

Dr. William Detar:

Hello, and welcome to the On-Call Consults in Less than 10 Minutes series on ENT in a Nutshell, a complement to Headmirror's online survival guide. I'm your host, Will Detar, and today we are joined by Dr. Matt Carlson, a board certified neurotologist. In this episode, we will cover temporal bone trauma. Let's jump right in.

The temporal bone houses important structures including the otic capsule, facial nerve, ossicles and carotid canal. Ruling out injuries to these structures is the primary immediate goal for patients with temporal bone fractures. Significant forces necessary to fracture the temporal bone and additional injuries, including maxillofacial, skull-based, or cranial injuries are commonly found. Dr. Carlson, can you tell us about the differential diagnosis for these?

Dr. Matthew Carlson:

Creating a differential diagnosis list for this episode doesn't apply great just because typically we're consulted for the chief complaint of temporal bone trauma, but in this setting, it's perhaps useful to develop a list of potentially associated sequela. In this setting, you're going to evaluate for facial nerve injury, carotid or jugular injury, CSF leak, ossicular disruption, tympanic membrane rupture, otic capsule fracture, labyrinthine concussion with hearing loss, traumatic BPV and other concomitant maxillofacial, cranial or spine fractures.

Dr. William Detar:

What history should we focus on when seeing these patients?

Dr. Matthew Carlson:

Very important is the mechanism and timing of injury. Is this blunt trauma, penetrating trauma or ballistic injury? You want to ask about loss of consciousness, hearing loss, vertigo, otorrhea, diplopia or other symptoms of cranial nerve injury including facial nerve paralysis. With regard to facial nerve paralysis, two of the most important aspects are the timing of it and the severity of it.

If it's possible to elicit the history, it's very beneficial to know if the patient has facial paralysis when you evaluate them, whether it had immediate onset after the event, or if this was something that developed several days following the event. Then you'll want to look for a history suggestive of syncope or seizure because this might require an additional workup beyond just the issue of temporal bone trauma and then a detailed otologic history standard.

Dr. William Detar:

What key supplies do you recommend we bring when seeing these consults?

Dr. Matthew Carlson:

Otoscope, a 512 hertz tuning fork to assess hearing loss, a cerumen curette, a suction trap if fluid collection for CSF analysis is anticipated, an ear wick if there is significant narrowing from trauma. If cleaning debris from the ear canal, you'll need an operating microscope or at least loops, several speculums, suction, and a suction source.

Dr. William Detar:

Can you tell us about the physical examination on these patients?

Dr. Matthew Carlson:

For this episode, we'll assume that the primary and secondary trauma survey have already been performed. You want to perform a detailed facial nerve examination if possible. However, oftentimes the patient is sedated or might have altered mental status just from their event or their trauma. In this setting consider asking the ICU to hold sedation or any potential paralytic to enable a more accurate exam, if clinically appropriate. In a sedated patient or one with altered mental status, a detailed facial nerve exam may be challenging. In this setting, the main goal is to determine if the nerve is grossly intact, partially paralyzed or fully paralyzed.

You'll also want to perform a detailed cranial nerve examination and neurological exam. You can evaluate for Horner syndrome, which may indicate a petrous carotid injury. You'll evaluate for spontaneous nystagmus, which may indicate stapes subluxation or otic capsule fracture. You'll perform a 512 hertz tuning fork examination. With a conductive hearing loss from temporal bone fracture, you'll expect the Weber to lateralize to the affected ear and bone to be greater than air conduction in most cases.

In contrast, if you're suspecting primarily a sensorineural hearing loss, the Weber will lateralize to the contralateral ear, and typically air will be greater than bone conduction. It's often less clean than that. It's often a mixed hearing loss, if you have a sensorineural component. With regard to otoscopic examination, there's frequently cerumen and bloody debris that has to be removed first from the external auditory canal in order to see the TM.

Oftentimes ear canal lacerations and hemotympanum are present. You want to look for copious clear otorrhea. Although evaluation for CSF otorrhea is challenging in the acute setting with mixed blood, it's still prudent to do so. You'll often hear the clinical presentation of a ring sign presented. In reality, a ring sign is not sensitive or specific for a CSF leak.

Dr. William Detar:

What diagnostic workup do you order in the acute setting?

Dr. Matthew Carlson:

Ideally if you're consulted for temporal bone trauma, it's best to get a high resolution temporal bone CT scan, and even better is a high resolution CT scan with thin cuts and dedicated planes of the entire skull base. You can settle for a head CT with reformats, although it's less ideal. You'll want to perform a systematic review of structures including the otic capsule, the internal auditory canal, facial nerve path, ossicles, external auditory canal, middle and posterior fossa, bony plates, TMJ and vascular structures. If you identified a questionable fracture, you might compare it to the contralateral unaffected side just to make sure you're not just seeing a natural suture line.

Focal mastoid opacification may direct your eye to a smaller occult fracture line. Pneumolabyrinth may indicate an otic capsule fracture or dislocated stapes footplate. Even scant pneumocephalus should raise concern for a possible CSF leak. These are sort of these indirect signs that should draw your eye or draw your attention to certain parts of the scan. There are several classification schemes for temporal bone trauma. However, pragmatically it's best to simply describe whether the otic capsule is involved or fractured and whether other important structures are involved. I always consider reviewing your films with an on-call neuroradiologist, if they're available.

Electro-diagnostic testing of the facial nerve may be considered if complete facial paralysis is present on exam, but this is generally not ordered until at least three days after paralysis onset and is generally only performed based on the preferences of the presiding staff surgeon. It's often a nuanced

decision. Collect and send any fluid for Beta-2 Transferrin, if a CSF leak is suspected. Consider placing it on ice to preserve the sample, if there's any significant delay anticipated between collection and testing. Although uncommon, angiography may be required in cases of a suspected significant vascular injury.

Dr. William Detar:

Can you tell us about the acute treatment for these patients?

Dr. Matthew Carlson:

General measures. Most patients, or very commonly patients will have involvement of their ear canal, debris in their ear canal and potential bony fracture and a skin laceration so clean the ear canal of debris. Possible placement of a ear wick if it's very narrow. An ototopical medication is commonly employed for most patients. If facial nerve paralysis is present, you want to institute aggressive eye cares with artificial tears, lubricating eye ointments and precautions to avoid inadvertent corneal injury. High-dose systemic steroid therapy is generally prescribed in less contra-indicated alongside a proton-pump inhibitor for GI prophylaxis.

We generally don't consider surgery for a partial paralysis or a delayed paralysis as both of these portend a good prognosis. Surgery is generally indicated for cases of complete paralysis where bony impingement of the fallopian canal is seen or in cases where significant neurodegeneration is seen on ENOG or evoked EMG is seen. The decision to perform surgical decompression is very nuanced and will be reviewed with your attending physician. It's beyond the scope of discussion in this podcast.

With regard to hearing loss, if sensorineural hearing loss is suspected, an audiogram should be obtained soon if feasible to confirm the diagnosis. If present, high dose steroids should be instituted. For conductive hearing loss, generally an audiogram is obtained two to three months following the event to allow middle ear effusion to resolve. CSF leaks are generally managed initially conservatively with bed rest, limiting strenuous activities and stool softeners. Less commonly, a lumbar drain or use of Diamox or Acetazolamide may be considered under joint decision-making with the neurosurgical service.

Most cases of traumatic temporal bone CSF leak self resolve within a week and do not require further treatment. Use of prophylactic antibiotics for active CSF leak is controversial, but most centers will consider use, but you should consult with your attending physician. Other referrals including a neurosurgery consultation is prudent, if there's associated intracranial injuries or CSF leak. Referral to Neurology may be indicated, if electro-diagnostic testing is being pursued.

Dr. William Detar:

Can you tell us about the disposition and followup for these patients?

Dr. Matthew Carlson:

Most patients with temporal bone trauma have sustained a significant injury and are admitted for care of their associated injuries. Isolated temporal bone fractures can be managed as an outpatient using the guidelines provided above. Uncomplicated cases may follow up in clinic for ear canal cleaning as needed and an audiogram two to three months following injury. Facial nerve paralysis and sensorineural hearing loss may require a closer followup depending on the severity and patient specific needs.

Dr. William Detar:

This concludes our temporal bone trauma episode for On-Call Consults in Less Than 10 Minutes. As always, we appreciate you joining us, and thank you, Dr. Carlson.