Cochlear implants for children

PART TWO

EnginEars
The Hearing Implant Program for Kids
EnginEars is a hearing implant program that helps babies, children and teenagers with severe to profound hearing loss. It includes a range of hearing implant options and a complete suite of services that addresses the child’s hearing loss, their language, cognitive, social, emotional and physical development, and their educational needs. Each child is regularly assessed and monitored and their program tailored to their individual needs. Once their education is complete, the young adult can continue to access cochlear implant and associated services for the rest of their life.

The ESIA Hearing Implant Centre and the School of Special Educational Needs: Sensory (SSEN:S) work in partnership to deliver EnginEars. Each institute has a well established service; SSEN:S has provided education services to the hearing impaired community since 1949 and ESIA has specialised in hearing implantation for over ten years. EnginEars has three convenient locations in Subiaco, Padbury and Hamilton Hill.

EnginEars is unique. It provides a consistent and highly supportive environment that our children ‘grow up within’, developing relationships with our staff and familiarity with our co-located facilities from an early age. This consistency ensures they remain settled through early intervention, education and their transition through adolescence into adulthood, giving them every opportunity to develop to their full potential.
This guide

‘Cochlear implants for children’ gives you the information you’ll need when considering a cochlear implant for your child. It explains the differences between hearing aids and cochlear implants, when a cochlear implant can help and discusses what you and your child can expect during the journey ahead.

Further detail on the cochlear implant program can be found in Part Three of the series ‘EnginEars - the hearing implant program for kids.’
Understanding your child’s diagnosis

It is important to understand the type of hearing loss your child has been diagnosed with, as this will affect their treatment options and how their condition can be best managed for their developmental, educational and long term needs. Please refer to our ‘Hearing loss in children’ booklet for detailed information.

Remember, we are with you every step of the way

Over the past 30 years cochlear implantation has progressed from being a medical and engineering challenge to a proven clinical solution that has reconnected thousands of adults and children with hearing disorders to the world of sound. Nevertheless, it can be a daunting prospect considering this step for your baby or a child of any age.

The EnginEars team includes specialists that will support you and your family through the process of decision making. These professionals are available throughout the process of assessment, implant surgery, rehabilitation, speech and language development and education and remain in touch long term to ensure that your child’s needs are met. The EnginEars team includes:

- ear, nose and throat surgeons
- implant audiologists
- educational audiologists
- speech pathologists
- radiologists
- psychologists
- teachers of the deaf
- access and equity coordinators
- in-house interpreters (Auslan)
- parent liaison staff
- in-take coordinators
Hearing aids help many people with hearing loss. However they can’t help everyone.

For many people with severe-to-profound sensorineural hearing loss in both ears, even the most advanced hearing aids can be like listening to a badly tuned radio. While you can certainly hear the broadcast, it’s broken up and hard to understand.

Whilst modern hearing aids can select and amplify specific sounds, for some people speech can still be difficult to understand.

How a hearing aid works

1. The microphone in the hearing aid picks up sound and sends it to the amplifier which processes and amplifies it according to the users programmed settings.
2. The receiver of the hearing aid sends the processed sound down the ear canal, causing the ear drum and middle ear bones to vibrate.
3. Motion transferred to the cochlear fluids is converted into electrical impulses by tiny hair cells inside the cochlear.
4. The impulses are sent to the brain via the acoustic nerve where they are perceived as sound.
What is a cochlear implant?

A cochlear implant (sometimes called a ‘bionic ear’) is a surgically implanted electronic device that provides a sense of sound to someone who has severe to profound deafness. The device consists of a speech processor, worn externally behind the ear, and the implant that is surgically placed under the skin.

A cochlear implant has the following parts:
- A microphone, which picks up sound from the environment
- A speech processor, which selects and arranges sounds picked up by its microphone and sends it via the transmitter to the internal components
- A receiver/stimulator which receives signals from the speech processor and converts them into electric impulses
- An electrode array, which is a group of electrodes that collects the impulses from the receiver/stimulator and sends them to different regions of the auditory nerve.

How a cochlear implant works

Unlike hearing aids, cochlear implants don’t amplify sounds to alleviate hearing loss. Instead they mimic and replace the hearing function of the inner ear through electronic stimulation. Incoming sounds are processed into electrical signals and then transmitted directly to the hearing nerve, bypassing the damaged parts of the inner ear.

1. The external speech processor captures sounds and converts them into digital signals.

2. These signals are sent to the internal implant, via the coil.

3. The implant converts the signals to electrical impulses and sends them to the internal electrodes inside the cochlea.

4. These electrodes stimulate the hearing nerve and the signal is sent to the brain.

Roughly the size of a pea, the cochlear is fully formed at birth and grows no bigger with age.
**Is a cochlear implant right for your child?**

Generally, a cochlear implant is suitable for:

- An infant, child or teenager who has severe to profound hearing loss
- An infant, child or teenager who has worn a hearing aid and is obtaining limited benefit.

The specific criteria changes from time to time, so it is best to talk to your child’s audiologist or have an implant assessment to gauge their suitability.

**One ear or two?**

Cochlear implants on both ears (also called ‘bilateral implants’) may improve hearing in difficult listening situations including classrooms. There are several advantages to using two implants instead of only one. Bilateral implant users can localise sounds much better (tell which direction sound is coming from), and are more able to understand speech in quiet environments and in the presence of noise. Most people find the benefits of one implant so remarkable that they don’t immediately think about having a second one. However, when you receive two implants close together, or even at the same time (simultaneous), the brain adapts quickly.

Bilateral simultaneous implantation is only suitable for some children so talk to your audiologist and surgeon for more information. For some children, it may be possible to achieve binaural benefits using one cochlear implant and one hearing aid.

**Electroacoustic stimulation**

Electroacoustic stimulation (EAS) is the combined use of a hearing aid and a cochlear implant together in the same ear. The hearing aid (acoustically) amplifies low frequency sounds, while the cochlear implant (electrically)
stimulates the middle and high frequencies. The inner ear processes acoustic and electric stimuli simultaneously.

EAS is often suitable for children and teenagers who have a ‘ski-slope’ hearing loss (where the audiogram shows good hearing, or minimal hearing loss, in the low frequencies but considerable loss in the higher frequencies). A thorough assessment of your child’s hearing will be required to determine suitability for this type of implant.
Steps to cochlear implantation

1. Hearing loss identified
2. Hearing aid fitted and progress monitored
3. Audiological assessment
4. Ear, nose and throat assessment
5. Speech and language assessment
6. Educational assessment
7. Psychological assessment
The well being of your child is our first priority. The EnginEars team of specialists conduct a thorough assessment of your child’s hearing and general health before recommending a course of action. Some of our clients are good candidates for a cochlear implant and, for those who are not suitable for this device, we have other hearing implant devices that can be considered.

**Assessments**

If your child is a potential cochlear implant candidate, we will conduct a number of tests to make sure your child is suitable. These include:

- Audiological (hearing) tests that determine your child’s hearing levels with and without hearing aids, their ability to understand speech and the function of the hearing nerve.
- Medical tests and MRI scans to evaluate their general health, the cause of your child’s hearing loss and assess the anatomy of the ear.
- Speech and language assessment to explore the relationship between hearing and communication skills.

Results from all these tests will be reviewed together by the team and a recommendation made. You will then meet with your audiologist and surgeon to discuss this outcome and any further questions you may have.
Surgery
The cochlear implant procedure is considered to be low risk, minor surgery and usually takes between one and three hours. Thousands of cochlear implant surgeries are performed each year. As with any surgery there are some risks; your child’s surgeon will discuss these with you. Our cochlear implant program has excellent relationships with Western Australia’s most respected hospitals including St John of God Hospital, Joondalup Health Campus, Subiaco Private Hospital, Sir Charles Gairdner Hospital and others, making surgery and post-operative care smooth and hassle free.

Activation of the cochlear implant
Two to four weeks after surgery your child’s audiologist will be able to activate the cochlear implant and the sound will be switched on. The audiologist will program the device to suit your child’s unique hearing needs, fine tuning the settings over a number of follow-up sessions. It is important to understand that if your child’s hearing nerve has never been stimulated, it will need time to ‘wake up’ and adjust to the new stimuli. Your child may not be able to hear immediately but as they continue to grow and develop with the added benefit of hearing, their nerves will become able to recognise and respond to sound.
Post operative care
The EnginEars team members work together to develop a program tailor made to your child and family’s needs.
In the twelve months following surgery, their audiologist will need to see your child frequently to update the ‘maps’ within the implant processor. This is where we adjust the speech processor, conduct tests to ensure that the adjustments are correct, determine what sounds your child is hearing and provide information on the proper care and use of the device to ensure your child receives the maximum benefit from it.
During this period, your child will also attend speech and language sessions to help identify and interpret the new sounds he or she is hearing. The aim is to help them develop and understand spoken language through listening. Families actively participate in sessions and learn how to help your child listen and learn through play, daily routines and planned activities. EnginEars provides parents and families with information, training and support so together we can optimise their development and ability to participate in family, school and community life.
You will also be seen by their surgeon to ensure that everything is progressing smoothly.

Ongoing audiological support
After the first year your child’s hearing and speech and language skills will be reviewed on a regular basis according to their hearing and educational needs. As they progress a series of annual reviews is typical, although we are always available to discuss any issues or concerns that may arise.
**Educational support**

With EnginEars, children receive educational support from diagnosis all the way through to the completion of high school. Support starts with a comprehensive early learning program which aims to equip children with the skills to attend their local kindergarten and eventually regular school. Children are provided with individual and group play activities which promote their development. Programs include:

- Parent/carer program (0-3 years)
- Kindergarten programs (4 years)
- Visiting Teacher Support at the child’s local school.

Once your child is school age, they are either supported at dedicated schools for hearing impaired children or in the child’s local school with the Visiting Teacher of the Deaf Service. The role of the Visiting Teacher of the Deaf is to:

- Develop each student’s competence in communication - spoken or sign language and written English
- To provide support to students so that they can access the curriculum and school community
- To provide specialist support for parents /carers, classroom teachers, education assistants, and educational interpreters.

More information is provided in Part Three of this series ‘EnginEars - the hearing implant program for kids.’
What to expect

The vast majority of clients receive significant benefit from their implant, however the early stages are often challenging and can be tiring for both you and your child. A number of factors influence communication outcomes and educational achievement with a cochlear implant. These include:

- What your child brings to the learning environment: e.g. their non-verbal intelligence, age at implant, age of onset of hearing loss, whether hearing loss is progressive, use of residual hearing prior to implantation.
- What the implant contributes: e.g. number of active electrodes, the speech processing strategy.
- What the rehabilitation and education program provides: emphasis on speech and auditory skill development and family involvement.

What does the cochlear implant sound like?

There are many new sounds that your child will experience that they may never have heard or not heard for a long time. Speech sounds through a cochlear implant are very different to speech sounds through natural hearing. It is also different from speech sounds through hearing aids. It is important to remember that, despite hearing much better than they did prior to implantation, your child will still not have normal hearing. There will still be situations, such as where there is background noise, where hearing will be difficult even with a cochlear implant. It is important to recognize this when communicating with your child.
How quickly will you notice improvement?

Everyone is an individual and the way your child hears through their cochlear implant is unique to them. It may take up to twelve months before your child is able to make the most out of their implant. Although we strive for the best possible outcome, it is important that you and your family have realistic expectations about what the implant is likely to do for your child.

• A cochlear implant will improve your child’s access to sound but cannot restore normal hearing.
• The level of benefit obtained through cochlear implantation will vary between children.
• Your child will still need training and appropriate speech and language therapy to make the best use of the new sound.
• You might have to review your child’s education progress and the amount of support required at different times throughout their schooling.
Frequently asked questions

How good is the implant for understanding speech?

Understanding speech is considered to be the most important goal in any form of treatment for hearing loss. How well your child understands speech following implantation is mostly dependent on how long they have had a hearing loss and the type or degree of hearing loss. Your audiologist will discuss your child’s specific situation with you.

If both ears are affected, how do we choose which ear to implant?

Following the assessment process your clinical team will recommend which ear to implant and if bilateral (both sides) implantation should be considered at some point in the future.

Will any activities be limited by a cochlear implant?

Contact sports, such as football, and activities that may result in blows to the head are not advised. Processors also need to be removed, or covered by an approved pouch, before participating in water sports. Check with your audiologist if your child needs to have an MRI scan or a brain scan after implantation as these procedures can damage the device.

Will they be able to keep up with developments in cochlear implant technology?

Today’s implant systems are designed to let your child benefit from future technologies without the need for further surgery. The ESIA Hearing Implant Centre staff will keep you in touch with new product releases (e.g. software updates and speech processor enhancements) from the manufacturer of your cochlear implant.
What if the implant stops working?
With any technical device there is a risk of it failing. This occurs very rarely (less than 1% of the time) but if it did fail, a new device would need to be implanted.

Are cochlear implants covered by health insurance?
The initial cost of the implant device is fully covered by a number of health insurers. Replacement or technology upgrades to speech processors are available through Australian Hearing until your child is age 26 years, after which replacement processors need to be accounted for via insurance or other financial means. Please contact your health fund for more specific information.

Can you rely on their cochlear implant for life?
The ESIA Hearing Implant Centre uses implant technology from the world’s most reliable device manufacturers because it is something that will be with our clients for the rest of their life. We are constantly assessing and reviewing reliability data from manufacturers to ensure we are using the best devices.

What if a cochlear implant is not suitable for my child’s hearing loss?
The team at the ESIA Hearing Implant Centre are specialists in complex hearing solutions. If a cochlear implant is not a suitable option there are other devices we can consider including bone conduction implants, middle ear implants, electro-acoustic systems or assistive listening devices. Our expert clinicians will guide you through these options to give your child every opportunity to reach their hearing potential.
If you have any further questions, or if your child has been diagnosed with a hearing loss and you are interested in learning more about EnginEars, our Parent Liaison Officer is available to meet with you or discuss further questions over the phone. Contact the ESIA Hearing Implant Centre on (08) 6380 4944 or email kids@hearingimplantcentre.org.au.
“Making the decision for our girls to receive cochlear implants has been one we will never regret. Their hearing and language is truly amazing.”

Damien and Jo, parents of Sophie, 10 years and Hailey, 6 years.
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