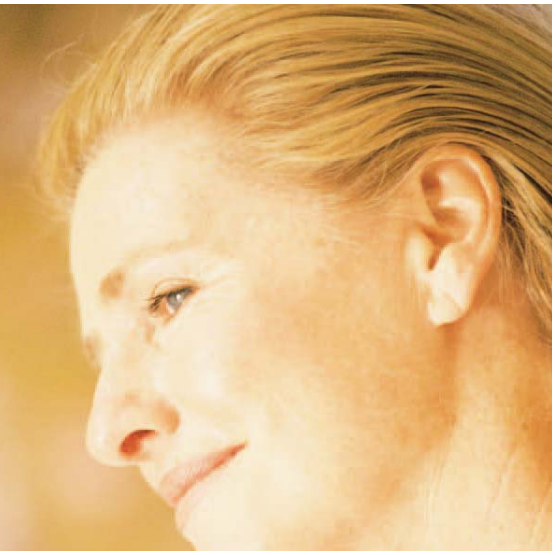

What to do about Ear Trauma: Investigating the Common Concerns

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1. How do I treat external ear trauma?
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The growing number of injuries caused by automotive, occupational, and military activities in modern industrial society has created an epidemic of trauma. Trauma is usually a surgical disease and, as such, trauma to the ear represents a common ear, nose, and throat (ENT) emergency. Since physicians who are not specially trained in otology often provide the initial care of ear injuries, proper recognition and treatment are critical to avoid possible complications, and to improve treatment outcomes.

Ear trauma is complex, as different harmful agents can affect different parts of the ear. The causative agents for ear trauma include mechanical and thermal factors, chemical injuries, and pressure changes. Depending on the type of trauma, either the external, middle, and/or inner ear could be injured.

Figure 1. Normal auricle.

How do I treat external ear trauma?

The external ear, consisting of the auricle and external auditory canal (EAC), is generally more vulnerable to physical trauma (Figure 1). The auricle is very vulnerable to both blunt and sharp trauma. The most common complication from blunt trauma to the ear is the formation of auricular hematoma (Figure 2). Failure

Figure 2. Post-traumatic auricular hematoma.

Figure 3. Primarily sutured lacerated ear canal.

to recognise and treat this condition early usually leads to an ugly deformity of the pinna known as a "cauliflower" ear. Collection of blood or serous fluid between the perichondrium and cartilage may be successfully treated by needle aspiration under sterile conditions followed by the application of a pressure dressing. If a hematoma recurs within 48 hours, formal incision and drainage are then required.

Sharp trauma to the ear causes lacerations to the pinna's cartilaginous framework. This requires minimal debridement and suturing of the perichondrium and skin in alignment with the remaining natural landmarks. Because the blood supply in this area is excellent, primary closure is usually successful, and even tenuous flaps will generally survive. The rare, but clinically significant, complication of severe injury, such as a through-and-through laceration of the EAC (Figure 3), can result in stenosis or false fundus formation (Figure 4) unless stented open.

The most common trauma to the ear in children is caused by foreign body (FB) impaction and from unsuccessful attempts at removal. Types of

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ear FBs vary from toy parts and wooden picks to cotton or paper balls, nuts, and grain. In the summer, especially during outdoor activity, live insects, buzzing and trapped in the EAC, can be very annoying and painful. Insects should first be drowned in mineral oil and then suctioned out. Soft or round FBs may be removed by gently inserting an ear curette or hook and rolling it outward. For sharp or irregular FBs, grasping and removing them with fine alligator forceps remains the best treatment. Special caution must be applied when dealing with potentially expanding organic FBs, like beans or nuts. Quick removal after dehydration of the FB with an alcohol solution may be helpful. For the correct syringing of impacted wax in the EAC, the jet of water should be directed posterior-superiorly in order to avoid injury to the EAC and tympanic membrane (TM). The popular non-medical practice of "ear candling" is not without risk for causing thermal burns to the ear canal.

Eardrops containing antibiotics are usually effective in preventing an external otitis resulting from secondary infection.

Figure 4. Development of a false fundus following primaril suturing EAC laceration.

Abrasions and lacerations of the EAC are common and may be caused either by the patient or by the well-intentioned physician trying to remove wax (Figure 5). Eardrops containing antibiotics are usually effective in preventing an external otitis resulting from secondary infection. Prescribing topical drops containing aminoglycoside in the presence of a TM perforation should be avoided.

Figure 5. Abrasions and hemorrhages in the ear canal.

Exposure of the ears to extreme outer temperatures may produce varying degrees of thermal injury. First-degree burns and frostbites are characterised by redness and swelling, and are highly sensitive to touch. Second-degree thermal injury is accompanied by blister formation due to extravasated extracellular fluid. Further exposure to extreme hot or cold causes

irreversible damage to the underlying cartilage, causing necrosis and severe deformity. The initial management usually includes local conservative treatment with gentle washing and application of antibiotic ointment in order to prevent secondary infection.

Figure 6. Traumatic perforation of the tympanic membrane due to welding injury.

Figure 7. Otoscopic picture of longitudinal temporal bone fracture.

How do I treat middle ear trauma?

Trauma to the middle ear is usually accompanied by ear pain and is sometimes also accompanied by bleeding from the ear, hearing loss, and ipsilateral facial weakness.

The curved shape of the EAC, with its narrow isthmus, hairs, and wax, help to protect the TM from direct injury. The pressure equalising function of the eustachian tube also helps to prevent TM rupture from excess pressure change. When these protective mechanisms fail, or extreme forces are applied to the ear or head, a traumatic perforation of TM may occur, usually in its central part. A traumatic perforation of the TM may be caused by direct trauma to the TM by a FB, explosive pressure changes from air or water, or as a result of head trauma with or without fracture of the temporal bone. The majority of traumatic TM perforations will heal spontaneously. If there is no evidence of infection, the use of topical antibiotics is not necessary. Prescription of eardrops containing gentamicin for longer than five to seven days, however, may result in ototoxicity and should be avoided. Conservative therapy in order to prevent a secondary infection is usually all that is required. Tympanoplasty is rarely necessary, except when a persistent perforation occurs. In welding spark injuries, for example, perforations of the TM are notoriously difficult to heal (Figure 6).

In conditions where rapid changes of external pressure (*i.e.*, airplane flight, diving, or an explosion) otic barotrauma may occur. Rupture of fine blood vessels in the middle ear causes a collection of blood on the inner surface of the TM or middle ear space, known as the hemotympanum. Prophylaxis of barotrauma during airplane flight depends especially on proper eustachian tube function. This can be provided by repeatedly performing Valsalva manoeuvres, the use of topical nasal and systemic

decongestants, or, on occasion, a preventive myringotomy with ventilation tube insertion.

Indirect trauma to the ear due to head injury, with or without skull fracture, may cause varying degrees of injury to middle ear structures. A TM hemorrhage may obscure ossicular fractures or disrupt the ossicular chain. Audiologic examinations, including pure tone, speech, and impedance testing, should be performed for an accurate diagnosis when possible, and may help further decide whether surgical intervention is indicated.

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How do I treat inner ear trauma?

The highly sensitive organs of hearing (cochlea) and balance (otolithic receptor and semicircular canals) are situated within the petrous part of temporal bone, surrounded by dense bone known as the otic capsule. Despite good protection from the firmest bone in the human body, these fragile inner ear elements are vulnerable to head trauma from longitudinal or transverse temporal bone (TB) fractures. A patient with history of head trauma, who demonstrates bleeding from the ear, a conductive hearing loss, and a step deformity at the level of the tympanic annulus on otoscopy (Figure 7 and 8), represents a classic example of a longitudinal TB fracture. Occasionally, a facial palsy (acute or delayed) may complicate this condition.

Severe head injury, typically after a blow to the occiput, may result in a transverse fracture across the bony labyrinth. The clinical picture of a transverse TB fracture includes a severe sensory-neural hearing loss, severe vertigo, and the immediate development of a facial palsy. Computed tomography (CT) scan of the temporal bone is a helpful tool for confirming the diagnosis.

Figure 8. Step deformity identified later in same patient. Note extrusion of incus into ear canal.

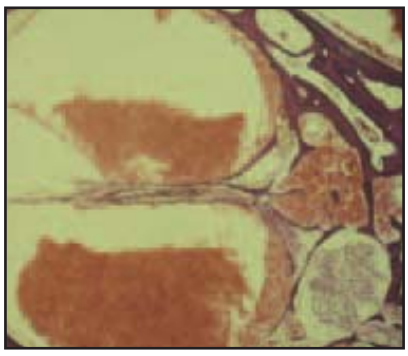

Figure 9. Traumatic cochlear hemorrhage.

Ear Trauma

Take-home message

- Trauma to the ear varies from a simple self-limiting injury requiring a conservative “wait and see” policy, to serious conditions involving loss of hearing or balance function.
- Initial evaluation of the patient with ear trauma should include a careful history, otoscopic examination, and a full audiogram if possible.
- Special attention should be focused on the early recognition of a facial nerve injury.
- When clinical suspicions arise, a CT scan is indicated to confirm/exclude a fracture of the temporal bone or a possible intracranial complication.

Injury to the inner ear also includes hemorrhage into the cochlea (Figure 9), membrane ruptures, and possible perilymphatic/cerebrospinal fluid (CSF) leakage. Damage to the inner ear with tinnitus (unwanted ear noise), fluctuating hearing loss, and vertigo after head trauma is possibly suggestive of a traumatic perilymphatic fistula from either the oval or round window membranes. Management of this condition initially includes bed rest with head elevation and close monitoring of hearing. In cases where further deterioration of hearing occurs, or other symptoms and/or persisting perilymphatic/CSF leakage is suspected, surgical repair would be indicated.

Later sequelae of trauma to the inner ear can also include post-traumatic benign positional vertigo (BPV) due to cupulolithiasis/canalolithiasis, or the phenomenon of delayed endolymphatic hydrops (DEH). Degenerative changes in the otolithic organs and epithelial lining of endolymphatic space are responsible for these conditions. Clinical findings of a positive Dix-Hallpike manoeuvre demonstrating positional rotatory nystagmus and dizziness in patients with previous head trauma is pathognomonic for post-traumatic BPV. The clinical signs of DEH can often mimic the presentation of Meniere's disease. Dx

Suggested Readings
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