Describe what you see in this clinical photograph

This is an endoscopic photograph of a left ear canal and tympanic membrane. The ear canal that is visible appears normal but the tympanic membrane is deep red in colour and my initial impression is that this is a haemotympanum.

If the likely diagnosis is obvious from a clinical picture then do not be afraid to give your opinion from the outset. If you are not certain, particularly...
If you have not been given any more clinical information, then giving a list of differential diagnoses is just as acceptable.

This patient sustained a head injury 2 days previously and you have been asked to see him because of hearing loss. He also has some bruising behind his ear. What diagnosis would you consider possible given this history?

A haemotympanum in a patient with a history of head injury is highly suggestive of a temporal bone fracture. This patient also demonstrates the classic appearance of Battle’s sign which supports this diagnosis.

Do you know any ways of classifying temporal bone fractures?

The most commonly used method of classifying temporal bone fractures is to divide them into longitudinal or transverse depending upon the direction of the fracture line compared to the direction of the long axis of the petrous temporal bone. Longitudinal fractures account for approximately 80% of temporal bone fractures. They tend to run along the line of the external ear canal, across the roof of the middle ear and along the long axis of the petrous temporal bone anterior to the otic capsule. It is generally caused by a blow to the temporoparietal region and, because the fracture is more likely to run through the middle ear, CSF leak is more frequently associated with this type of fracture. Transverse fractures are much less common accounting for approximately 20% of fractures. They are usually caused by a higher energy injury to the occipital or frontal region. These patients are more likely to have significant brain parenchymal injury and so the possible complications of the temporal bone fracture may not be initially apparent to clinicians managing the acute brain injury. The fracture line runs perpendicular to the long axis of the petrous temporal bone and both the labyrinth and internal auditory meatus are more likely to be involved. As a result of this, sensorineural hearing loss, vertigo and VII nerve injury are more commonly associated with this type of injury.

In actual fact CT studies have revealed that this classification system is flawed as the vast majority are oblique and quite often mixed. Despite this finding, this remains the most commonly used system of classification. An alternative classification system is based upon whether the otic capsule is involved in the fracture line or not. A fracture involving the otic capsule is much more likely to be associated with both intratemporal and intracranial complications and so this radiological classification could be considered to carry more clinical significance.

At this point in the viva it is likely that the examiner will want to discuss one or more of the complications of temporal bone fractures. If you know your knowledge is strong in one particular area, such as the management of facial nerve paralysis, you may be able to direct the questioning in this direction.

The remainder of this article goes on to discuss...
other questions which could be asked in the exam. In reality you would probably only be able to discuss one topic before the examiner moved on to a new question, as each examiner usually has to get through 3 topics in the 15 minutes allocated.

You request an audiogram for this patient and this is the result that you receive (Audiogram 1). What type of hearing loss has the patient sustained?

An audiogram is an excellent way of starting an otology viva question. It is important that you understand symbols that used on a pure tone audiogram. It would not be uncommon to be presented with an incomplete audiogram and so you should be familiar with the process of performing an audiogram, particularly when masked thresholds are indicated. A session spent with an experienced audiologist supervising you performing audiograms is an invaluable way of improving your understanding of the process.

This audiogram demonstrates that the left patient has a moderate to severe hearing loss in the ear and normal hearing in the right ear. It is not possible to tell from this audiogram what type of hearing loss this is because the audiogram is incomplete. The difference between the air conduction thresholds is more than 40dB and so masked air conduction thresholds are required for the ear.

The air conduction thresholds are demonstrated to be true thresholds after masking. The unmasked bone conduction thresholds reflect the hearing in the good ear and so masking is required to establish the bone conduction thresholds. It will then be apparent whether the hearing loss is conductive, sensorineural or mixed, all of which are possible in a patient with a history of temporal bone trauma.

The completed audiogram reveals normal bone conduction thresholds in the left ear (Audiogram 2). How would you manage this patient’s hearing loss, assuming there are no other effects from his head injury?

Because the patient clinically has signs of a haemotympanum his hearing loss is likely to be secondary to this. I would explain to the patient that he has not sustained any sensorineural damage to his hearing and his hearing may recover to normal after the haemotympanum has resolved. I would arrange a review appointment in 2 months time to reassess his hearing. If he has not already had a high resolution CT scan I would arrange for one to be performed in the meantime.

The patient returns and although the haemotympanum has resolved he still has a mild to moderate conductive hearing loss and the following CT findings. (Figure 1)

This is an axial CT through the temporal bones at the level of the internal auditory meati. Both mastoids are well pneumatised and there is no evidence of any residual blood in the middle ear. On the right side the head of the malleus and body of the incus are clearly seen. On the left side, however the incus appears to be absent or displaced. There is also a probable fracture line visible in outer table of the mastoid bone. Although
only one section is visible, this CT scan is highly suggestive of a left sided temporal bone fracture which has resulted in a dislocation of the incus and a subsequent conductive hearing loss.

**These abnormalities are fairly subtle and may not be obvious at first glance, particularly with the anxiety associated with the viva situation. The examiner would expect you to be able to describe the CT and point out some normal anatomical structures. If the abnormalities are subtle then the examiner will guide you towards the area of the abnormality to give you the opportunity to then discuss the findings.**

**How would you manage this patient’s hearing loss?**

I would first explain to the patient what the problem is and why he has the hearing loss. I would then want to know how much of a handicap the hearing loss is causing the patient and whether they felt they needed any intervention. Not all patients with a unilateral hearing loss find it to be a significant handicap and are happy to manage without treatment. Assuming the patient was having problems I would explain their options to them. The first line of management of a conductive hearing loss is with a conventional hearing aid. This should produce good functional results. Some patients find wearing a hearing aid problematic, either due to the occlusion effect or exacerbation of otitis externa. If this is the case then there are surgical options available. A bone anchored hearing aid (BAHA) or ossiculoplasty would both be a possibility. In the first instance I would recommend a trial of a hearing aid.

**Assuming the patient has returned after a trial of hearing aid and is keen to consider an ossiculoplasty rather than continue to wear a hearing aid. What would you discuss with the patient before deciding whether to go ahead with surgery?**

When considering middle ear surgery to improve hearing it is important to make the patient aware of the limitations of surgery in order that they have realistic expectation. It is likely that an ossiculoplasty would be technically possible as the malleus and stapes are technically possible as the malleus and stapes are technically possible as the malleus and stapes are unlikely to be affected by the injury. Successful surgery could therefore result in the patient having normal hearing. However, I would explain that outcomes from ossicular surgery are variable and there may not be complete closure of the air bone gap. According to the ‘Belfast rule of thumb’ patients are only likely to gain significant hearing benefit if the interaural difference is reduced to ≤15dB. Since the hearing in the right ear is normal there is a possibility that the hearing in the left ear could be improved audiometrically but the patient would not perceive great benefit. I would also explain that ossicular surgery can result in a sensorineural hearing loss, although this would be extremely rare. I also routinely mention the possibility of damage to the chorda tympani in middle ear surgery.

**How would you manage a patient with cSF leak occurring as a result of a temporal bone fracture?**

In some ENT departments a cSF leak would always be managed on a Neurosurgical ward. If you have not been responsible for the management of cSF leaks it is reasonable to say so. You would however be expected to have a basic understanding of the management of cSF leaks. It is not acceptable to simply say that you would ask a Neurosurgeon.

Csf leak is a common complication of temporal bone fracture occurring in approximately one third of cases. More commonly it presents as cSF otorrhoea, although if the tympanic membrane is intact it can present as cSF rhinorrhoea. If a cSF leak is suspected a sample should be tested for beta-2-transferrin levels.

**At what stage would you consider surgical closure of a leak and what surgical approaches could be used?**

If a cSF leak persists despite the use of a lumbar drain for 5–7 days I would consider surgical closure as persistent cSF leaks are at increased risk of meningitis. If the defect is small and accessible it could be closed via a transmastoid approach. Larger defects would require intracranial closure usually via a middle fossa approach.

**You mentioned the risk of meningitis associated with cSF leaks. Would you prescribe prophylactic antibiotics for this risk?**

The literature remains controversial on this subject. Some authors still recommend the use of antibiotics but the majority do not. This means that there is not any one answer that is absolutely correct. The examiner will be looking for an answer along with a reasoned explanation for your management plan.

I would not recommend prophylactic antibiotics as there is little evidence to support the fact that they protect against meningitis. There is also a risk that if meningitis occurs in patients on prophylactic antibiotics the infective organisms are more likely to have antibiotic resistance possibly delaying successful treatment.

**How would you manage a patient who has a facial nerve palsy complicating a temporal bone fracture?**

The management of patients who have facial nerve palsy is often complicated by the severity of any associated brain injury which often leads to delayed diagnosis of the weakness and therefore uncertainty about the time of onset of the weakness. It is worth mentioning this to the examiner before outlining what your management plan would be. As with any controversial area it is good to have a reasoned management plan whilst being aware that there are
The management of a facial nerve paralysis is influenced by two factors – the timing of the onset of paralysis and the completeness of paralysis. If the facial nerve weakness is immediate and complete then surgical intervention may be indicated, depending on the findings on high resolution CT scanning of the facial nerve and results of electroneuronological studies. If the CT scan demonstrates a definite transection of the nerve then early exploration and anastamosis or cable grafting is indicated. If there is doubt about the integrity of the facial nerve but no definite transection on the CT scan then serial electroneuronography should be performed to assess the degree of nerve degeneration. If more than 95% neuronal degeneration has occurred within 14 days then surgical exploration and decompression should be considered. Exploration in this situation is controversial as there is little or no evidence that outcome is improved. Patients who develop a delayed facial nerve weakness or have an incomplete paralysis should be managed conservatively. The prognosis in this situation is extremely good with the majority of patients recovering to a House-Brackmann grade of I or II. If a facial nerve weakness becomes complete soon after injury then management mirrors that of an immediate injury with no radiological evidence of a transection.

What surgical approach would you use to explore a facial nerve injury?
Since this is a rare procedure you may not have actually seen a case. You should however be familiar