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## Ears - otosclerosis

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### Summary

- Otosclerosis is a form of abnormal bone growth within the middle ear that causes progressive hearing loss.
  - The sense of balance may also be impaired.
  - The cause is unknown, but risk factors include family history, gender and pregnancy.
  - Treatment options include surgery and hearing aids.
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The middle ear is the area behind the ear drum and it contains tiny bones that amplify sound waves. Otosclerosis is characterised by the abnormal formation of bone within the middle ear that stops these tiny bones from vibrating. This causes hearing loss because the sound waves can't reach the inner ear.

The sense of balance may also be affected if the abnormal bone growth extends into the inner ear. Women aged between 15 and 30 years are most commonly affected by otosclerosis. The cause is unknown, but risk factors include family history, gender and pregnancy. Treatment options may include surgery or the use of hearing aids.

### Structures of the ear

Sound waves are vibrations through the air. When we hear a sound (such as somebody's voice), sound travels along the ear canal and causes the eardrum to vibrate. The vibration of the eardrum causes movement of the three bones (malleus, incus and stapes) in the middle ear. These bones move against the cochlea (the hearing organ) and pass the vibrations to thousands of special hair cells inside it.

The hair cells then send the sound as an electrical signal along the nerve to the brain, where we perceive the sound (our brain interprets the signal as sound). Otosclerosis most commonly affects the tiny bone known as the stapes.

The body's organs of balance, the vestibular system, are also located within the inner ear. The main part of the vestibular system is the labyrinth – a series of fluid-filled canals set at different angles. Each semi-circular canal has a different orientation to detect a variety of head movements, such as nodding or rotating. Movement of fluid inside the canals caused by head movement stimulates tiny hairs that send messages via the vestibular nerve to the brain. The movement of fluid within these canals is one way the body remains upright and maintains balance.

The normal functioning of the labyrinth will be affected if abnormal bone growth extends into the inner ear, causing dizziness and nausea.

### Symptoms of otosclerosis

Otosclerosis tends to target one ear at first, but both ears are generally affected, eventually. The symptoms of otosclerosis may include:

- gradual but progressive loss of hearing
- sensations of ringing in the ears (tinnitus)
- dizziness.

### Risk factors for otosclerosis

The cause of otosclerosis is a mystery, but researchers have uncovered a number of risk factors including:

- family history – otosclerosis tends to run in families, which suggests a genetic susceptibility or hereditary component to the disorder
  - gender – women are more likely to develop otosclerosis than men
  - pregnancy – susceptible women may develop otosclerosis during pregnancy
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- race – Caucasians (white people) tend to be most commonly affected
- osteogenesis imperfecta – this genetic disorder is characterised by abnormally brittle bones. People with osteogenesis imperfecta are at increased risk of developing otosclerosis
- non-fluoridated water – some evidence suggests that drinking non-fluoridated water may increase the risk of otosclerosis in susceptible people
- measles virus – there is some evidence that viruses may be contributory to developing otosclerosis, in particular the measles virus
- unknown causes – some people develop otosclerosis even though they don't have any of the known risk factors.

### Diagnosis of otosclerosis

Otosclerosis is diagnosed using tests including:

- hearing tests – a person with otosclerosis typically has a hearing loss that affects all frequencies (pitches). The hearing loss may be conductive or mixed in nature. A conductive hearing loss is caused by a problem in the middle or outer parts of the ear. A mixed loss combines a conductive hearing loss with a hearing loss that results from damage to the inner ear
- CT scan – to check for damage to the cochlear nerve and labyrinth.

### Treatment for otosclerosis

Treatment may not be needed until the degree of hearing loss is significant. Options may include:

- medication – some studies have suggested that taking fluoride, calcium and vitamin D supplements may help to slow the progression of otosclerosis. However, this treatment needs further research before it can be confirmed
- hearing aid – hearing aids can help most people with a hearing loss, even though they cannot restore normal hearing. Hearing aids aim to increase communication by providing more useful sound information
- surgery – the affected stapes is surgically removed and replaced with a prosthesis or artificial stapes (stapedectomy). A successful operation may correct or improve the conductive hearing loss of otosclerosis.

### Self-care after surgery for otosclerosis

After surgery, it is important (particularly in the early postoperative phase) to protect the structures within the ear from infection, pressure and noise to reduce the risk of complications.

Be guided by your surgeon, but general suggestions include:

- avoid blowing your nose
- avoid cold temperatures
- reduce your risk of upper respiratory tract infections by avoiding sick people
- avoid changes in air pressure (air travel or scuba diving)
- avoid loud noises
- see your doctor promptly if you experience ear pain, dizziness or fever, as these symptoms could indicate an infection.

### Where to get help

- Your **GP (doctor)**
- **Audiologist**
- **Ear, nose and throat specialist**
- The **Royal Victorian Eye and Ear Hospital** Tel. **(03) 9929 8666**

**This page has been produced in consultation with and approved by:**

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