Middle ear conditions
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This factsheet is part of our Ears and ear problems range. It is written for people who have been diagnosed with a condition that affects the middle ear.

Read this factsheet to find out:

- How do the ears work?
- What can go wrong with the middle ear?
- What is acute otitis media?
- What is chronic suppurative otitis media (CSOM)?
- What sort of injuries can damage the middle ear?
- What is otosclerosis?
- What about congenital (birth) defects?
- What if I need an operation?
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How do the ears work?
Your ears have three sections: the outer ear, the middle ear and the inner ear.

The outer ear
The outer ear consists of the pinna, which is the part you can see on the side of your head, and the external auditory canal, which is the passage that sound travels along. The eardrum – also known as the tympanic membrane – covers the other end of the canal. When sound reaches the eardrum from the outside, it vibrates. Beyond the eardrum is the middle ear.

The middle ear
The middle ear is a space or cavity, filled with air. A chain of three tiny bones, the ossicles, stretches right across the middle ear cavity to conduct sound from the eardrum to the inner ear. These three bones are called:

- The malleus – attached to the inside of the eardrum.
- The incus – stretching between the malleus and the stapes.
- The stapes – the base of the stapes fits into the oval window.
When sound enters your ears and makes the eardrum vibrate, the vibrations pass from the eardrum along the ossicles. The stapes pushes like a little piston against the membrane in the oval window of the inner ear. Behind the oval window is the inner ear.

**The inner ear**

In the inner ear, the cochlea is the hearing part of the ear. The cochlea is a fluid-filled spiral tube. The vibrations caused by sound pass from the stapes through the oval window and into the cochlea. The cochlea is lined with thousands of tiny hair cells. When sound waves enter the cochlea, they move the tiny hairs, causing the hair cells to send electrical messages to the auditory nerve which sends the information to the brain. Different frequencies (pitches) of sound are picked up by different hair cells, depending where in the spiral tube they are located. The nerve passes impulses up to your brain, which recognises them as different sounds – for example, people talking, or footsteps.
What can go wrong with the middle ear?
In this section, we look at some of the more common conditions that affect the middle ear, their symptoms and treatments:

- Acute otitis media.
- Chronic suppurative otitis media.
- Injuries to the middle ear.
- Otosclerosis.
- Congenital defects.

What is acute otitis media?
Acute otitis media is the name for inflammation – swelling, pain and redness – and infection of the middle ear. The condition starts quite suddenly. It usually occurs in children and can follow a cold or flu. Bacteria or viruses can cause the infection. The symptoms include earache, fever, irritability and hearing loss.

How can it be treated?
Acute otitis media is an infection that often gets better without treatment and does not return. However, sometimes you might have to take antibiotics if your symptoms don’t improve after 24 hours. In severe cases, pressure builds up behind your eardrum (the tympanic membrane). This causes your eardrum to burst, or perforate, and your ear discharges fluid or pus. Your eardrum will normally heal within a few days. However, sometimes the perforation doesn’t heal, which can result in hearing loss or may allow infection into the middle ear. The perforation can then be repaired by an operation called a tympanoplasty (also known as a myringoplasty).

Tympanoplasty or myringoplasty
These are the names given to the operation to repair a hole – perforation – in your eardrum if it hasn’t healed naturally after a period of time. An infection or injury could be the cause of the hole. The operation makes your middle ear watertight to prevent discharge and the infection coming back. It can also sometimes improve your hearing.

What happens during the operation?
The operation is usually carried out under general anaesthetic, so you won’t feel anything while the operation is taking place. The operation involves using a piece of body tissue – often known as a graft – taken from under the skin just behind the ear. The tissue is taken out by making a cut behind your ear. The graft is put behind your eardrum to repair the hole. This operation is very successful in sealing the hole and creating a watertight middle
ear. However, if your eardrum is scarred because of infection or injury, your hearing might not return to how it used to be.

**What is chronic suppurative otitis media (CSOM)?**
CSOM is the name given to a condition when you get an infection of the middle ear, which fails to settle or occurs frequently. There are two forms of this condition:

- tubo-tympanic
- attico-antral.

**Tubo-tympanic form**
If you have this, you probably have a perforation in the central part of your eardrum. This can be caused by infection, injury or surgery.

**What are the symptoms?**
You may have hearing loss and a discharge, which may come and go, particularly if you get a cold or your ear gets wet. You might also get tinnitus.

**How is it treated?**
You can usually help your symptoms by taking simple steps; for example, by wearing an earplug or keeping your ear dry when you are having a bath or swimming. A hearing aid can improve your hearing. However, you may need an operation to repair the hole in the eardrum. This is called a tympanoplasty or myringoplasty (see top of the page).

**Attico-antral type**
If you have this, you might have a hole in your eardrum – usually in the upper part. This form of CSOM can be more of a problem than the tubo-tympanic form because your eardrum sheds dead skin, which can build up and enter the middle ear. This skin can then mix with wax and other debris to form a cyst-like mass. This mass is known as a cholesteatoma. This type of CSOM is more serious because the cholesteatoma can get bigger and cause damage to nearby parts of the ear, such as the eardrum and ossicles (see page 2).

**What are the symptoms?**
The attico-antral form of the condition causes a smelly discharge to leak from the ear. You may also have hearing loss and sometimes tinnitus. You can get vertigo (dizziness) if your semicircular canals, which form part of the balance system, are damaged. Occasionally, the cholesteatoma can damage the bone covering the nerve that supplies your face, which can weaken your facial muscles. In very severe cases, it may even wear through your...
skull, causing meningitis or brain infections. Signs that damage is taking place include vertigo, weakness of the facial muscles and bad headaches.

**How is it treated?**
It is important to remove the cholesteatoma and all traces of infection. For this, mastoid surgery is usually necessary.

The mastoid is an area of bone just behind the ear. It contains lots of small air pockets. Infection and cholesteatoma can get into the bone and the air pockets, making it very difficult to treat with antibiotics. An operation on the mastoid bone involves drilling away the infected bone. This aims to remove all the infected tissue and cholesteatoma. There are a few different types of mastoid surgery depending on how bad your condition is. Some of these leave a cavity (hole) in the mastoid bone, which may require regular cleaning. Your surgeon should discuss with you exactly which operation is suitable.

**What sort of injuries can damage the middle ear?**
You can injure your ear in several ways, including:
- A severe blow to the side of the head.
- Damage from something being pushed too far into the ear canal.
- Exposure to sudden changes in pressure – for example, when diving or occasionally when flying. This can lead to ear injuries known as barotrauma.

Two main things can happen when the middle ear is injured – your eardrum may perforate or you may damage the ossicles.

**Perforated eardrum**
About 90% of eardrums perforated due to injury or trauma will heal on their own within about three months. However, if a dirty item caused the injury, such as a soiled cotton bud, you might need antibiotics after the injury. If it fails to heal, you may need a tympanoplasty to repair the eardrum (see page 4).

**Ossicular chain disruption**
This is the name given to the condition when the ossicles are damaged. In most cases, this causes persistent hearing loss. You may also occasionally have tinnitus and/ or feel dizzy.

You may need an operation, called an ossiculoplasty, to repair the chain of bones. An ossiculoplasty operation repairs damage that has occurred as a result of infection or injury.
to the ossicles. The damaged ossicles are replaced with either artificial bone, called prostheses, or small pieces of bone taken from somewhere else in your body. The prostheses can be made from man-made bone material, plastic or ceramic. The ossicles are very small and this makes the surgery very delicate. This means that although the operation can improve your hearing, it may not return it to its former level.

**What is otosclerosis?**
As sound hits your eardrum, it vibrates, causing the ossicles to move. The sound is then transmitted through to your inner ear. The chain of ossicles must be able to move freely for you to have normal hearing. The last bone in the chain is called the stapes. Otosclerosis causes new bone to grow over the stapes. This leads to a reduction in movement and eventually the bone becomes fixed. This reduces the transfer of sound to your inner ear and causes hearing loss.

Very occasionally, otosclerosis can also affect your inner ear. The condition can affect either one, or more commonly, both ears. If left untreated, otosclerosis will cause your hearing to steadily get worse and can lead to profound deafness.

Otosclerosis is quite common in the UK. It affects about 1-2% of the population and in most cases it is an inherited condition. It usually starts when people are in their twenties or thirties.

The condition is more common in women and often gets worse if the woman is pregnant. It is thought that this is due to the high concentration of the hormone oestrogen during pregnancy. If you have otosclerosis and are worried that your pregnancy may affect your hearing, see your doctor. You may have to have a hearing test from time to time to monitor your hearing.

**What are the symptoms?**
Symptoms include tinnitus and hearing loss, often at lower frequencies – deeper sounds – to begin with, which means that your hearing may be better in noisy surroundings. People with otosclerosis tend to speak quietly.

**How is it treated?**
In the early stages of otosclerosis, or when the condition is mild, you might not need any treatment. However, sodium fluoride tablets help prevent the progression of otosclerosis, but only if the condition has affected the inner ear.
Hearing aids can be very helpful and you will usually be given the chance to try them before surgery is considered. However, otosclerosis will continue to progress and hearing aids will not stop you developing profound deafness in the long term.

If you do need surgery, then an operation called a stapedectomy is carried out. However, surgery may not relieve the tinnitus, and if your inner ear is also affected, surgery may not improve your hearing either.

**Stapedectomy**

This operation aims to improve your hearing by replacing the stapes – one of the three bones (ossicles) in your middle ear – with a piston. The piston helps restore the movement of the ossicles, thereby transmitting sound into the inner ear. A surgeon will remove most of the stapes bone, leaving just the portion called the footplate, which sits in contact with the oval window. The oval window is the link between the middle and inner ear. A small hole is then drilled in the footplate and the piston is inserted so that it sits in contact with the oval window. At its other end, the piston is attached to the incus, the middle of the three ossicles.

About 85% of people find the operation a success and report a good improvement in hearing. However, there is a very small risk – about 1% – that fluid will leak from the inner ear and cause a complete loss of hearing in that ear. There is also a small risk of fluid loss in the years following surgery; for example, if you have a sudden blow to the head or sudden pressure change.

Occasionally, the piston may move slightly and you will need a second operation to put it back in place. If you have this second operation, there is a higher risk – about 5% – that you will lose your hearing completely in the ear that has been operated on.

**What about congenital (birth) defects?**

Very rarely, babies are born with ears that have formed abnormally. This may just involve the outer ear – the pinna – or the ear canal or the middle ear as well. If the ear canal has failed to develop, so that it remains completely closed, it is known as atresia.

**How is atresia treated?**

If only one ear is affected and the hearing in the other ear is normal, it may not be necessary to do anything. However if both ears are affected, then a bone-anchored hearing aid (BAHA) may be tried. A metal (titanium) fixture is inserted into the bone behind the ear and a special hearing aid is fitted on to it. This conducts sound through the bone
directly into the inner ear, bypassing the abnormally formed outer or middle ear. For more information, see our factsheet **Bone conduction hearing aids**.

**Diagram of an implanted BAHA**

Diagram © Entific Medical Systems.

**What if I need an operation?**

As we have explained above, treatment for all these conditions can vary. Sometimes hearing aids can be helpful, or you may be advised to have an operation.

If you need an operation, your surgeon should discuss the possible risks with you. Any operation involves some risks, but the most important for you to know about are:

- The small risk of the operation causing complete deafness in your affected ear.
- Tinnitus.
- Dizziness.
- Temporary or permanent changes to your sense of taste and/ or weakness in the muscles on the side of the face being operated on, because these nerves are close to the site of the operation.

These risks vary depending on the operation and the condition it is for. If you are unsure about anything, or have more questions, it is important to ask your surgeon.

**Where can I get further information?**

Our helpline offers a wide range of information on many aspects of hearing loss. You can contact us for further copies of this factsheet and our full range of factsheets and leaflets – see the cover page for contact details.
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