DEPARTMENT OF OTOLARYNGOLOGY

The Hearing and Balance Program
What is otology/neurotology?

Otology is the field of medicine that includes problems of the ears, hearing and balance. Neurotology is a sub-specialty of otology that includes acoustic neuroma and skull base surgery. The field of otology/neurotology includes the diagnosis and treatment of cholesteatoma and chronic ear disease, hearing disorders including otosclerosis, balance disorders, facial nerve disorders, acoustic neuroma and skull base surgery, and cochlear implantation.

An explanation of normal ear function

The ear is an organ of hearing and balance.

- **How We Hear**
  Think of the ear as having three parts: the outer ear, the middle ear, and the inner ear. The outer ear, the part that we see, collects sound. The middle ear transforms sound energy from air vibrations to fluid vibrations. The inner ear receives the sound energy and transmits it to nerve endings.

- **How We Balance**
  The inner ear also contains the organs of balance—the three semicircular canals and the utricle and saccule. These balance organs contain fluid and work like a carpenter's level, to detect movement of the head in space. The semicircular canals detect rotational movement, and the utricle and saccule sense to-and-fro movement. These organs change the sensation of motion to nerve impulses that travel to the brain and result in compensatory movements of the body and the eyes.

Hearing loss

The diagnosis and treatment of hearing loss involves both the audiologist and the otologist. The commonest causes of hearing loss are age, noise exposure, and genetics. When hearing loss is more than mild, hearing aids can be recommended. The latest generation of hearing aids use digital technology and are nearly invisible, so the traditional reasons that patients resisted hearing aids—poor function and appearance—have been remedied.

**COCHLEAR IMPLANTATION** is appropriate for patients with severe hearing loss in both ears who cannot benefit from conventional hearing aids. Cochlear implants are able to bypass
the cochlea to stimulate the auditory nerve directly. Cochlear implants have provided splendid results to properly selected patients, and are suitable for adults and children 1 year of age and older. CI recipients usually regain the ability to hold conversations—often without lipreading.

The operation, which can be done on an outpatient basis, involves implanting an electronic device through the mastoid, behind the ear. An electrode array is passed into the inner ear, next to the hearing nerve. When connected to an external microprocessor that resembles a hearing aid, the implant produces a series of electrical impulses that directly stimulate the hearing nerve.

**Otosclerosis** is a genetic disorder that causes a mechanical (“conductive”) type of hearing loss that can be identified by a hearing test. Otosclerosis affects the bone of the inner ear and prevents the stapes from vibrating properly. Treatment options include surgery or a hearing aid.

**STAPEDECTOMY SURGERY** can restore hearing in well over 90% of cases. The operation is done through the ear canal using a microscope. The stapes is separated from the incus bone, and removed. A prosthesis made of plastic or wire is then inserted in place of the stapes. This prosthesis conducts the vibrations of sound to the inner ear, and hearing is restored.
Chronic ear disease and Cholesteatoma

Ear infections are common in children, and often require treatment with antibiotics and sometimes ear tubes. Chronic ear disease occurs in older children and adults, and include disorders that are often treated surgically.

Eardrum perforations may result in hearing loss and drainage from the ears. These are treated with TYMPANOPLASTY surgery, in which the ear drum is grafted with healthy new tissue, and the small hearing bones are repaired. Surgery of this type is commonly performed on an out-patient basis, and the success rate is quite high.

Cholesteatoma is a relatively common disease that results from repeated ear infections. Cholesteatoma is a benign growth that forms beneath the eardrum. Over time, the growth enlarges and causes recurrent infections and hearing loss. If left untreated, serious complications such as labyrinthitis or meningitis can develop.

The treatment of cholesteatoma is always surgical. Surgery involves opening the bone behind the ear to remove the growth (MASTOIDECTOMY) and reconstructing the eardrum and hearing bones. Our philosophy is to try to manage the disease in a single-stage operation whenever possible, and we have been successful in the majority of cases.

Cholesteatomas can re-grow in the best of hands, so close follow-up every 6 months for several years after surgery is advisable.

Balance disorders

Vertigo and imbalance are cardinal symptoms of inner ear disease. Other forms of dizziness can arise from neurological, cardiovascular, and metabolic disease. At Mount Sinai, patients with balance disorders can benefit from the combined clinical expertise of both the Neurology and Otolaryngology departments.

Common balance disorders include Meniere’s disease, benign positional vertigo, labyrinthitis (“vestibular neuritis”), and vestibular migraine.

Meniere’s disease causes unpredictable episodes of vertigo. Patients also experience hearing loss, fullness and noise (tinnitus) in the affected ear. Most patients, when properly diagnosed, respond to medical treatment and dietary measures. A relatively new office procedure, INTRATYPANIC GENTAMICIN, has been effective in curing many patients of vertigo without the need for an operation. Patients who don’t respond to these measures are sometimes treated surgically.
Benign positional vertigo ("BPPV") is a very common inner ear disturbance that causes spinning vertigo when lying on one side, bending, or looking up. The symptom can be effectively eliminated with a simple office procedure, the PARTICLE-REPOSITIONING MANEUVER (or "Epley Maneuver").

Labyrinthitis (vestibular neuritis) is an acute inner ear infection that causes vertigo of sudden onset. The condition can be frightening, but is usually self-limited. Labyrinthitis needs to be differentiated from other more serious disorders, including acoustic neuroma.

Vestibular migraine has increasingly been appreciated as a cause of chronic dizziness. Patients usually respond to medical treatment once the proper diagnosis is made. Chronic forms of dizziness and imbalance can be effectively treated with special exercises. VESTIBULAR PHYSICAL THERAPY, or “BALANCE THERAPY”, has come to play a major role in the management of these problems.

Acoustic Neuroma and Skull Base Surgery

THE PROGRAM FOR SKULL BASE SURGERY is a multidisciplinary team that involves experts in otolaryngology, neurosurgery, interventional radiology, and related specialties.

Acoustic neuroma (vestibular schwannoma) is a benign tumor that arises from the nerves of hearing and balance and grows in the space between the ear and the brain. These tumors usually present with hearing loss in one ear, and are detected by MRI. Acoustic neuromas can be treated by surgery, stereotactic radiation therapy, or can sometimes be simply followed with serial MRI. With proper treatment selection, the vast majority of our patients have had excellent outcomes.

Acoustic neuroma surgery is a team approach that involves a neurosurgeon and a neurotologist. Thanks to an extensive experience, our patients have had a very high rate of success with respect to facial nerve and hearing preservation, and a low rate of complications.

Stereotactic radiation therapy is a non-surgical alternative that is suitable in many instances for providing long-term control of tumor growth. At Mount Sinai, state-of-the-art equipment allows precisely contoured radiation dosing, resulting in minimal exposure of normal tissues.

Other conditions of the skull base include benign growths including meningioma and glomus tumors, malignancies of the temporal bone and adjacent structures, inflammatory diseases including cholesterol granuloma, epidermoid tumors, facial nerve disorders, traumatic and acquired spinal fluid leaks, and vascular lesions requiring skull base access.
ERIC SMOUHA, MD, FACS joined the faculty of Mount Sinai School of Medicine in June, 2005 as Associate Professor of Otolaryngology and Director of Otology and Neurotology after spending 15 years at SUNY Stony Brook. He is a graduate of Yale University and McGill Faculty of Medicine, a recipient of the Certificate of Honor of the American Academy of Otolaryngology-Head and Neck Surgery, a fellow of the American College of Surgeons, and a member of the American Otological Society, the American Neurotological Society, the Triological Society, and the North American Skull Base Society. Dr. Smouha is listed in the Best Doctors in America® database.

His clinical interests include all aspects of ear disease, hearing and balance disorders, and skull base surgery. He has performed hundreds of surgical operations for cholesteatoma, cochlear implantation, acoustic neuroma, and stapedectomy. He has developed innovative techniques aimed at conserving function in cholesteatoma surgery. He has also conducted basic research on matrix metalloproteinase enzymes in cholesteatoma, on three-dimensional imaging of the temporal bone, and on hearing preservation surgery of the inner ear. His recent meta-analysis on the conservative management of acoustic neuromas was presented at the North American Skull Base Society and published in the journal Laryngoscope.

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