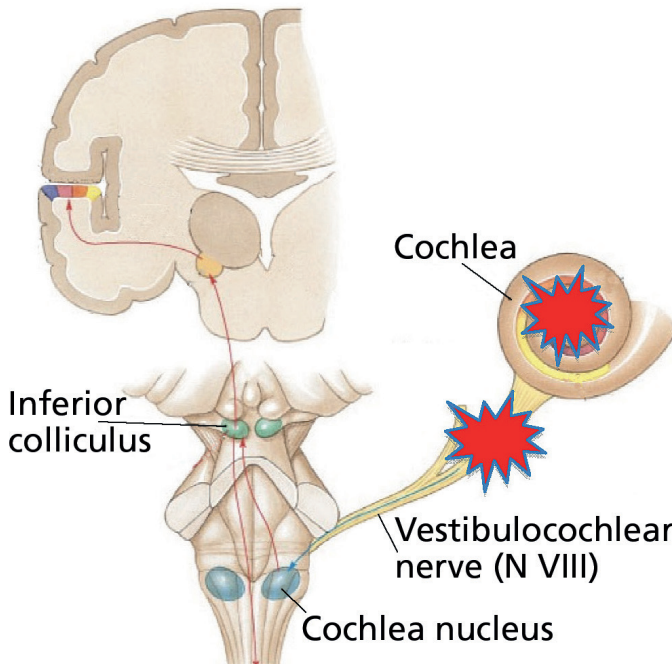
## Indications for an ABI

The hearing system consists of the hearing organ, the cochlea, the hearing nerve that carries sound as electricity to the brain and the hearing pathways in the brain that allow us to interpret sounds. Patients can become profoundly deaf because the cochlea does not work. In this situation the cochlea can be stimulated by a cochlear implant and this restores hearing.

If the cochlea or hearing nerve are very badly damaged or absent, it is not possible to use a cochlear implant.

In this situation it is necessary to stimulate the hearing pathways of the brain directly in order to restore hearing. An ABI can be used to do this.

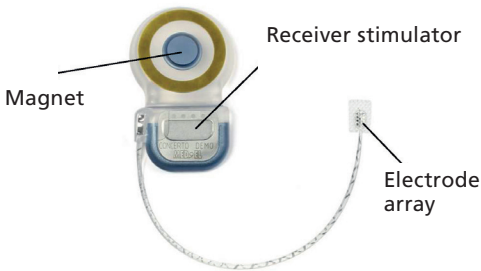
## Central hearing pathways



The commonest reason to need an ABI is loss of the hearing nerves following surgery to treat inner ear tumours in Neurofibromatosis type 2 (NF2). They are also used to restore hearing in children that are born with no hearing nerves or cochleas.

## The ABI device

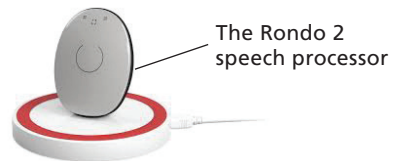
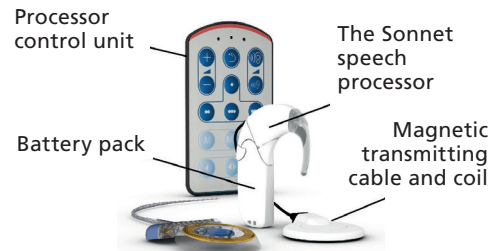
The ABI has both internal and external parts.



The internal components of the ABI consist of a magnetic receiver stimulator that is implanted underneath the skin behind the ear. An electrode array comes off the receiver stimulator and is placed against the central hearing pathways in the brainstem.

## There are two external ABI options:

1. A speech processor and battery pack that looks like a hearing aid and fits behind the ear. The speech processor is attached via a cable to a magnetic transmitting coil that is positioned on the head over the magnetic, internal receiver stimulator package. This is called the SONNET.



2. A speech processor with an integrated, rechargeable battery that attaches magnetically on the side of the head to the internal receiver stimulator. This is called the RONDO 2.

The external parts of the implant can be removed at any time, for example when sleeping or swimming and bathing.

## How does the ABI work?

Sound is picked up by the microphone on the top of the speech processor.

- The speech processor filters and analyses the sounds and codes them into digital signals.
- The coded signals are sent along the cable to the transmitting coil.
- The transmitting coil sends the coded signals to the implant underneath the skin.
- The implant delivers the signals to the electrodes on the brainstem.
- The electrodes stimulate the hearing pathways in the brainstem, producing a stimulation that can be interpreted as sound.

This whole process happens very quickly so that the ABI user will hear sounds as they occur.

## What will I be able to hear with an ABI?

About 6 weeks after the ABI surgery you will have to come back to the hospital for programming and rehabilitation with the implant.

Normally, the process of getting used to listening with the implant may take many weeks or even months. The sound will be very strange at first and possibly not very meaningful. Results from experience to date shows that ABI users may be able to obtain the following benefits:

- Detection of environmental sounds.
- Improvement in the ability to lip-read conversations.
- Ability to follow the rhythm of speech and detect short and long speech sounds.

Some of the limitations of using an ABI have also been described and they are as follows:

- Many noises may sound the same at first and it may be difficult to identify what you hear with the ABI.
- It is normally not possible to understand speech without lip-reading.
- Some patients may not be able to hear anything at all after the ABI.

## Clinical Psychology

If you have NF2 and you are considering having either a cochlear or a brainstem implant you will be offered an appointment with one of the NF2 psychologists. This is a routine part of your care and will be an opportunity to talk about a range of issues including your mood, any anxiety but also think about your hopes and expectations of having an ABI. Any worries or concerns you might have about the ABI surgery can be discussed at this session. We know that some people with NF2 have gained a lot of benefit from using their ABI and others have struggled to use their implant as well as they might have hoped. The appointment you have with our psychologists may help us to identify these problems in advance.

## MRI scans and the ABI

If you have NF2 it is important that you have a head scan at least once every year, and your spine at least every three years.

An MRI scan uses strong magnetic fields in order to take very detailed pictures of your head and spine, and normally we would ask people to remove any metal work before we do the scan. However, if you have a cochlear implant (CI) or an auditory brainstem implant (ABI), this means that the procedure for scans is slightly different, because there is a magnet in the implant inside your head.

We are able to perform the MRI scans safely without removing the internal magnet from your implant by using a bandage on your head to support the implant. In some cases its may not be necessary to bandage the head but this depends on the type of implant you have.

## Head bandaging

In order to perform an MRI scan safely with a magnet in place, we apply some rubber material over the magnet which is kept in place by a pressure bandage. The bandage can feel a little bit tight but should not be too uncomfortable.

## **Pain relief**

Some patients experience some discomfort during scanning. Most patients are able to tolerate this without any need for pain relief. In our experience, some patients have found this more uncomfortable and require injection of local anaesthetic around the implant.

If you have any questions, please ask your NF2 team who will be happy to discuss this with you.

## **How do I get an ABI and how many people have one?**

There are two implant centres that provide ABIs in the UK, Manchester and Cambridge. In Manchester the surgery takes place at Salford Royal Hospital and subsequent rehabilitation with the implant takes place at the Richard Ramsden Centre for Hearing Implants. In Cambridge the surgery and rehabilitation takes place at Addenbrooke's hospital.

## **Website information:**

For more information about the ABI please visit the **Medel website at: [www.medel.com/maestro-components-abi](http://www.medel.com/maestro-components-abi)**

## 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](http://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.

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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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