



The child and the cochlear implant



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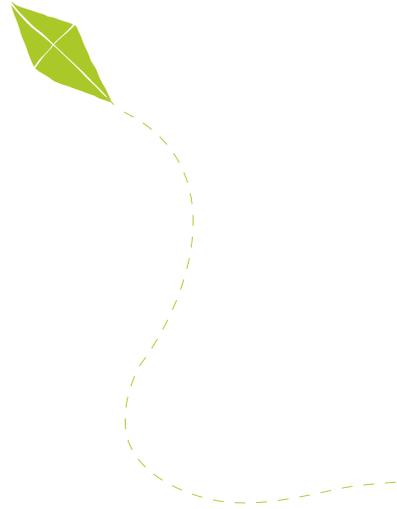


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The child and the cochlear implant

The rehabilitation of severe or profound hearing losses has changed dramatically during the last fifteen years. Cochlear implants have given almost all children the chance of hearing sounds, speech, singing and laughter. Over 95 per cent of children diagnosed with a hearing defect are born to parents who hear normally and who communicate with speech. Thanks to cochlear implants, most of these children are able to learn the language of emotion, i.e. the spoken language of their family. In Finland, the first implant for a prelingually deaf child was inserted in 1997. After that, cochlear implants have quickly become an established practice in the treatment of children.

This brochure is aimed at the parents who consider the cochlear implant treatment for their child, as well as at the child's grandparents, circle of acquaintances and grown-ups in daycare and school, i.e. at the whole network of people surrounding the child. It is an information package that contains the key facts about cochlear implant treatment and rehabilitation.



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What is a cochlear implant?

Cochlear implant is an electronic hearing aid system that consists of a surgically implanted internal component and an external component. The internal component consists of a receiver, a magnet and an electrode array. The external component consists of a sound processor, a cord connecting to a transmitting coil and a transmitting coil. The coil is magnetically attached to the skin behind the ear. The sound processor can be attached behind the ear lobe or e.g. to the clothes. The implant is powered by the sound processor's rechargeable battery or disposable batteries.



Photo: Cochlear



Photo: MED-EL

- Speech processor's **A** transmitting coil **B** is kept behind the ear
- The implant **C** is inserted under the skin, behind the ear

- 1 The speech processor converts sounds into a digital signal.
- 2 The speech processor sends digitized signals to the implant via the transmitting coil.
- 3 The implant converts digitized signals to electrical signals and sends them to the electrode array in the cochlea.
- 4 The implant's electrodes stimulate the inner ear's auditory nerve that transfers the signals to the brain where they are interpreted as sounds.

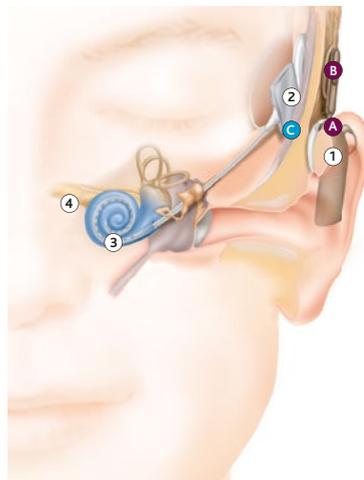


Photo: Cochlear

Will the cochlear implant help my child?

Cochlear implant treatment can be considered when a child is diagnosed with a severe or profound hearing defect and when standard hearing aids can not improve hearing to such a degree that the child could learn spoken language.

The aim of using a cochlear implant is to enable the hearing of surrounding sounds and speech and that way to enable the learning of spoken language. Completely normal hearing can not be restored but most children with a cochlear implant benefit significantly from it while learning spoken language. Still, exact prognoses are not possible. Rehabilitation also depends on the child's individual language learning capacity, possible other defects or special difficulties and structural differences in the ear or the auditory system. Other important factors are how much the implant is being used and how motivated the parents, the daycare and the school are during the rehabilitation.

Cochlear implant treatment is also a potential choice when a child, a young person or an adult who has already learned spoken language loses their hearing or when the hearing of a person who before has managed with a standard hearing aid deteriorates significantly.

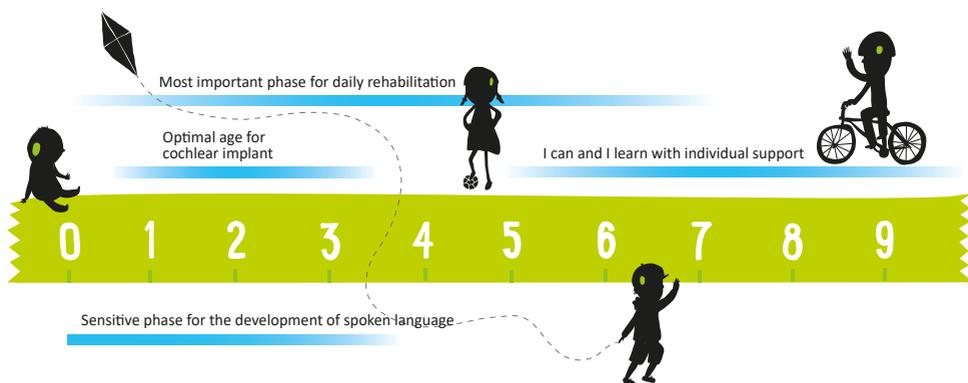
Use it or lose it!

A sound travels through the outer ear to the middle ear and then the inner ear, where sensory cells convey it to the auditory nerve. The auditory nerve then passes the information to the auditory cortex where it will be processed. Consequently, in order to hear, recognize sounds and understand speech a person needs a working brain as well a functioning ear. It is in the brain where the stimuli will be perceived (Wow, a sound!), distinguished (That was not a dog!), recognized (A meowing cat!) and remembered. It could, in fact, be said that we do not hear with our ears but with our brain.



As to the learning of spoken language, it is vital to start rehabilitation early enough because of the plasticity of a small child's brain. The brain is like an open window – ready to receive information.

This plasticity is at its strongest during the first three or three and a half years. Therefore, it is vital to start the aural and linguistic rehabilitation early enough. If the auditory cortex will not be activated by auditory stimuli, the window gradually closes and other senses or functions take over the area that was reserved for hearing. It is the law of the jungle: use it or lose it.



These time frames present the current knowledge but are only indicative.

Before the operation

When a child's hearing loss has been diagnosed, hearing centre's target team together with the parents will start considering the suitable rehabilitation choices for the child. Technical rehabilitation usually starts with hearing aids. If they prove to be useful, the child will start to hear surrounding sounds and speech. If the child will be able to learn speech and language, the hearing aids will suffice, but if the results in the learning of spoken language are not good enough, cochlear implant treatment can be the next choice.

Hearing centre's team will discuss with parents the implant, its functions, restrictions and possibilities as well as the intensive rehabilitation period. If the decision is made to start the treatment, the next phase is a series of examinations e.g. about the structure of the child's ear. Next in line is the decision to operate and to start protective vaccinations.

Cochlear implant operation

The operation day is an exciting day for the family and the near ones. The anaesthesia and the waking up from it as well as the very specialized operation can be a nerve-racking and emotional experience for the child's parents. The operating doctors and the whole medical staff, though, are seasoned experts, so you can be sure that the child is in good hands. During the operation and recovery it might be wise to try and think about other, nicer things. Do something pleasant: call a friend, go for a jog or feast on the biggest cinnamon bun you can find. Remember that there are parents who have gone through the same thing and probably the same feelings. You can e.g. contact the Satakieli Programme's peer support group and find a trained person who listens and understands you.



"They told me to go and have a cup of coffee. How can I have coffee when I am so nervous that it's hard to breathe?"

In Finland all university hospitals (HUS/HYKS, Tays, TYKS, KYS, OYS) perform cochlear implant operations. In the operation, the surgical team implants the internal components of the implant: the electrode array in the inner ear's cochlea and the receiver under the scalp. The length of the operation depends on the chosen surgical technique. Its decisive factors are the child's age, their ear structure and whether one or two implants will be inserted. The operation usually takes 3-5 hours but it is not a sign of failure if it takes longer - sometimes extra time is needed in order to place all the components in best possible positions.

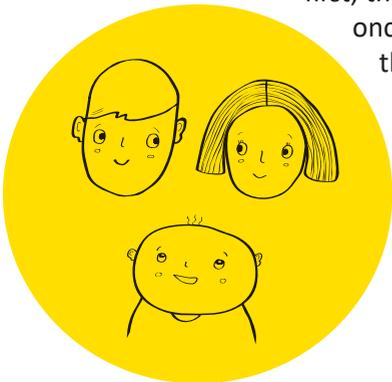
Finnish hospitals use two cochlear implant manufacturers: Cochlear and MED-EL. Both are used in all hospitals and both rate equally successfully in rehabilitation results. The implant brand and model will be chosen by the operating doctor.

The child usually spends one or more nights in the hospital after the operation. Hearing centre's competent staff will instruct the family on incision care and other relevant matters. It is good to remember that the operated ear does not yet have hearing even though the internal components are now in place.

Activating and adjusting

After the operation the wound and the tissues will need to heal for a couple of weeks. The outer parts (sound processor and transmitting coil) will be put into operation and activated within four weeks. The first hearing experiences can be disconcerting, even frightening. Some children, though, do not seem to react at all in the beginning. Quite likely, the child will constantly want to remove the device, especially if he/she is not accustomed to having a hearing aid behind the ear. The child will need time to get accustomed to the new device and the gradually opening world of sounds, and the support and encouragement from the people in their life is now vital.

Hearing centre's audiologist will use a computer to adjust and personalise the cochlear implant while keeping a close eye on the child's reactions. At first, there will be lots of visits to the centre but later just once a year will be enough. It is of utmost importance that the parents monitor the child's auditory perceptions in everyday life and share their observations with the hospital staff. As the child grows, also his/her own perceptions matter. The child can be encouraged to tell about the sounds or disruptions by drawing or making sounds.



Rehabilitation of hearing and language

At first, the surrounding sounds heard due to the implant are new and strange to the child because he/she hasn't heard them before. Even if there have been former hearing experiences, the sounds can sound different than before the implant. The child may notice that there are sounds but does not distinguish or recognise the surrounding sounds. He/she doesn't know that the train whistles, the microwave oven beeps or the dog barks. Each sound has to be learned one by one.



"In the beginning, our speech therapist used to ring the doorbell three times. The first time my child didn't hear it and I had to "wake him up". The second time we listened together and the third time we ran to the door together. It was the doorbell!"

The rehabilitation of hearing and speech requires patience and lots of repetition. Even the hearing child learns speech and language gradually, at first by just listening, then by making sounds and babbling. Little by little, there will be single words and then the combining of several ones. It takes about two years, maybe even more, for a child with normal hearing to learn whole sentences. Studies show that the schedule of learning speech is quite similar for the children who have received a cochlear implant in the early age. Still, it is important to remember that all children develop differently and at their own pace. That applies to the children who have normal hearing, too: there are big differences in the development of speech and language.



"Once I counted that if Pekka uses the implant for four hours a day it will make 1,460 hours a year. But if he uses it for ten hours a day, it will make 3,650 hours. With the four-hour use it would take two and a half years!"

The implant teams of hearing centres usually recommend speech therapy as an additional support for the learning of hearing, language and speech. Because repetition is the key, it is important to make use of everyday situations. The speech therapist or the rehabilitating speech therapist of the hearing centre will instruct parents and other people in the immediate circle on how to support the child's aural and linguistic development at home and in daycare.



"The speech therapist said that a child with normal hearing assimilates a new word after ten repetitions but a child with a hearing defect learns it after 200 repetitions. Because background noise and echoes disturb the hearing of words, repetition is essential in the remembering of a word shape."

The functioning network in support of the child's rehabilitation

When a child is diagnosed with a hearing defect, the family deals with many different occupational groups. As many as twenty experts may manage the child's and the family's affairs in the hospital, social insurance office, municipality and daycare/school. All these people are important and have their own role, and all of these experts do their best to help your family. Rehabilitation supervisor, one of the closest supporters of the family, is an important link between the family, the daycare/school and the hospital. Your local rehabilitation supervisor is the person who knows the challenges of everyday home life as well as hospital policies. The supervisor can evaluate the listening conditions of the home and school/daycare and instruct on possible alterations, as well as give advice to the daycare and school staff about hearing, relevant technologies and possible technical aids (e.g. FM Systems).



It is easy to recognise a well functioning network: when you tug at one corner of the net, the whole net swings.

Grown-up, help the child learn!

The adult who spends time with the child has an important role in training the child's listening skills and spoken language learning.

It is the adult's job to

-  make sure that the implant works and is on use during waking hours.
-  check that the listening conditions are satisfactory. Should the tv, the window or the utility room's door be shut so that there would be less noise?
-  give the child time to listen and understand speech – a child needs more time than adults for that
-  articulate clearly – normal speaking voice is enough, though
-  motivate the child to listen to different sounds: domestic appliances, musical instruments, nature's sounds, Ling's speech sounds (/m, u, i, a, s, sh/) etc.
-  be pleased about the child's listening skills
-  encourage the child to produce sounds and speech, to sing and chirp
-  provide the child with suitable linguistic experiences: sound making games, songs, name-giving, naming of feelings, telling news and conversating all improve conversation skills and language
-  bring language into the child's surroundings by naming, describing, telling and conversating

Still, the most important tool for the adult is the attitude. A positive, encouraging and reassuring attitude and the willingness to help the child is the best starting point for the rehabilitation. The child can not wait – the time for the learning of spoken language is now.



"When I grow up, I want to learn how to speak Russian. And it would be nice to learn other languages, too. For example French or sign language."

Things to consider when using the implant

Remember that the cochlear implant is a technical device. It should be protected against dirt, dents, water and disappearing – just like your phone. Common sense always helps but it is good to bear in mind certain things:



Water is wet! The outer parts of the implant are not waterproof so they should be either removed before shower or swimming or be protected with a specially designed bag. The implants are designed to withstand moisture and sweat but they should be carefully wiped dry according to the manufacturer's instructions. When the child goes to the sauna the outer parts should be removed.



Electricity in the air! Static electricity can cause disruptive sounds, distorted hearing or unpleasant sensations for the implant user. It is possible, although extremely rare, that static causes a fault in the settings or a voltage spike that breaks down parts of the implant. Take that into account in everyday life and observe the child's reactions in situations that often involve static electricity: the plastic slide, trampoline, static clothes or the touching of a car. It is a good practise to touch the child's shoulder before touching the implant. That way the static electricity discharges to the shoulder, not the implant.



Yay, we're flying! Airport security detectors (and detection security gates in stores) form electromagnetic fields that may distort the heard sound or cause disruptive sounds. When necessary, switch off the sound processor momentarily. Implant materials can also trigger an alarm in metal detectors. Always carry with you the child's implant card. During airplane takeoffs and landings all electronic devices must be switched off.



Hurrah for hobbies! A child or a young person with a cochlear implant can choose whichever hobby he/she wants. Only rough contact sports like boxing are not recommended because of the risk of getting blows to the head.

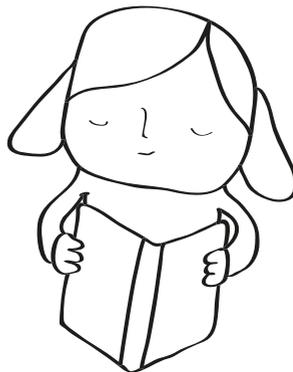
Power in peer support!

Worrying about the hearing, development and future of one's child, as well as about one's own strength as a parent, are feelings that all parents of children with hearing defects share. Then again, it is also important to share the joy one feels about those child's achievements that the parents of children with normal hearing take for granted. Sharing the ups and downs with trained peer support people is a comfortable outlet. Through their own experiences they have the ability and the motivation to support others who are in the same situation. Peer support can be useful to children, young people or grandparents, too. It builds a sense of community and offers a chance of exchanging experiences and getting encouragement. Expertise through experience is the strength of the Satakieli Programme's peer support group. Contact details can be found in **www.satakielihjelma.fi**. There are also parents' groups in social media where one can have discussions and share one's feelings.



Further information

www.satakieliohjelma.fi
www.kuuloavain.fi
www.lapci.fi
www.cochlear.fi
www.medel.com
www.advancedbionics.com





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