

## Otosclerosis and Stapes Surgery

Otosclerosis is the name given to a condition of the bone which affects the bony capsule of the inner ear and may affect the chain of hearing bones in the middle ear as well, resulting in hearing loss. When we are born, the bony capsule of the inner ear which contains nerve endings of hearing and balance is already full size. So are the three hearing bones (malleus, incus, and stapes) which conduct sound vibrations from the eardrum into the fluids of the inner ear where the hearing nerve endings live. In some individuals bone changes continue and can cause the chain of bones to become stuck, resulting in a hearing loss which can easily be corrected with an outpatient surgical procedure. The object of the surgery is to replace the hearing bone which has become fixed with a small prosthesis that will conduct sounds to the inner ear..

Otosclerosis occurs in females approximately twice as often as it does in males. In ½ of cases, there is a family history with least one other family member having the problem. The other half of the cases we consider “sporadic”. Approximately 70% of patients have fixation of the stapes (the 3<sup>rd</sup> hearing bone) in both ears. This results in a conductive hearing loss which may sometimes be more pronounced in one ear than the other and lead the patient to believe that only one ear is affected. Because the bony activity of otosclerosis can be accelerated by the hormones produced during pregnancy, many will experience a hearing loss in one or both ears around the time of a pregnancy.

The greatest part of the hearing loss in an ear with otosclerosis is caused by sound not being able to travel through the chain of bones to a healthy hearing nerve. Amplified sound can be forced through the stiffened chain of bones with a hearing aid, but since most patients discover this problem when they are young, they are usually eager to have a surgical correction which will allow them to hear naturally without a hearing aid. These patients typically elect to have a surgical procedure called stapedectomy.

**Stapedectomy** surgery is typically performed in an operating room. Some sedating medication is given through an IV and the ear is thoroughly numbed with an injection. Using microsurgical instruments and an operating microscope, the eardrum is lifted and the ossicular chain (chain of bones in the middle ear) is inspected. After fixation of the 3<sup>rd</sup> hearing bone, the stapes, has been confirmed, a laser or microsurgical instrument is used to remove the stapes and it is replaced with a tiny prosthesis made of Teflon, platinum, stainless steel, or other materials. A small gasket is placed over the fluids of the inner ear and underneath the artificial bone to prevent leakage of inner ear fluid. Material for this natural gasket is usually taken from a small incision above the ear or in the ear canal. When the stapes has been replaced, the eardrum is put back in its natural position and the patient can confirm that the hearing has been significantly improved. If it has not been significantly improved, a re-inspection of the implant for proper position, proper coupling, and an inspection of the ear for other possible sites of ossicular fixation is made. When good hearing has been established, the eardrum is held in place with a light packing which is removed one week after surgery. Most patients go home within a few hours after surgery,

but one out of ten patients will experience significant dizziness after having the inner ear opened and will stay overnight in the hospital before traveling home.

The success rate for this type of surgery is approximately 95%. Failures of surgery to correct the hearing usually relate to other sites of ossicular fixation which could not be identified at the initial procedure or from movement of the prosthesis after surgical positioning. In one out of a hundred cases, a significant loss of hearing can occur just from the act of opening the inner ear. This may occur immediately or as late as several weeks after the initial surgery. The cause of this remains unclear in most cases. In very rare cases, persistent dizziness can occur after stapedectomy which becomes problematic and requires treatment, but this is a very rare occurrence. Most patients have mild symptoms of dizziness which resolve within a few days. Some patients may also experience a metallic taste disturbance for a few days or weeks after surgery.

Although surgery can immediately improve the hearing caused by the part of the bony growth which interferes with the function of the stapes bone, stapes surgery does not stop the abnormal bony growth which, over decades, can weaken the inner ear hearing itself. For this reason, patients with evidence of nerve hearing loss may be asked to take a supplement of fluoride and calcium twice daily for a period of 15 months in order to consolidate areas of active bone which are usually scattered around the inner ear. This can help to preserve hearing levels in the long run and may prevent the need for hearing aids decades later.