

THE COCHLEAR IMPLANTATION, STEP BY STEP

DIGISONIC® SP COCHLEAR IMPLANT SYSTEMS



neurelec
SEE • FEEL • HEAR • LIVE



NEURELEC, 25 years *of Experience* IN COCHLEAR IMPLANTATION

Based in France at the heart of the Sophia-Antipolis Technology Park, Neurelec is known worldwide for the integrity of its products and for its commitment to patients.

Much more than just a cochlear implant manufacturer, Neurelec is committed to using the very best of its research and development and its service to enable those suffering from profound-to-severe perception deaf to

communicate, exchange, live and go beyond simply hearing. If you are reading this brochure you are no doubt considering a cochlear implant, whether for yourself, your child or someone close to you. The decision to

undergo cochlear implantation, for you or your child, is a serious one; we hope to be able to provide the information you need to make the best decision.



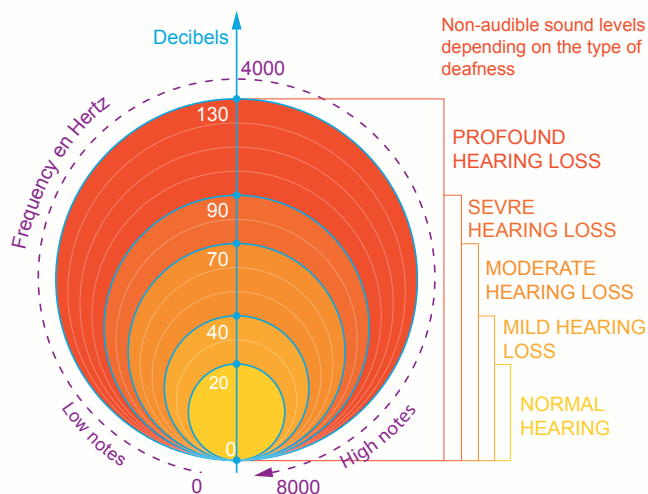
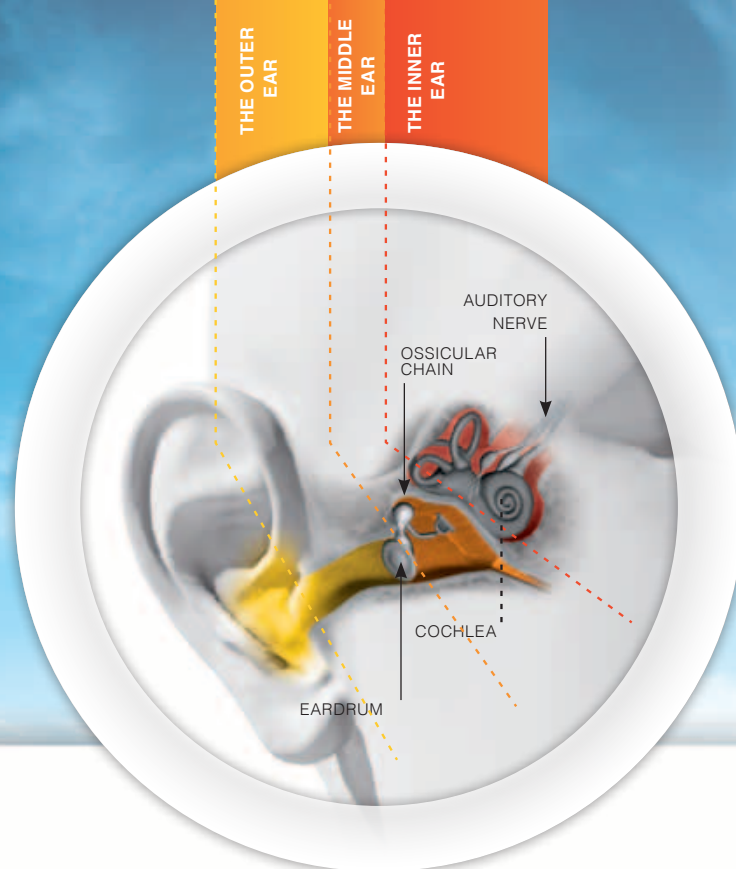
NORMAL FUNCTIONING OF HEARING

THE OUTER EAR. The auricle of the outer ear captures sound energy and directs it down the auditory canal toward the middle ear.

THE MIDDLE EAR. The tympanic membrane and bones of the middle ear vibrate in response to sound and act as a lever system, forcing those vibrations into the inner ear.

THE INNER EAR. The fluids in the inner ear pick up these vibrations and cause special hair cells-which are embedded in a membrane floating in the fluids-to move. It is the movement of these hair cells that ultimately generates the electrical signals in your auditory nerve. The auditory nerve transmits this electrical sound information to your brain.

DEAFNESS. When any part of the hearing path is damaged, sound information cannot be carried to the brain properly resulting in hearing loss. Of all the parts of the hearing path, the hair cells are the most susceptible to damage. Often when hair cells are damaged they leave an intact auditory nerve--but one without a good signal to carry.



COCHLEAR IMPLANTS AND HEARING AIDS - WHAT ARE THE DIFFERENCES?

- Hearing aids (auditory prostheses) are designed for patients having a mild to medium degree of deafness. Cochlear implants are designed for patients having severe to total bilateral deafness without any comprehension even with their hearing aids.
- Hearing aids capture the sound, amplify it and send it through the normal auditory channel. Cochlear implants capture the sound, process it, and electrically stimulate the auditory nerve by bypassing the damaged areas.
- In cases of severe to total deafness, hearing aids are not powerful enough.
- If the cochlea is damaged, amplifying the sound is useless. The signal must be sent directly to the auditory nerve.



THE COCHLEAR IMPLANT, FROM *Sound* TO *Stimulation*

To recover hearing, it is not sufficient to increase the sound volume. One must capture the sound, treat it to make it audible and comfortable and send it directly to your auditory nerve without passing through the normal hearing route.

The behind-the-ear processor **1** captures the sound, digitizes it, and sends it via an antenna to the **2** implant receiver, which is situated under the skin at the level of the temporal bone.

The implant **3** transforms the digital information into an

electronic **4** signal which will be sent in the electrode-array inserted in the cochlea.

The electrodes corresponding to the captured signal frequency stimulate the auditory **5** nerve, which transmits the sound to the brain **6**.

93% OF THE PATIENTS WHO HAVE RECEIVED AN IMPLANT DECLARE THAT THE COCHLEAR IMPLANT HAS IMPROVED THEIR *Quality of Life**

When classical hearing aids do not give sufficient benefit, the cochlear implant allows persons afflicted with severe to total deafness to improve their quality of life by giving them (or returning to them) better comprehension of the spoken word both in quiet and in noisy surroundings, and in helping them confront the challenges of professional or school life.

Patients with an implant declare that they feel safer (for example, in being able to be alert

in emergency cases). They are also more independent and resume a social life.

To be able to use the telephone, to make an appointment with the doctor, to watch television, to participate during a meal, to hear an alarm, to share secrets, to benefit from the laughter of children, to enjoy the rustling of leaves, and much more. So many sounds that no longer have to be guessed at.

*Data from Neurelec 2009



HEAR THE SOUNDS OF EVERYDAY LIFE



SHARE SECRETS



“ Throughout my adolescence I held season tickets to the theatre, but I had to give it up when my hearing got too bad - for over thirty years! I went back the year after having my implant and was delighted to understand everything that was said. With the implant I can once again enjoy culture.” Mrs. P.



WATCH TELEVISION



USE THE TELEPHONE



THIS IS NOT MAGIC BUT *High-Technology.*

What can you expect from a cochlear implant?

For the past thirty years research in the field of cochlear implants has continued to advance so that one day natural hearing may be restored to the profoundly deaf and severely hard of hearing. When cochlear implants were first introduced they merely enabled sounds to be perceived; then, bit by bit, they improved patients' understanding of words spoken in quiet environments. Today, the progress made

has led to an improvement in the sound quality of the signal, the understanding of speech in noisy environments, and the ability to listen to music.

Of course, cochlear implants do not claim to restore perfect and natural hearing; instead they provide patients with the keys to living and adapting to a world made of sounds, music, and words.

Although many patients achieve results which allow them to live and enjoy the same

opportunities as people with normal hearing, the results of two individual patients may differ considerably and are unique in each case. The results of the implantation depend on the technology used, physiological factors such as the cause of the deafness, the duration of hearing loss and the efforts of the individual and those around them to educate or re-educate the brain to receive sound signals. Implant do not work by magic but require patience and perseverance.

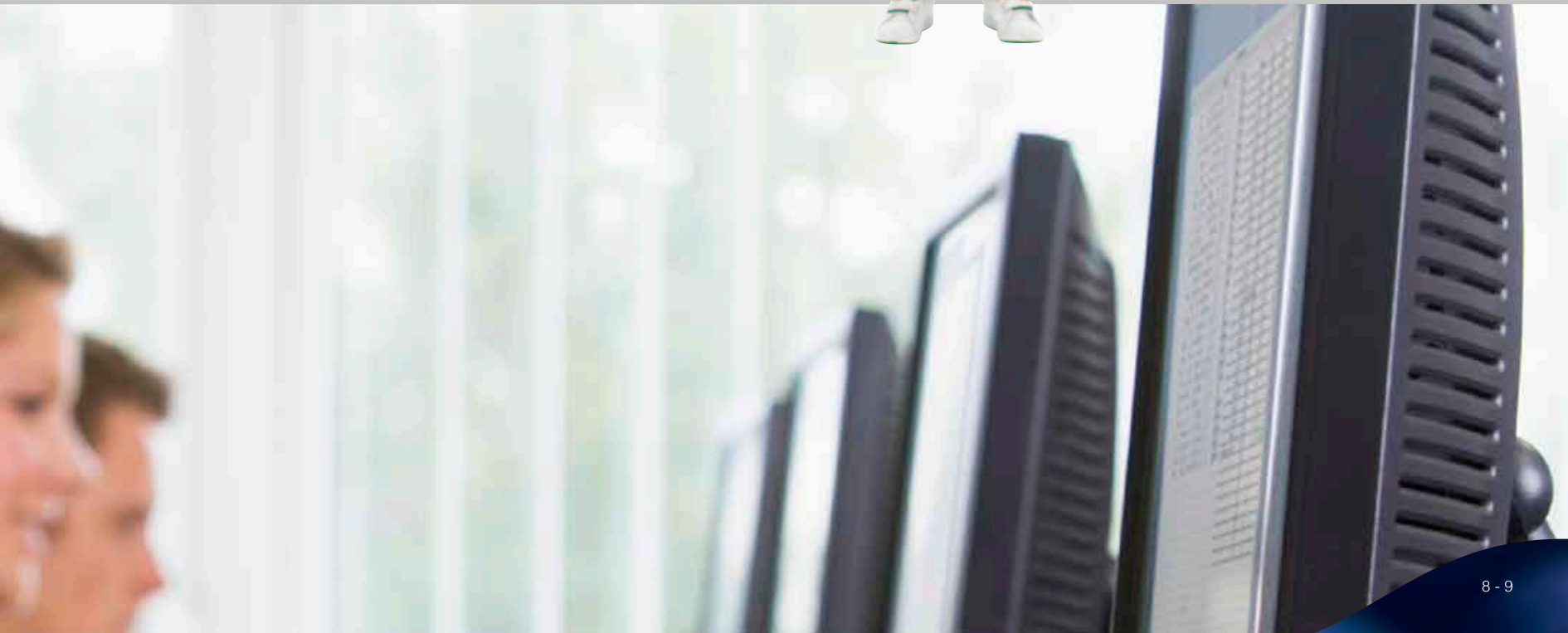


Is there an ideal age to receive a cochlear implant?

Patients may be implanted from the age of six months. Since hearing enables the development of speech, it is strongly recommended that children be implanted as early as possible in order to give them every possible chance to attend a normal school, be independent and enjoy a fulfilling professional life.



“ Anthony was implanted at the age of two and a half. Without the implant he would not be able to say his name. His progress today is fantastic; he improves a little bit more each and every day. ” Mr P., Anthony's father



TO BE A CANDIDATE FOR IMPLANTATION

Cochlear implantation is not indicated for all cases of deafness. Cochlear implants are designed for patients, both adults and children, afflicted by bilateral severe to profound perceptive hearing loss, who have unsatisfactory results of understanding speech while wearing hearing aids.

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IN CASE OF DOUBT, HERE ARE THE QUESTIONS THAT YOU SHOULD ASK YOURSELF:

- 1 Do you feel isolated, despite your hearing aids?
- 2 Are you or your child obliged to read lips?
- 3 Are you exhausted after a meal among friends or with your family because communication demands so much concentrated effort on your part?
Is your child exhausted after a day at school?
- 4 Do you or your child no longer react when someone addresses you, even if you are wearing hearing aids?

If you have answered **yes** to one of these questions, it is recommended that you consult your family doctor or ENT specialist (ear, nose, and throat physician), who will give you advice.



1 YOU FEEL ISOLATED

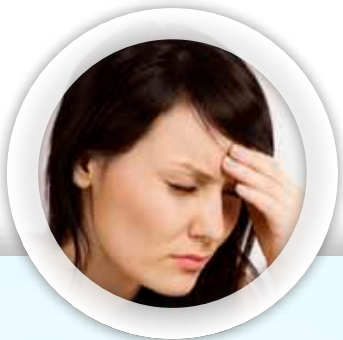


2 YOU READ LIPS

FINANCING AND MAINTENANCE COSTS

Financing surgery and hospitalization, as well as the reimbursement of maintenance expenses for the processor and consumable supplies depends on the health system of each country. Inquire at your local implantation center or at an implant user's association in order to receive the correct information regarding the financing of a cochlear implant in your country.

We also highly recommend that you take out insurance for the behind-the-ear processor.



3 YOU FEEL TIRED



4 YOU ARE UNABLE TO HEAR DESPITE YOUR HEARING AIDS

CONTRAINDICATIONS TO COCHLEAR IMPLANTATION

Although there is no longer any doubt as to the success of cochlear implant systems in improving the quality of life of the hearing impaired, in some cases implantation may not be advisable:

1 You must suffer from bilateral severe-to-profound perceptive deafness. If your hearing is «too good» or the results obtained with hearing aids sufficient for understanding speech, a cochlear implant is not necessary.

2 If the auditory nerve is severely damaged or non-existent, if the cochlea is not the principal cause of deafness, or if hearing loss has lasted too long, the results of a cochlear implant may be unsatisfactory.

3 You must be fit enough to recover from the operation and then follow a program of fine settings and of hearing re-education in order for the

implantation to be successful

4 Finally, you must have realistic expectations of your "post-implant life" and understand that cochlear implants are merely a substitute for a normal auditory system and will not restore natural hearing, despite the efforts of technology to achieve something that increasingly approach natural sound quality. It is important to realize that rehabilitation (or habilitation) often requires a great deal of time and personal effort to optimize your hearing potential. In the same fashion, children who are candidates for implantation must be sufficiently supported by their family if they are to acquire speech..



1 THE APPOINTMENT

2 THE EVALUATIONS



THE ROUTE TO IMPLANTATION

The road to the comprehension of the spoken word and/or the acquisition of language may sometimes take several months (or years in the case of young children). Here are the major stages:

1 Appointment at a cochlear implant center

The first step is to report to a center having a cochlear implant unit. Your family physician or your otorhinolaryngologist (ENT specialist) will be able to give you advice. In this unit, you will be able to meet the implantation team:

- A surgeon
- An otorhinolaryngologist (ENT physician)
- An audiologist or an audioprosthodontist responsible for audiometric evaluations and settings.
- A speech therapist who will take care of evaluating language abilities, follow-up, and reeducation
- A psychologist to evaluate abilities and the psychological outlook to receive a cochlear implant.



3 THE OPERATION



2 The pre-operative assessments

A series of tests and of assessments is necessary for the implant team to evaluate whether a cochlear implant system is indicated in your case or in the case of your child:

- An audiology assessment to evaluate the details of your hearing abilities and the functioning of your auditory nerve
- Various medical examinations necessary to verify your general state of health before the operation
- A scan and/or an MRI to visualize in detail the state of your inner ear
- A psychological assessment
- A speech assessment to measure your language aptitudes and your ability at lip reading.

3 The intervention

As in every surgery, certain risks exist, principally connected to general anesthesia. However, today the operation is a routine operation that generally does not last longer than 2 to 3 hours and in which the risks are minimal.

As a hygienic measure, the hair will be shaved off in the area behind the ear at the point where the implant will take place.

After the application of general anesthesia, the surgeon will proceed to make a small incision behind the ear in order to slide the cochlear implant under the skin. In the case of the Neurelec Digisonic®SP implant, it is not

necessary to drill the bone to fix the receiver, meaning a less invasive technique that reduces the length of the operation. An opening is made in the cochlea to insert the bundle of electrodes, specially designed for natural insertion.

The ENT surgeon verifies the proper functioning of the implant, and then closes the incision. The operation is then completed.



4 THE RECOVERY

“ The first strong moment, an unforgettable moment, is once the outer part is activated. You go from lack of understanding to the world of sound. This is an improvement for each activity that had become impossible, such as communicating with other people. Previously, I avoided certain people because I couldn't understand. Today, I can once again go out toward others. ” Mrs. P

4 The Recovery

When you wake up, it is normal to feel some pain. Leaving the hospital after the surgery can often take place after two days.

The phase of scar healing lasts about 3 to 5 weeks. Only a small scar behind the ear will remain, which will be quickly hidden by the hair. During this time, most patients generally resume normal activity.

During this period, it is still not possible to hear.



5 START-UP

5 Adjustments and the discovery of the first sounds

After this period of recovery (about one month), you or your child will be able to receive the sound processor. Before beginning to hear the first sounds, it is necessary that your audiologist adapt the processor to your needs or to those of your child.

Thanks to a fittings software, the audiologist will then create "a sound chart" by determining for each electrode the threshold at which you have the most comfortable hearing possible.

Each experience is unique, and it takes some time for the brain to adapt to this sort of unnatural stimulation.

6 THE SETTINGS



6 Settings and reeducation

The improvement of performance after a cochlear implantation depends on part on efforts made by the patient and those around him or her to regularly follow the post-operative follow-up. It is thus highly recommended that you carefully follow the speech therapy reeducation program and that you show up for all the fittings sessions for your sound processor. At first, the fittings sessions are frequent, but then they become further apart when the setting becomes optimal. An annual visit is then necessary.



PUSHING THE LIMITS

High-level athlete and musician - performance as a leitmotiv.

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Thierry K. was affected by neuro-sarcoidosis and successively lost his vision and his hearing. In spite of his blindness and deafness, he now performs in alpine ski events in the French Cup guided by the voice of a guide. But that is not all! He plays 5 musical instruments, does carpentry and masonry work and similar tasks. He visualizes the world around him thanks to his Digisonic®SP implant system.



Find his exclusive testimonial at www.neurelec.com

MAXIMIZE YOUR PERFORMANCE

Speech therapy re-education is sometimes neglected by patients. However, it is indispensable for obtaining maximum benefit from a cochlear implant and being able to understand words.

Re-education is an extremely important post-operative stage. Its duration may vary from one patient to the next depending on the type of deafness and the individual's age and motivation, for example. For an adult suffering from post-lingual deafness, re-education lasts an average of six months to one year, although some patients must undergo speech therapy sessions for even longer. Essentially, re-education can be difficult for patients who have had a relatively long period of auditory deprivation.

For a child with pre-lingual deafness and who has received an implant at a young age, we use the term habilitation rather than re-education. In this case language acquisition and comprehension can take several years, depending on the age at which the implantation took place. For children with post-lingual deafness (for example, as a result of meningitis), encouraging results are often quickly achieved through cochlear implantation, provided that surgery is performed relatively soon after loss of hearing.

Teenagers or adults who have suffered from pre-lingual deafness for many years will feel more at ease and have a better understanding of speech after a period of re-education which may last several years. However, they will still need to supplement their implant system with lip reading..

Expand your vision

Experience more

Hear

Live life to its fullest

Life AFTER IMPLANTATION

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Hearing is to explore the world from a different angle. To hear is to enlarge one's view of the world, to see and to discover things that you would not have seen if you had not heard them: a bird in the tree, an airplane in the sky, a vehicle at the street corner, etc.

To hear is to recover intimacy and independence. To hear is to sense safety in a world that delivers its secrets to us. To hear is to be able to share, to participate, to experience and to live life to its fullest.



TO KNOW WHAT IS GOING ON...

To pick up the telephone and to get news from your close relatives; to watch television and to be informed of the latest events; to go to the movies, to a concert, or to the theater to enjoy yourself and to cultivate your mind; to participate at a meeting to learn... To move from the world of silence to the world of sounds is to enlarge your vision of the world by having access to information. Accessories compatible with the behind the ear processor are available to improve patient performance.

TO BE TOGETHER

A family dinner, a restaurant among friends, an evening out with your pals, a professional meeting... You no longer have to stand in the corner! After a cochlear implant, the majority*of patients declare that they have more confidence in themselves and that they rediscover a social life.

*Neurelec study 2009

TO ENGAGE IN SPORTS

The fact that one wears a cochlear implant does not prevent participation in sports, but as with any electronic device, it is necessary to protect the implant and the sound processor from shocks and from humidity. For more information, consult our Internet site www.neurelec.com or ask for advice at your implantation center.

“ Our assistant was implanted with Neurelec when she was 20 years old. She leads a completely normal professional life in our department - she attends meetings; she telephone suppliers, she conducts presentations, and so on.

” Ms. M



TRIPS

Flavors, aromas, materials, sounds... Traveling is an invitation to awaken your senses to the fact that your cochlear implant will not prevent you from living, whether the weather is hot and damp or cold and rainy. It is sufficient that you follow the recommendations for maintenance from your manufacturer such as putting the processor overnight in a drying box supplied with your processor.

For airplane trips, there's no problem! As with any electronic device, it is recommended that you turn off the processor on takeoff and landing. It is possible that the safety alarm will sound, but it will then suffice to show your owner card.



MEDICAL EXAMINATIONS AND TREATMENTS

Most medical examinations are possible on the condition that you remove the external part. The only restrictions that may exist are those that involve examinations in the area surrounding the implant and that thus may disturb the functioning (for example, radiation therapy) and that involve magnetic resonance imaging (MRI).

The Neurelec Digisonic® SP is compatible with MRI exams of 1.5 Tesla without having to remove the magnet and allows a good quality image without demagnetizing the implant.

It is however strongly advised to inquire of the the cochlear implant manufacturer or its implantation center before any operation, even if there are few medical restrictions due to wearing a Digisonic® SP cochlear implant.



NATURE HAS CREATED US WITH *two Ears*

We see with two eyes, why not hear with two ears?

More and more patients who have already had an implant are candidates for a bilateral implantation in order to optimize their performance. A second implant improves the ability to locate a sound, to understand words in a noisy environment, and allows the perception of sounds stereophonically. Patients with bilateral hearing thus feel safer when they know where the sound is coming from, and are more integrated socially and get less tired since communication demands less effort.

Does an implant for both ears have to be done at the same time?

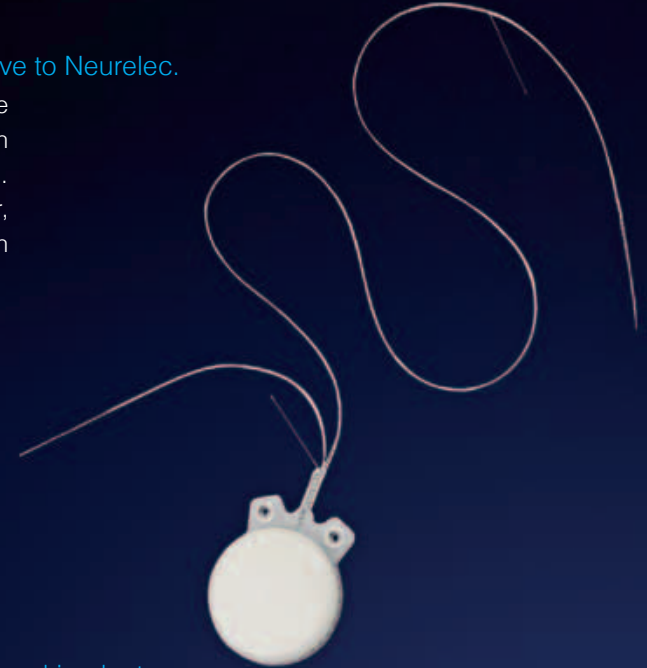
It is possible to implant both sides during the same operation, but the surgery will then be longer. However, the majority of bilateral implants are done at two separate times, with the second implant taking place several months or even years after the first one. Bilateral implantation is an option to be discussed with your implantation center.



ARE YOU FAMILIAR WITH *Binaural* HEARING ?

1 implant to stimulate 2 cochleas, exclusive to Neurelec.

The Neurelec Digisonic®SP Binaural is the only implant on the market that stimulates both cochleas, thanks to its two electrode-arrays... A single implant, a single sound processor, a single operation... For an adult, it is an excellent alternative to bilateral implantation!



The advantages of the Digisonic®SP Binaural implant

- A less invasive system - a single surgery
- Better stereophonic sound and better spatial location - the signal is captured by the microphone of the sound processor and the contralateral microphone and then sent on to the two cochleas
- Hearing that is closer to natural hearing - in the framework of a bilateral implantation, the two signals sent by each behind the ear processor are not synchronized, the Digisonic®SP Binaural implant system synchronizes the information before stimulating the auditory nerve in the same way that the brain does, thus limiting the difference in perception.
- A more economical system for patients and health systems - with a single surgery, a single implant, a single sound processor, and a contralateral microphone, the Digisonic®SP implant is cost-effective and easier to maintain.



THEY HAVE CROSSED THE
headland

He *can hear* HIS
GRANDCHILDREN

She *can contact* HER
FRIENDS

“ The implant has improved many things - I can follow a conversation, be on my own at home and hear the doorbell, but above all, I have 3 grandchildren and it is a great joy to me to be able to communicate with them.” M.R

“ The telephone changes your life. My friends say to me, “When I feel like telling you something now, I know that I can call you up and tell you.” Ms. L.



HE *lives* THE NORMAL LIFE
OF A CHILD

THEY *discover* THAT LIFE
IS PUNCTUATED BY VERY
SMALL EMOTIONAL MOMENTS THAT
MAKE IT SO BEAUTIFUL.

“ Morgan was operated on at age 2 years and 3 months.

He is now 9 years old, goes to school, takes karate, rides a horse, plays basketball, skis, goes roller skating... It is an operation which can be frightening but it is worth it. He no longer pulls off his processor, but when it suits him, he takes out his antenna so he cannot hear us any more! He plays with it! ” Mrs. S.

“ The implant has brought me back to life. I used to feel distant, drained. It warmed my heart when I found I could hear again... I even cried when I heard the noise of my coffee maker.. ” Mrs. M

“ If I hadn't done anything, I would have become completely deaf. Now I know that I will be able to hear for the rest of my life... When I heard my little dog Ninou whining, it did something to me...I had never heard my dog whine before. ” Mrs. B



SEPTEMBER 22 1976
First cochlear implant performed at Saint Antoine Hospital (France)

1977
Filing of the Bertin patent for a cochlear implant system



1977
MXM Company setting-up

1988
MXM buys the right to use the Bertin patent



1992
Digisonic® DX10 and Digisonic® BW



1995
Digisonic® ABI



1999
Digisonic® Convex



2001
Digisonic® BTE



2004
Digisonic® SP and other associated implants



2004
Digi SP



2005
Digi SP'K



2006
Digisonic® SP Binaural



2009
Digi SP'K

2010
Saphyr®

1992
MXM launches the world's smallest device: the Digisonic®, the first entirely digital implant.

2006
MXM created its subsidiary Neurelec



FROM MXM TO NEURELEC, *Hearing* IS OUR PASSION

Neurelec is a young and fast-growing company belonging to the MXM group, specialists in neurostimulation research and cochlear implantation for nearly twenty-five years..

Every day, more and more ENT surgeons, medical teams, and patients rely on us to move forward, together, towards the future of hearing.

Because improving the quality of patients' lives is our top priority, we regularly develop new, high-performing solutions that are compatible with older products, easy to use and radically innovative:

- The SAPHYR® behind-the-ear device is light and discrete with its butterfly shape.
- The CRYSTALIS signal processing, which today offers the purest and most natural sound quality.
- The Digisonic®SP, the most compact implant on the market for the least invasive surgery.
- The Digi SP'K sound processor with remote battery, ideal for the ears of very young children or for deformed auricles.
- The Digisonic®SP Binaural, the only implant capable of giving binaural hearing with a single implant and a single sound processor.



OUR PRODUCTS, OUR *Solutions*

Since we think that technology has to be more than high-performance, our cochlear implant systems (implants and sound processors) are easy to use. By listening to patients and professionals, Neurelec proposes unique solutions adapted to individual expectations.



SAPHYR®

SAPHYR® is the latest generation of a Neurelec behind the ear processor with integrated Telecoil and 4 independent programs. It is associated with CRYSTALIS signal processing, and assures a purer sound and offers very good results at very low sound intensity.



DIGI SP'K

The Digi SP'k is the smallest micro-behind the ear processor with remote battery on the market. Especially designed for the small ears of young children or for deformed auricles, it assures perfect comfort. With its integrated Telecoil, its 4 independent programs, and a battery life of about 6 days, this micro-contour has everything that a big device has!



Digisonic® SP

The Digisonic® SP implant is the easiest to place and the least invasive*. Thanks to its convex form and the monobloc ceramics structure covered in a silicon envelope, the Digisonic® SP is reliable and very resistant to shocks. Based on the Digisonic® SP, other implants exist that are adapted to different pathologies or to cochlear malformations.



DIGISONIC® SP BINAURAL

The Digisonic® SP Binaural implant is exclusive to Neurelec, and brings true binaural hearing with a single surgery, a single implant, a single sound processor, and a contralateral microphone. This is an ideal alternative to bilateral implantation in an adult.

[For more information, refer to our product brochures.](#)

Choosing THE RIGHT COCHLEAR IMPLANT

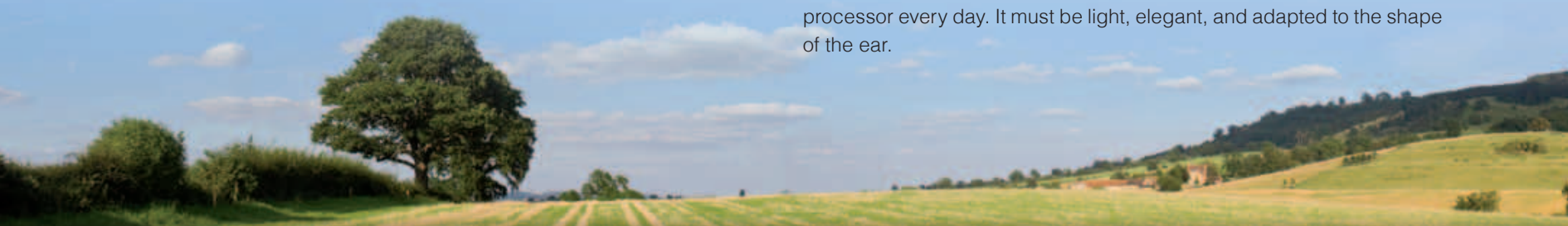
Choosing a cochlear implant brand means choosing a partner for life. It is therefore very important to evaluate the implant and the associated processor in addition to the quality of service and follow-up care provided by the manufacturer.

1 The implant

- The impact resistance and reliability of the implant are essential.
- Surgery should be the least invasive possible - the method of fixation, the size of the implant, and the surgery itself are therefore important factors to be taken into account.
- The compatibility of the implant with technological advances in sound and signal processing. It is why Neurelec behind-the-ear processors are developed to be compatible even with older-generation implants.

2 The behind the ear processor

- The performance, flexibility, and compatibility of the outer part with FM systems and other accessories (integration of the Telecoil, direct auxiliary socket, possibility of adjusting different settings according to the sound environment).
- Ease of use - the programs have to be easy to change with one click, and the processor has to be simple to maintain (changing batteries, battery life, etc.).
- Comfort and aesthetics are important for someone wearing a sound processor every day. It must be light, elegant, and adapted to the shape of the ear.



3 The manufacturer

The cochlear implant manufacturer becomes part of patients' lives and should pride itself on offering upgradeable solutions compatible with all product generations so that all patients have access to the best technology. Service quality and a rapid response to the needs of patients and professionals are also extremely important.

WHERE CAN ONE FIND INFORMATION?

We hope this brochure will have answered your questions..


If you require further information there is no doubt an implant users' association near you which may provide assistance. You may also refer to our website www.neurelec.com or request our other brochures.

SEE MORE – EXPERIENCE IN A BETTER WAY – *Hear* – LIVE LIFE
TO ITS FULLEST

Every day our team of engineers and researchers exert themselves in working with our medical teams around the entire world in order to give back to patients the means of realizing their ambitions - to continue their studies, to have a professional life, to be independent, to have access to culture and information, to feel safe, to participate in dinners or in meetings... For Neurelec: [hearing is more than just hear. Live it!](#)



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