

## ACOUSTIC TRAUMA

### TRAUMA TO THE EXTERNAL EAR

#### I. BACKGROUND

The common types of trauma to the external ear usually result from thermal, blunt or penetrating trauma causing damage to the auricle, external auditory canal, or tympanic membrane.

#### II. DIAGNOSTIC CRITERIA

##### A. Pertinent History and Physical Findings

Direct examination of the external ear and tympanic membrane and evaluation of hearing with an audiogram.

#### III. TREATMENT

1. Hematoma of the external ear, usually due to a direct blow, is treated by drainage of the hematoma which may be done with an 18 gauge needle and syringe or a small incision under local anesthesia followed by application of Vaseline gauze and fluffs between the external ear and mastoid, and a soft gauze bandage is wrapped around the head. The patient should be re-examined in 24 hours for reaccumulation. Time loss from work, 0 to 2 days.

2. Simple lacerations present no difficulty in management and may be sutured, and a bulky pressure dressing is applied. They are anticipated to heal. Time loss from work, none.

3. Exposed cartilage presents a special problem. Debridement and complete coverage of all cartilage are key principles, and torn cartilage should be repaired. These usually heal readily. Maximum time lost from work, only with the most serious injuries, five days.

4. Large auricular avulsions may need to be reanastomosed by an otolaryngologist or plastic surgeon. This will require follow-up visits. Loss of work may be minimal depending on the type of work, but maximum time lost from work, two weeks.

5. Large circumferential lacerations to the external auditory canal may lead to stenosis of the canal and these mandate referral to an otolaryngologist. Loss of time from work, 1 to 2 days.

6. Burns to the auricle require removal of devitalized tissue and antibiotic ointments to protect the underlying cartilage. Time lost from work, none.

7. Chemical burns may follow exposure to acids or alkali. Primary treatment consists of immediate irrigation with several liters of water, identification of the toxic chemical and should be treated primarily as a burn. No loss of work anticipated. No time lost from work.

8. Simple perforation of the tympanic membrane generally heals in four to six weeks, some use of antibiotics if there are definite signs of contamination. Failure to heal will require an ENT referral. Patient to be instructed to keep water out of ear until perforation has healed. No loss of time from work anticipated.

#### IV. ANTICIPATED OUTCOME

Full Recovery.

### INJURY TO THE MIDDLE EAR

#### I. BACKGROUND

The middle ear cavity is connected with the nasal pharynx by the eustachian tube and is intimately related to injury or diseases of both structures.

The primary trauma to the middle ear is barotrauma due to changes in barometric pressure and blunt trauma. Severe injury can disrupt the ossicular chain with conductive hearing loss or cause a perilymphatic fistula resulting in vertigo and sensorineural hearing loss.

Tympanic membrane perforations secondary to thermal burns as well as slag-bur injury and perforations from direct trauma to the ear drum from foreign body.

## II. DIAGNOSTIC CRITERIA

Examination of the ear looking for retraction, or perforation of the tympanic membrane as well as evidence of effusion or hemotympanum. A neurological examination should be performed looking for evidence of vestibular disfunction (nystagmus). Patient should have an audiogram and if clinically indicated (vertigo) a fistula test can be performed by an audiologist, but only after examination by otorhinolaryngologist.

## III. TREATMENT

1. Antibiotic if URI is present, oral steroids may reduce eustachian tube edema. No loss of time from work.
2. Patient with vestibular findings requires an emergency ENT referral. There may be no time lost from work, but this would depend on the ENT referral, including the severity of the vertigo and the type of work the patient is involved with.

## IV. ANTICIPATED OUTCOME

This depends on how much damage has occurred.

## TRAUMA TO THE INNER EAR

### I. BACKGROUND

Trauma may result from blunt injury causing temporal bone fracture, blast injury, noise exposure or toxic injury. Vestibular, cochlear or facial nerve function may be affected.

### II. DIAGNOSTIC CRITERIA

Radiologic evaluation with blunt trauma is of limited value. An MRI or CT Scan may show the fracture. The physical examination may reveal the discolored tympanic membrane and may show the fracture through the external canal. The neurological examination may reveal facial paralysis, perforation of the tympanic membrane with CSF

leak. The patient should be examined for evidence of hearing loss (Hearing Test) or vestibular dysfunction (ENG) by an otolaryngologist.

### III. TREATMENT

1. CSF Leak. One should watch for a cerebral spinal fluid leak and if this persists may require a neurosurgical consultation and repair, usually a combined procedure performed by an otolaryngologist and neurosurgeon. The use of antibiotics is controversial, more recently it is felt that they are not useful in this situation.

#### 2. Hearing Loss.

a. Nerve hearing loss, there is no surgical treatment although amplification devices may be required.

b. Conductive hearing loss.

1. Repair of tympanic membrane perforation. Time lost from work with surgery, maximum one week.

2. Repair of disrupted ossicles. Time lost from work with surgery, maximum two weeks.

3. Facial paralysis may require nerve repair or a form of re-animation procedures of the facial muscles. Time lost from work would be variable in this case, but not more than three days.

#### 4. Vestibular Injury.

a. Vestibular suppression medications such as Antivert, Valium or Klonopin.

b. If the vertigo becomes disabling and persists after six months of treatment with the above medications, then vestibular destructive surgery either with labyrinthine destruction or vestibular nerve section may be required. Loss of time from work would be two weeks following surgery.

### IV. ANTICIPATED OUTCOME

This depends on how much damage has occurred.

## WORK-RELATED HEARING IMPAIRMENT DUE TO NOISE

### I. BACKGROUND

Hearing impairment due to noise may occur in the workplace. An effort has been made by the American Academy of Otolaryngology Committee on Hearing and Equilibrium and the American Council of Otolaryngology Committee on the medical aspects of noise.

### II. DIAGNOSTIC CRITERIA

#### A. Pertinent Historical and Physical Findings.

The history consists of impairment of hearing. The Hearing Conservation Program requires employers to monitor noise exposure levels in a manner that will accurately identify employees who are exposed to noise at or above 85 decibels (dB) averaged over eight working hours. The exposure measurement must include all noise within an 80 dB to 130 dB range and must be taken during a typical work situation. Audiometric testing must be made available to all employees who have average exposure levels over an eight-hour period of 85 decibels.

### III. TREATMENT

Hearing protectors must adequately reduce the severity of noise in each employees' work environment.

The percentage loss is to be evaluated by an Otolaryngologist and Audiologist.

Protocol History:  
Passed: 3/30/1993  
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