Children's Hearing Aid Clinic

Enclosed are a number of information sheets. Each has a separate heading. Don't feel that you have to read them all at one go.

These sheets are not intended to be the answer to every question that you might have but to give you a background to what can be quite a complex problem.

Contents:

Sponsored by the Carlisle and Eden Deaf Children's Society.

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1) What have the tests found?

The tests that we have carried out so far on your child tell us the he or she has a hearing loss. We believe that this is a permanent hearing loss. In other words there is not an operation or course of medicines that we can give to make the hearing better. It doesn't have to mean that your child can't hear anything at all. Approximately half of children born with hearing loss have what is known as a mild loss. It certainly doesn't mean that we cannot help them.

How common is it for a child to be born with hearing loss?

Approximately 1 in every 1000 children is born with a hearing loss.

Why has it happened?

Sometimes we think we know the reason. For instance hearing loss is more likely to occur if there are other young family members with deafness, if the pregnancy or the birth has been particularly difficult or if the baby is born with abnormalities of the face or head. There are a number of other less common "risk factors" but even so, in about half of all cases there will not be an obvious reason for the hearing loss. Many of the children with an "unexplained" hearing loss will have a genetic cause for their deafness and it is worth checking whether there are any family members with early deafness that you didn't know about.

How bad is it?

This is the most important question. At first it may be difficult for us to obtain anything other than a general idea of the severity of the hearing loss. As a child gets older and can co-operate with more "grown up" hearing tests we can get more information about how well they hear different pitches (frequencies) of noise and what type of hearing loss it is (conductive or sensori-neural). For more detail about the normal hearing mechanism see page 3 **"**How hearing works**"**. For more detail about the tests and what information we can get from them see page 8 "About the tests – what do they tell us?"

2) How hearing works

The ear takes in sound, converts it into an electrical signals and transmits it to the brain. The ear is divided into 3 parts: the **external**, the **middle** and the **inner** ear.

The **external ear** consists of the part that is attached to the side of the head (the **pinna**) and the ear-hole (**external auditory canal**). The pinna acts like a funnel to "catch" sounds and channel them into the external auditory canal. The external ear is separated from the middle ear by the ear drum (**tympanic membrane**).

The **middle ear** is like a cave in the temporal bone (part of the skull). It is normally filled with air and connected to the top part of the throat at the back of the nose by a tunnel (the **eustachian tube**). The middle ear contains three bones (**ossicles**) joined together in a chain. These are the hammer (**malleus**), the anvil (**incus**) and the stirrup (**stapes**). Sound waves make the ear drum vibrate and then the ossicles vibrate because the drum is attached to the malleus.

The stapes is plugged into the **inner ear** (**cochlea**). Vibration of the stapes produces vibration in the fluids within the cochlea. This in turn makes small receptors in the inner ear (known as **hair cells**) vibrate. Hair cells are able to turn these vibrations into electrical energy to power the nerve of hearing. The fibres of the auditory nerve then carry information about the sound to the brain.

It is an abnormality of these hair cells that is responsible for the hearing loss in most cases of childhood deafness.

On the next 2 pages are a number of diagrams and photos of the ear.

Diagram of the ear:

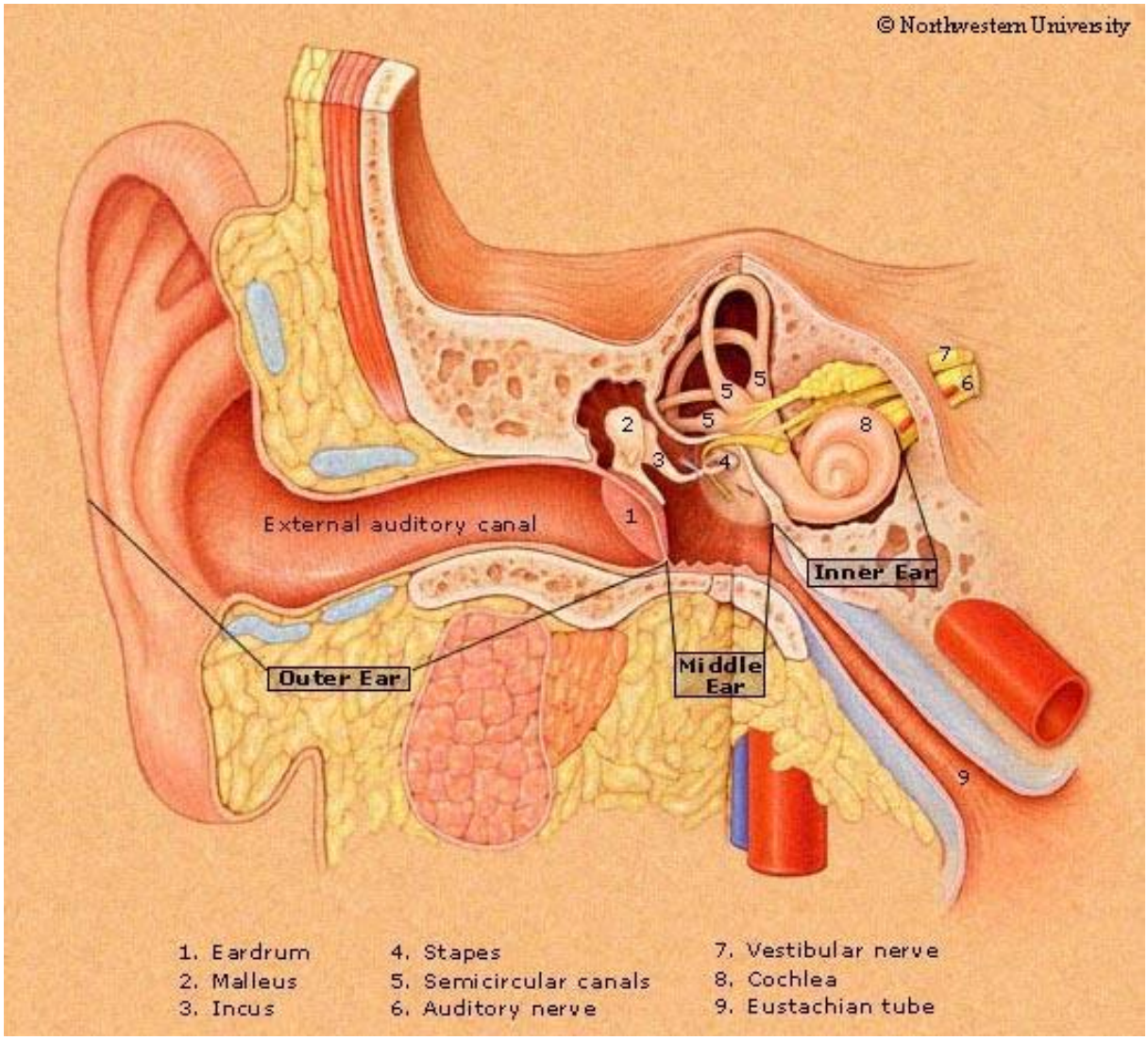

Fig 1: Diagram to show the outer, middle and external ear

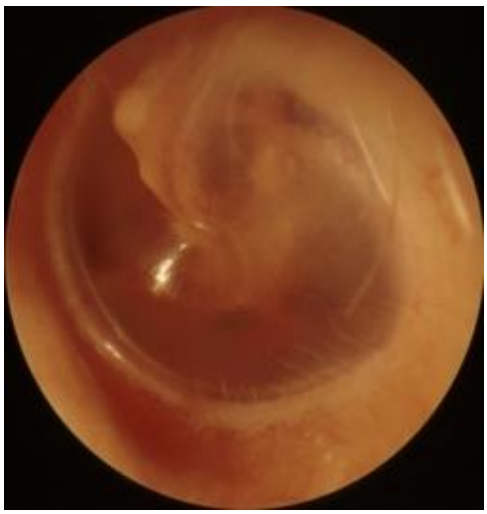

Fig 2: Photo of a normal ear drum

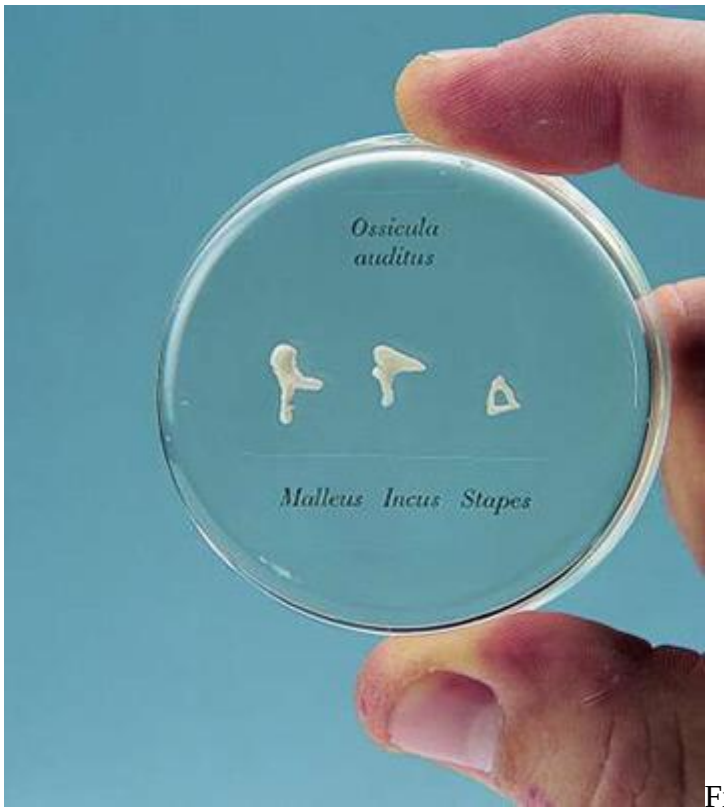

Figure 3: The ossicles (hearing bones)

Fig 4. Ear drum (pink) and ossicles connected to the inner ear (blue)

Fig 5: Transmission of sound waves (red) to the inner ear

3) What stops the hearing working?

There are two types of hearing loss; **Conductive** and **sensori-neural.** Each type of deafness may be present at birth (**congenital hearing loss**) or develop later in life (**acquired deafness**).

A **conductive hearing loss** (CHL) occurs when sound is prevented from reaching the inner ear. CHL comes from the outer or middle ear. You can give yourself a CHL by sticking your fingers in your ears. Wax build up will also cause it. The commonest childhood hearing loss is a conductive loss from **glue ear** (see page 16), which is an accumulation of fluid in the middle ear. This is an acquired hearing loss. Any child may get glue ear, particularly with colds. It is nearly always temporary but sometimes an operation (grommet insertion) is needed. Rarely, children can be born with abnormalities of the outer ear or the ossicles, which impair the hearing, causing a congenital conducive deafness. Congenital conductive hearing loss is rare and whilst surgery may help, there is a risk of further damaging the hearing. It is usually best helped with hearing aids.

A **sensorineural hearing loss** (SNHL) comes from the inner ear. The cochlea is the sensory organ of hearing (hence **sensori**-neural) and is most often affected. Less commonly the hearing (auditory) nerve is at fault ("neural" things are to do with nerves, hence sensori-**neural**). Sensory and neural deafness are hard to tell apart, so we group them both together as sensori-neural hearing loss. Significant SNHL is treated with hearing aids. In the vast majority of cases of SNHL, there is no possibility of an operation to help the hearing. Rare exceptions occur in children with too severe a hearing loss for a hearing aid. These children may be considered for a cochlear implant (see page 17). This is a major operation with a lengthy selection procedure. All children with cochlear implants wear an ear piece that looks like a hearing aid connected to a box that processes the sounds. Childhood SNHL is most often present from birth but may be acquired at any age e.g. after meningitis.

4) How bad is the hearing loss?

Hearing loss may affect one ear or both. It may affect all pitches (frequencies) of sound or just certain frequencies (see "Understanding audiograms" on page 19). The commonest form of SNHL in childhood is a high frequency hearing loss but any or all frequencies may be affected.

Generally, high frequency sounds are more important for understanding speech (see page 21, "Audiograms, speech and hearing loss") They give us the consonant sounds like "ss", "sh", "th", "t" & "p" and they tend to give a word its sense. Poor high frequency hearing makes speech difficult to understand and impairs speech development.

Low frequency sounds tend to be vowel sounds like "ah", "oh" and so on. Poor hearing for low frequency sounds is less of a handicap than high frequency deafness. Children with this form of hearing loss may not have any major problems developing speech and may not be diagnosed until they reach school age as a result.

The hearing loss can also vary in severity. Hearing loss is measured in **decibels (dB).** A" perfect" hearing level would be at 0 dB (Zero dB does not mean no sound at all, it is just very quiet sound).

Normal hearing levels run between 0 & 20 dB (the ability to "hear a pin drop"). A whisper may be as loud as 35-45dB and conversational speech up to 60dB. A shout may be as loud as 80-90dB (see Fig 18). It is important to remember that although ordinary speech may be ***up to*** 60dB a lot of the sense comes from the beginnings and end of the words which will be quieter and may be lost in background noise, so a child with e.g. a 40dB loss may have difficulty understanding speech and difficulty mimicking sounds when his or her turn comes to start learning to talk (see Fig 20).

The people helping your child will measure how well he or she hears different frequencies of sound on an **audiogram** (see page 19).

5) About the tests – what do they tell us?

A young baby has a “startle reflex”, throwing back his arms and legs in response to very loud noise. Babies can’t show whether they hear quiet sound below the age of 6-8 months because they cannot turn the head towards a noise. There are ways to test hearing in the first weeks of life **(otoacoustic emissions** and **evoked response audiometry**) All new-born children are now tested in the first weeks of life.

Evoked Otoacoustic emissions (**OAEs**) are very very quiet sounds that are actually produced by the inner ear in response to external sound by nearly all normal hearing people. They are sometimes called “cochlear echoes”. People with significant conductive or cochlear hearing loss do not produce OAEs. OAE tests are quick (2-3 minutes) and cause no discomfort to the baby. About 5 out of every 100 babies will fail to produce an OAE. This doesn’t always mean that a baby has a hearing loss but tells us that further testing is needed. OAE does not give any real information about the severity or the type of loss.

Fig 6: OAE testing on a young baby

Evoked Response Audiometry (**ERA**). This measures brain waves produced in response to sound. It takes at least 45 minutes and requires the baby to be still. It can often be done during a nap but is sometimes carried out under a general anaesthetic. With quieter sounds, the size of the brain waves reduces. The waves disappear at the threshold of hearing. This test is very accurate but only gives information about high frequency hearing.

Performance audiometry. As a child gets older they will usually be able to co-operate with more sophisticated hearing tests. We can then build up a picture of the type of hearing loss at all frequencies. This process is sometimes very slow and may take many return visits for assessment before we have a full picture of the type and severity of hearing loss.

The simplest of these tests check for the baby's head turning toward sounds (distraction tests). If the child is rewarded by seeing a toy that lights up when he/she turns to sound, then the response is "reinforced" and more accurate results obtained. This is visually reinforced audiometry (VRA)

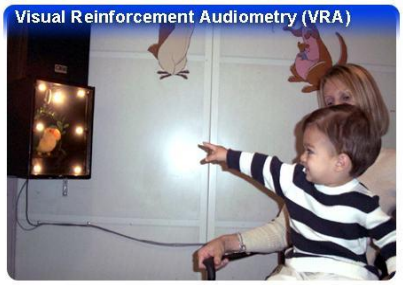

Fig 7. VRA

As the child gets older, we can ask for more co-operation; first with "games" designed to test the hearing e.g. putting toy bricks in a box whenever a sound is heard and finally "grown up" tests using headphones.

Fig 8. Play testing with ear inserts.

Fig 9. Testing with ear phones.

6) Could the tests be wrong?

There is no such thing as a fool-proof test. As you know, babies have a hearing check in the first few weeks of life. At such an early age, you may well not have noticed any hearing problems at all. Your baby may "startle" to louder noises (for instance a door shutting). These things do not exclude a hearing loss.

We know that the earlier a hearing problem is found, the better the child will do; from an educational point of view, in mixing with other children and later as adults, leading a normal life. The OAE & ERA tests are recognized world-wide as being the best way of finding a hearing loss at the earliest possible age.

Even so, sometimes there are children who pass their first hearing checks who later turn out to have a hearing problem. This is because some children are born with normal hearing but develop a hearing problem in the first few months or years of life. There are a variety of reasons for this, which include infections such as meningitis and progressive damage to the hearing in children who have been very poorly at birth in an incubator in a neonatal intensive care unit (NICU).

. NICU

What if my child is deaf in one ear only?

Many children with "unilateral" (one-side only) deafness do not need extra help or hearing aids. However this is not always the case and the doctors and audiology staff will always be very happy to discuss the pros and cons of hearing aids for unilateral deafness with you.

7) About the hearing aids

Hearing aids are amazing little gadgets. They may look ordinary but they have silicon chip technology. Many look similar but there is a wide variety of hearing aids available. We will try our very best to make certain that your child has the best aids for his or her type of hearing loss. At present we are unable to afford "hidden" hearing aids and in fact these tiny hearing aids may not be powerful enough for some children. We use "behind the ear" (BTE) aids. BTE aids range from low to high-powered and can be adjusted to boost certain pitches of noise and not others e.g. for a high frequency deafness.

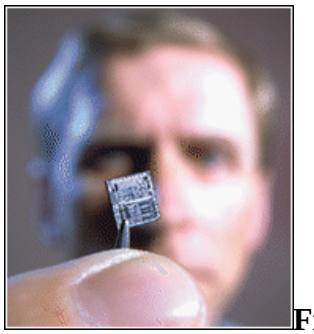

Fig 10. Digital hearing aid computer chip

The hearing aid is your child's friend, it will help to bring the experience of more normal sound to your child. The more your child wears it the more they hear.

All hearing aids nowadays are "digital" aids which are computer programmed to suit each child's hearing loss. Initially the only information we have about the hearing is likely to be from ERA (see p 8). Over time we will get a more complete picture of the hearing loss at all frequencies and the hearing aid programming may need to be changed. In most cases a child with hearing loss will be given two hearing aids as we know that children benefit from the "stereo" effect of what is called binaural aiding (aids fitted to both ears).

Remember that a child with normal hearing has to listen to speech for a year before he or she can say a word with meaning. A hearing aid will help your child's speech but it may be slower to develop than that of a normally hearing child.

About the hearing aids (continued)

The audiologist will take impressions from your child's ears. This is not a painful procedure but young children may find it uncomfortable. The ear is gently filled with a substance that feels like "Blu-tac". After a couple of minutes it sets like soft rubber. The impression is sent to the factory to be made into a plastic mould. As your child grows the mould will cease to fit. A poorly fitting hearing aid mould will cause the aid to whistle. Hearing aids only work well if the mould is a snug fit and each child will have many, many moulds taken as he or she grows.

Your audiologist will show you how to check the hearing aid, and your specialist teacher will advise you too. You will be given a care pack to help you with this.

Fig 11. Behind the ear (BTE) hearing aid

8) What happens next?

Once a hearing loss is confirmed the ENT doctor looking after your child will discuss with you what has been found, whether any further tests are needed and try to answer any questions you may have.

In up to 50% of cases the cause for the hearing loss will not be found but these days we will always look to see if a cause can be identified. Approximately half of children with a permanent hearing loss will have a genetic basis for the loss and half will have a hearing loss as a result of some factor that has interfered with the normal development and function of the ears. Examples will include problems during pregnancy, difficult delivery or illness shortly after birth.

There are many reasons for trying to find the cause of the hearing loss. It is natural and right for parents and carers to simply want to know *why* this has happened. It may provide important information to help provide the best treatment for the hearing loss. Some children with hearing loss may also be found to have associated medical problems that need to be treated in addition to the hearing loss. If the hearing loss is inherited, then advice about the chances of any further children also having a hearing problem can be given.

In order to determine whether a cause can be identified, the various possible tests will be discussed with you. You will be offered the opportunity to see other specialists for further investigations and checks for your child. These would normally include hearing tests for other members of the family, a visit to a paediatrician and an eye specialist (as some children may have eye as well as ear problems). You will also be offered the opportunity to be seen by a clinical genetics doctor. Tests to try to find a cause may include blood and urine tests as well as specialist examination. In some cases Xray tests and scans can be helpful, and some children may have a heart tracing undertaken (an electro-cardiogram, or ECG). Not all of these tests will be required for every child, depending on severity of hearing loss, family history of hearing problems and other medical conditions. You may feel that you do not wish to have all of these investigations undertaken, or that you might wish to delay them for a time. The test results and what they mean for you and your child will be shared with you at the earliest opportunity.

The hearing aid will be provided in a few weeks. You will be shown how to fit and remove it, how the controls work and how to change the batteries. Hearing aids are not like glasses; the hearing is not instantly "perfect". Children have to get used to the new sounds that they are hearing and this takes time. Some children will keep taking the aids out in the early stages and you will need to be patient until they get used to wearing them.

Your GP will be informed and you will also be contacted by one of the local education authority home visitors (see page 14). These are teachers who are specialists in helping children with hearing problems. One of them will be assigned to your child. He or she will contact you to arrange to visit you at home and help you plan for your child's education. Whenever possible we would plan for a child to attend a normal school with assistance as required. The level of support will be determined by the amount of hearing loss and any other problems your child may have. The specialist teacher will help you with all of this well before your child is ready for school.

Speech may be slow to develop but with appropriate aiding and support from the specialist teacher most children develop good speech and language. It is possible that children with the most severe losses may need to communicate by sign language. If so, the specialist teacher will arrange for you and your child to be taught this by a representative of the Cumbria Deaf Association (see page 23, "Useful contact numbers").

The Children's Hearing Clinic (CHAC) is held regularly to assess hearing with and without the aids, check the aids are working well and to discuss any problems in an informal setting. The audiology department in Carlisle is open 5 days a week (3 in West Cumbria) for repairs, new mould and tubing etc.

9) The specialist teaching service

A follow-up home visiting service is provided by specialist teachers who are trained to work with families of babies and children who are fitted with hearing aids.

They will be able to spend time with you to discuss any points regarding your child's hearing loss that you are not clear about. The specialist teacher will arrange regular home visits to suit your family.

The role of the teacher for the deaf:

To listen and provide advice and support to the family including contacts with other families in the same position - if they wish.

To provide information so that families can make informed decisions for their child.

To help the family to make sure that the best use is made of the hearing aids and to provide information for the audiologists about how well the child is doing to ensure that the hearing aids are the best ones for each child.

To monitor the development of your child's listening, communication skills and spoken language. To advise parents as to how they can encourage this development.

To provide information about future Nursery education and schooling and to help make the transition from home to school as smooth as possible.

To liase between the family and the other agencies involved to make sure that everybody understands one another so that we can work as a team in the best interests of the child

10) What can you do as parents?

Encourage your child to wear hearing aids. Try to show you are pleased when they do - just as if they were wearing a smart pair of new shoes. Talk normally to your child in a lively way, with lots of facial expression, accompanied by smiles and hand gestures. Don't raise your voice or speak more slowly than usual.

Make sure that you have his/her attention when you are talking and that they can see your face.

Children learn through play. The more time that you can spend with him or her, the better. Take an interest in the things that they enjoy.

In the early days of wearing hearing aids, children remove them. Don't be discouraged by this; replace the aids as much as possible. It can be helpful to use teddy or dolly as "pretend" hearing aid wearers.

Check the hearing aids daily. Contact the audiology department or teacher straight away if you think there is something wrong with one or both of them. All children tend to lose or damage their aids from time to time. Don't hesitate to contact the audiology department if the aids need to be replaced. They will treat this as a matter of urgency.

Make sure that your child has regular appointments for hearing tests and to check the hearing aids etc. If you can't attend an appointment, let the audiology department know- they'll be happy to send you another. Sometimes if it's difficult to get to audiology, things like new moulds can be sent through the post.

Above all remember that there are lots of people around to help, from other parents of deaf children through to the staff at the hospital - don't feel that you are on your own and don't be afraid to ask about things that trouble you.

What about other children?

If you have a child affected by deafness, there is increased risk of a new brother or sister being affected. If you are worried about this, ask to see a genetic specialist. Any older brothers and sisters can be tested, if they haven't already had a test in school.

11) Glue Ear

"Glue ear" is a collection of fluid in the middle ear. The fluid is mucus (snot), the same as you get in your nose when you have a cold. It produces a blockage to sound (a conductive hearing loss). The effect on the hearing is the same as sticking your fingers in your ears. In a child who already has a hearing loss glue ear may make things worse.

Glue ear is very common between the ages of 2 & 7 but can occur at any age. It tends to accompany coughs and colds, so it is worse in the winter. Fortunately most cases of glue ear improve with time; most people have had temporary dullness of hearing with a cold. In a minority of cases, the fluid does not clear and is may affect a child's speech development, school progress or ability to socialise with other children. Recurrent ear pain may also be a feature. For these children an operation to insert grommets into the ear drum may be helpful. Grommets ventilate the ear and keep the middle ear dry. The conductive hearing loss from the fluid is abolished. The ear drum slowly heals and pushes the grommet out after an average of 6 months or so. Whilst they are in place you do have to be a bit careful to make sure that water, particularly water with soap or shampoo in it, does not get into the ears as there is a risk of infection (which leads to a runny ear). Infected grommets are usually treated with antibiotic ear drops. Unfortunately after the grommets come out about 1 in 3 children will get a recurrence of the glue ear.

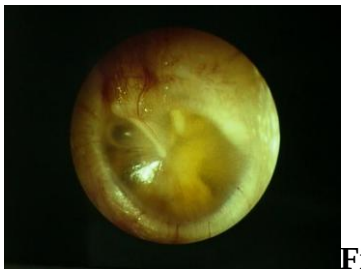

Fig 12. left ear drum with glue ear (see air bubble top left)

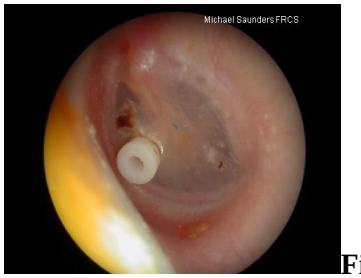

Fig 13. Grommet in place – left ear drum. The glue ear has gone.

12) Cochlear Implants

Cochlear implants are not hearing aids. They are devices which turn sound into coded electrical signals and send them direct to the hearing nerve.

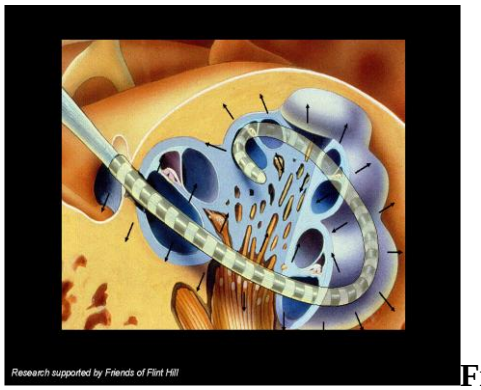

Fig 14. Drawing of cochlear implant in inner ear.

They are designed for children who have such a severe hearing loss (what is called a "profound" hearing loss – see Fig 19) that an ordinary hearing aid will not be helpful. They are not better than hearing aids for the vast majority of children with permanent hearing loss.

An operation is needed to place the cochlear implant into the inner ear. This specialist surgery is undertaken at major centres such as Manchester. There is a lot of detailed assessment that has to be done before the operation as not all children with profound hearing loss are suitable for an implant. After the surgery there is a lot of monitoring, and frequent check-up visits to the hospital where the implant was put in. All in all, cochlear implantation is usually well worthwhile but requires a lot of time, effort and dedication from the children and their families.

Fig 15. Implant wearer with BTE processor. Some children need a larger body-worn processor

13) Bone anchored hearing aids (BAHA)

In rare cases, children cannot wear a normal BTE type of hearing aid. This may be because of abnormalities of the outer part of the ear or possibly because of infection or a skin reaction to the hearing aid mould materials.

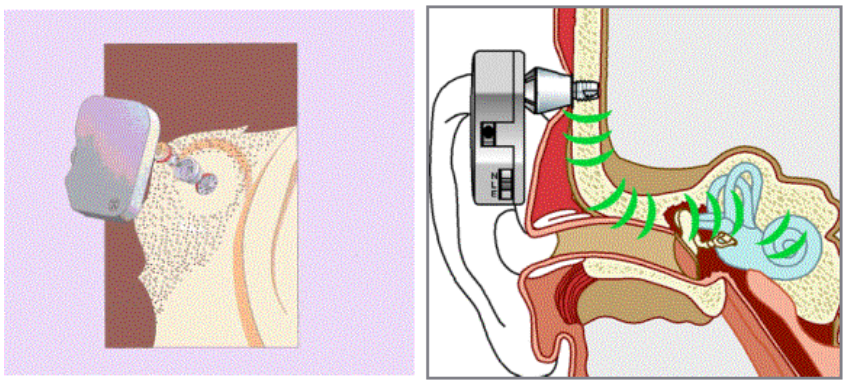

Fig 16. (Left) Diagram of BAHA clipping to screw fixture. (Right) Diagram of sound waves (green) traveling to inner ear through bone of skull from BAHA.

A bone anchored hearing aid (BAHA) sends sound directly into the inner ear via the bone of the skull. An operation is required to place a metal screw into the bone. One end of the screw sticks through the skin and a special hearing aid can be clipped to the screw. Although this may sound gruesome, these hearing aids work very well and are worn without pain or discomfort. Because of the hair, they are often less obvious than a BE hearing aid

Fig 17. BAHA in place.

14) Understanding audiograms

Hearing is measured in decibels (dB). The louder a noise is the greater the number of decibels. The level at which a person can *just* hear a sound is the **hearing threshold**.

An audiogram is often shown as a graph. The higher up an audiogram chart a person's threshold is, the quieter the sounds they can hear. The lower down the chart the threshold is, the louder the sound needs to be in order to be heard.

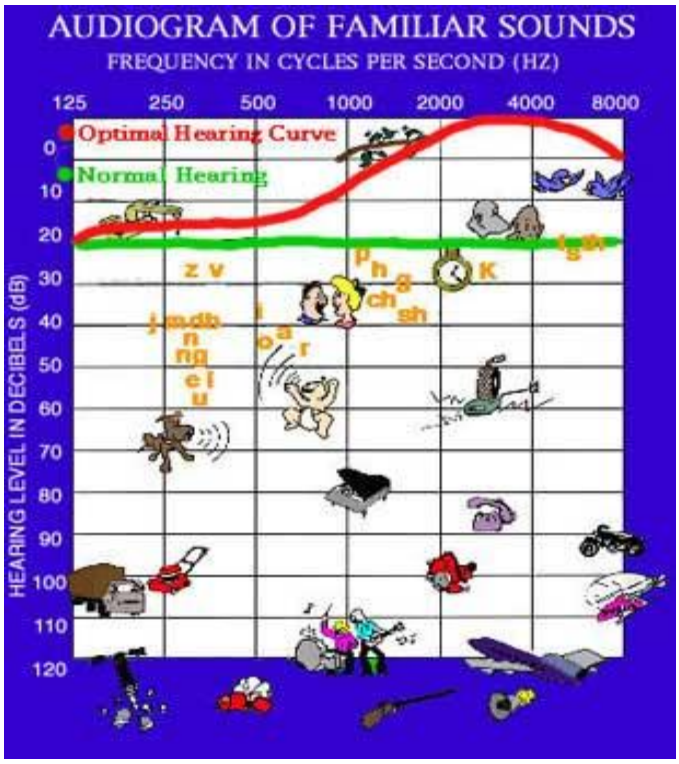

Fig 18. Audiogram with "perfect" hearing test (red), lower limit of normal hearing (green) and sound levels for common sounds. The orange letters show the pitch of different speech sounds.

Different pitches **(frequencies)** of sound are measured across the graph from left to right. The low pitch sounds (vowel sounds) are on the left and the higher pitch sounds (consonant sounds - more important for recognising words) on the right. Frequency is measured in Herz (**Hz**). One thousand Herz is a Kilo-Herz (**KHz**). Most audiograms measure information between 250Hz and 8KHz although most people can hear sounds at both lower frequencies (the rumble of thunder) and higher frequencies (the rustle of leaves). What we measure is the sounds that are important for everyday life.

You may hear doctors referring to hearing loss as mild, moderate, severe or even profound. Figure 19 below shows where on the audiogram these categories of hearing loss are. Comparison with Fig 18 will give an idea of just what a child can and cannot hear for any given degree of hearing loss.

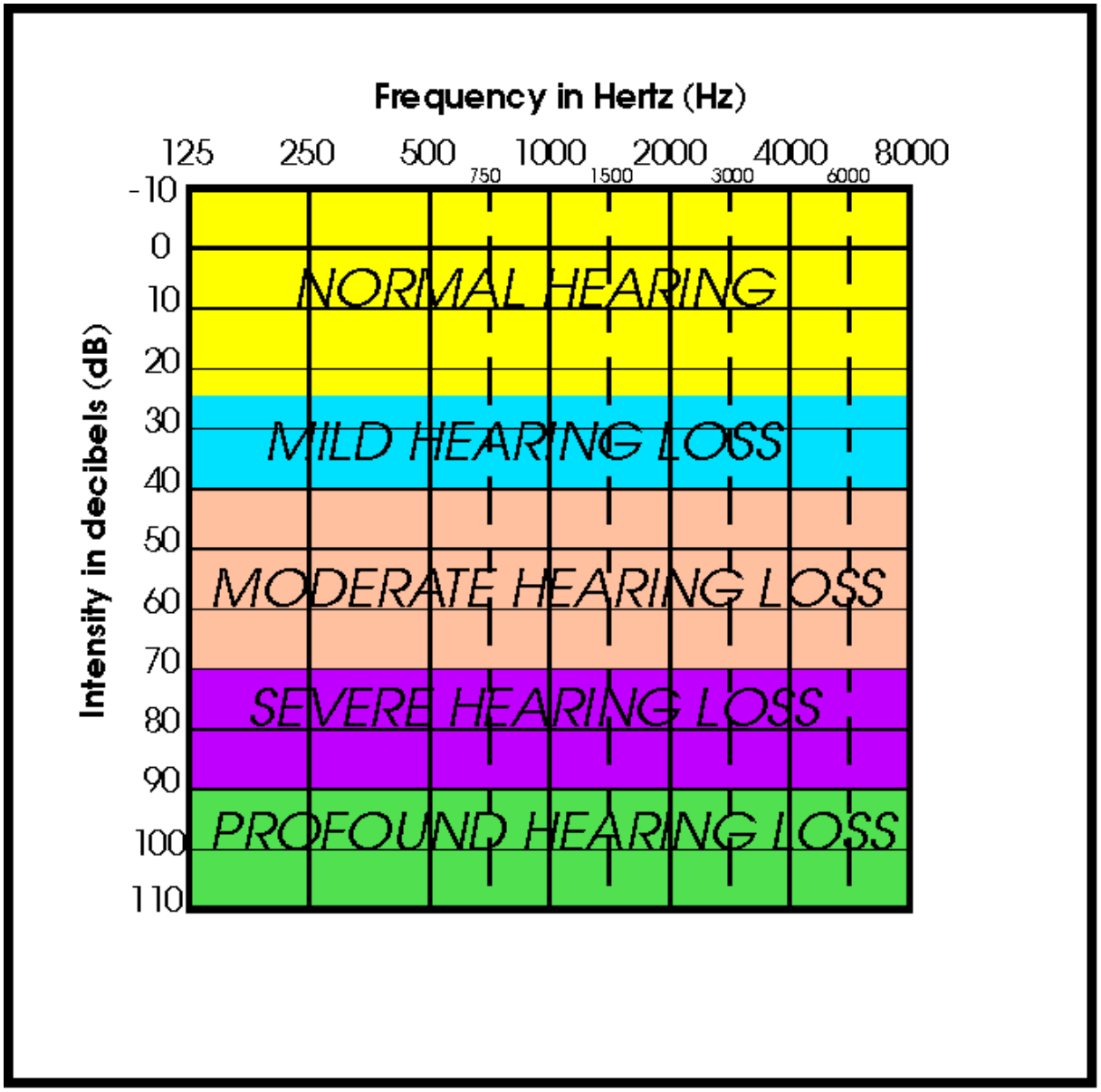

Fig 19. Degree of hearing loss

Hearing can be measured through the normal pathway (**air-conduction -AC**) using headphones, or through the bone of the skull (**bone conduction – BC**) using a sound vibrator on the skin behind the ear. We use these two methods to tell a sensori-neural from a conductive hearing loss.

Each time you attend the clinic you will be given a copy of the hearing test; keep them in the back of this folder as a permanent record.

15) Audiograms, speech and hearing loss

Look at Fig 20, below. Just as in the audiogram on the previous page, louder sounds are towards the bottom of the graph and high pitch (frequency) sounds are on the right side.

The banana shape shows the pitch and loudness of conversational speech sounds (a bit like Fig 18 on page 19). You can see why it is called a “speech banana”.

The diagonal line where the light blue squares meet the green squares represents a typical high frequency hearing loss. You can see that the hearing gets worse at high frequencies on the right side of the graph.

Sounds which cannot be heard are to the right and above this line (green). Vowel sounds tend to be low pitch and consonants high pitch. Consonants are more important for understanding speech.

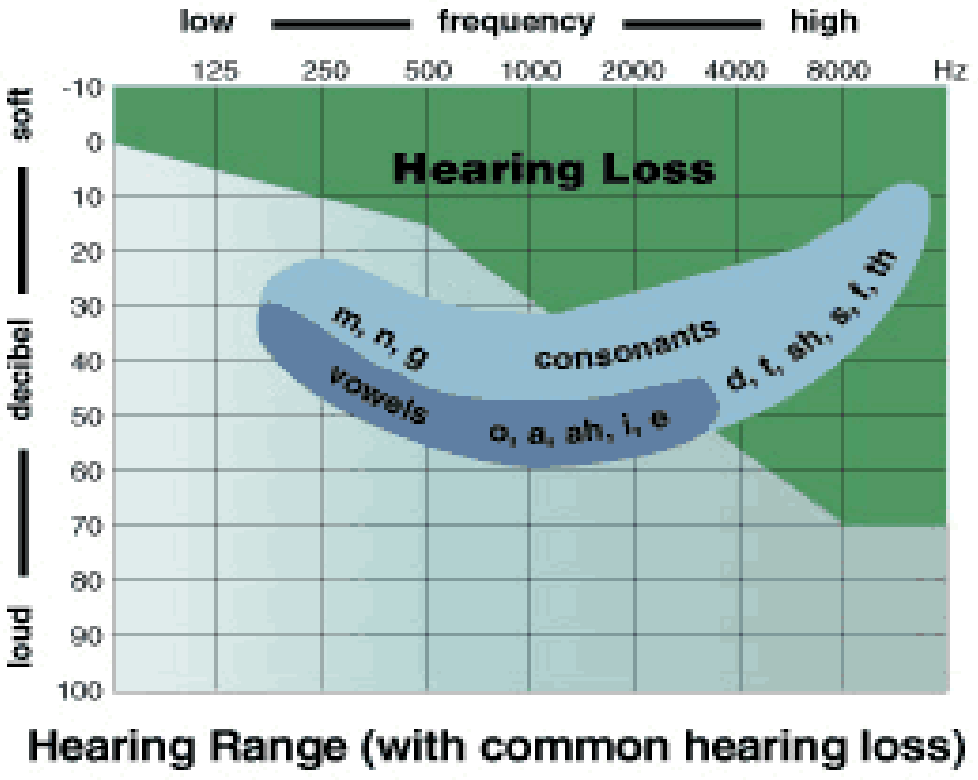

Fig 20. Speech banana and the effect of a typical high frequency hearing loss

The part of the speech banana in the green area will not be heard by someone with this degree of deafness. This child might hear vowel sounds without hearing aids but may not understand what is being said and won’t be able to produce clear speech.

16) Glossary of abbreviations

AC	Air conduction (page 20)
BAHA	Bone anchored hearing aid (page 18)
BC	Bone conduction (page 20)
BTE	Behind the ear (type of hearing aid (page 11)
CASWG	Children's audiology services working group (local umbrella organization for co-ordination of children's hearing services)
CDA	Cumbria deaf association (page 23)
CHAC	Children's audiology clinic (page 13)
CHL	Conductive hearing loss (page 6)
CI	Cochlear implant (page 17)
dB	Decibel (pages 7 & 19)
ENT	Ear, Nose & Throat (page 13)
ERA	Evoked response audiometry (page 8)
ITC	In the canal ("hidden" hearing aid) (page 11)
ITE	In the ear (smaller hearing aid) (page 11)
NDCS	National deaf children's society (page 22)
OME	Otitis media with effusion (another term for glue ear) (page 16)
OAE	Otoacoustic emissions (page 8)
SNHL	Sensori-neural hearing loss (page 6)
VRA	Visually reinforced audiometry (page 9)

Useful contact numbers and addresses

Cumberland Infirmary	01228 523444
West Cumberland Hospital	01946 693181
Carlisle audiology department (direct line)	01228 814422
Central Clinic, audiology department	01228 603484
National Deaf Children's Society	020 7250 0123
Carlisle & Eden Deaf Children's Society Chair, Mrs S Beattie, 1 Old Road, Longtown CA6 5TH	01228 791567
Cumbria Deaf Association, 3 Compton St, Carlisle CA1 1HT	01228 606434
Royal National Institute for the Deaf	0870 605 0123
Teachers for the Deaf, North East Cumbria Gillford Centre, Upperby Road, Carlisle CA2 4JE Specialist teaching services co-ordinator, Angela Gibson Senior teacher, Rose Foster	01228 606949
Senior Education Officer (Special Educational Needs) N. East Cumbria Beth Dawson, 5 Portland Square, Carlisle	01228 606840
Teacher for the Deaf, North West Cumbria Learning Centre, Toll Bar, Distington, Workington CA14 4PU Specialist teaching services co-ordinator, Christine Thompson Senior teacher, Roberta Bowen	01946 834848
Senior Education Officer (Special Educational Needs) N. West Cumbria David Henderson, Union Hall, Whitehaven	01946 852715
Cumbria Education Authority, Educational Audiologist John Elwood, Newbridge House, Ewan Close, Barrow-in-Furness, LA13 9HU	01229 894464

Websites:

Royal National Institute for the Deaf	http://www.rnid.org.uk/
National Deaf Children's Society	http://www.ndcs.org.uk/
Cumbria Deaf Association	http://www.cumbriadeaf.co.uk/
DELTA (Deaf Education through listening and talking)	http://www.deafeducation.org.uk/

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NJM