MALIGNANT OTITIS EXTERNA

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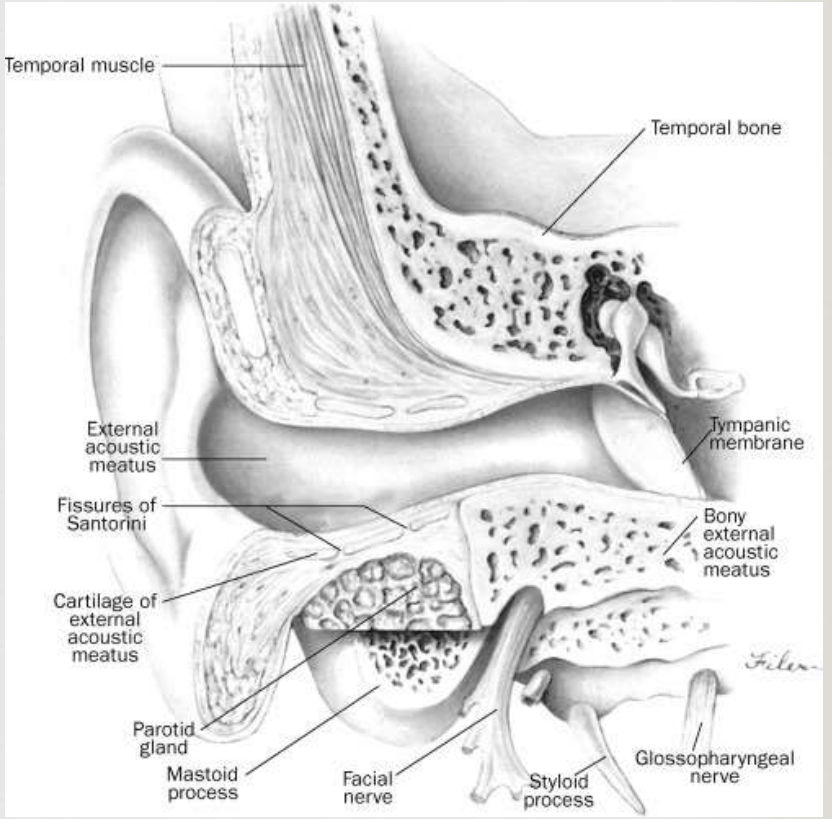
Malignant otitis externa

- Progressive necrotizing OE is classically known as (MOE) and represents an aggressive infection of the EAC, mastoid, and skull base that can be life threatening.
- The infection begins in the soft tissues of the EAC and spreads to the skull base via the fissures of Santorini and to the stylomastoid foramen and jugular foramen via the tympanomastoid suture.



MOE

- Unlike other infections of the temporal bone, it does not spread through the pneumatized tracts, and the middle ear is rarely involved until late in its course.
- Spread to the dural sinuses occurs via venous channels and facial planes.

Malignant otitis externa

- MOE is a rare disorder; most patients are **elderly and have diabetes.**
- The percentage of MOE patients with glucose intolerance may be as high as 90%.
- reasons for this correlation…… microangiopathy in the ear canal and increased pH of the cerumen of diabetics.
- MOE …… in other immunocompromised states, such as myeloid malignancies, pharmacologic immunosuppression, and HIV/AIDS.
- More rarely in immunocompetent patients.

Pathogenesis in MOE

- **P. aeruginosa** is the most common organism, more than 90% of cases;
- other causative organisms include S. aureus, S. epidermidis, Proteus mirabilis, Klebsiella oxytoca, and fungal species.
- Fluoroquinolone-resistant Pseudomonas is an increasing problem and is particularly concerning because the fluoroquinolones are the only enterally administered antibiotics with antipseudomonal activity.
- Fungal MOE has been reported and is most commonly associated with HIV-positive patients.
- The causative organism is most commonly **Aspergillus fumigatus.**

MOE

- Before the discovery of effective antibiotics, MEO had a mortality rate of up to 50%. Since the introduction of ciprofloxacin and other antipseudomonal agents in the 1990’s, the survival rate has improved .

Diagnostics criteria of MEO (Cohen and Friedman)

- Major (obligatory) signs
- 1) Pain
- 2) Exudate
- 3) Edema
- 4) Granulations
- 5) Microabscesses
- 6) Positive Technetium-99 (99Tc) scan of failure of local treatment after more than 1 week

- Minor (occasional) signs
- 7) Pseudomonas
- 8) Positive radiograph
- 9) Diabetes mellitus
- 10) Cranial nerve involvement
- 11) Debilitating conditions
- 12) Old age

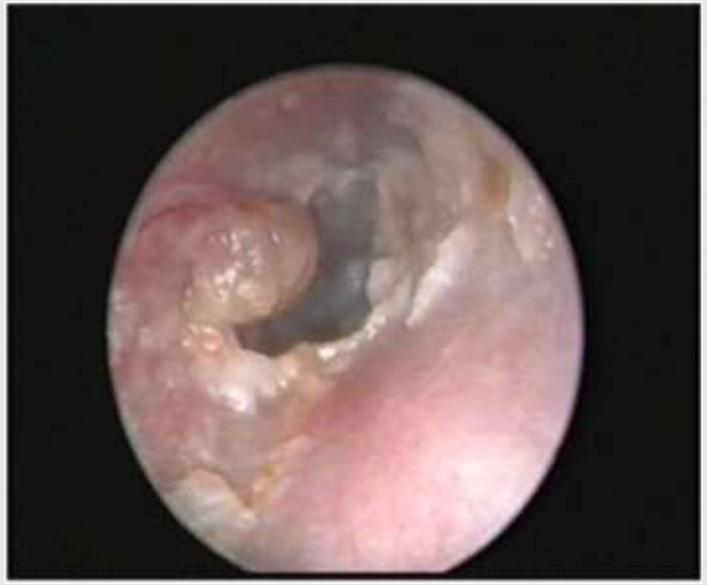
- The diagnostic criteria of malignant external otitis (MEO) was divided into two categories: obligatory and occasional. All of the obligatory criteria must be present in order to establish the diagnosis. The presence of occasional criteria alone does not establish it.

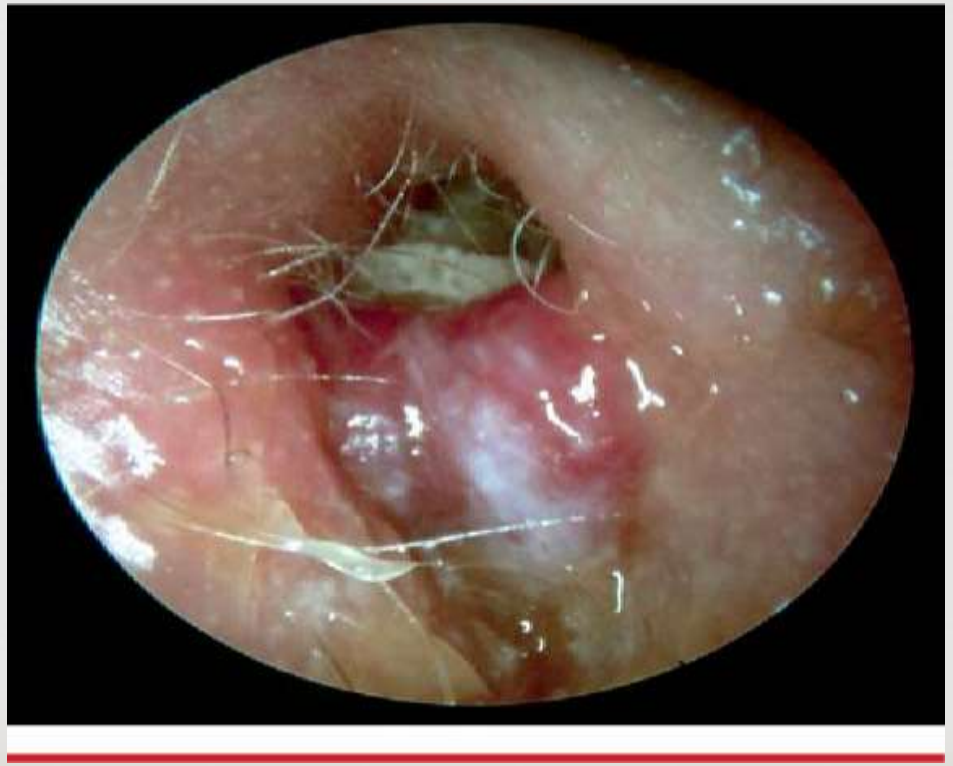
Signs and Symptoms

- Signs and symptoms:
  - severe, long-standing otalgia that is often worse at night
  - otorrhea
  - neurologic deficits of cranial nerves VII to XII.
- The facial nerve is the most commonly affected nerve due to involvement of the stylomastoid foramen, and **children are more likely to have facial palsy than adults**.

Signs and Symptoms

- A finding of granulation tissue at the bony cartilaginous junction of the EAC is pathognomonic for MOE.



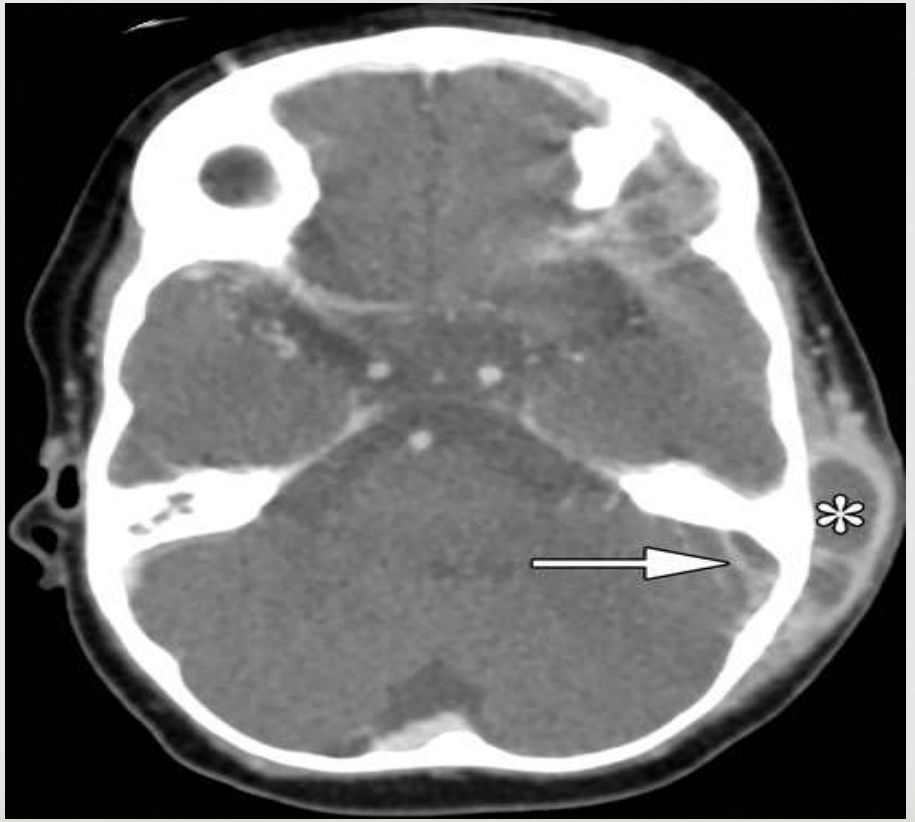


Signs and Symptoms

- Many patients will not present with the classic findings, however, and delayed diagnosis can lead to significant morbidity and mortality.
- A high index of suspicion must be maintained, especially in patients with otalgia out of proportion to their clinical exams.
- As the infection moves intracranially, meningeal signs become apparent, including headache, neck stiffness, fever, and altered level of consciousness.

Signs and Symptoms

- Septic thrombophlebitis of the sigmoid sinus may also occur, leading to picket fence–type spiking fevers.



LAB data

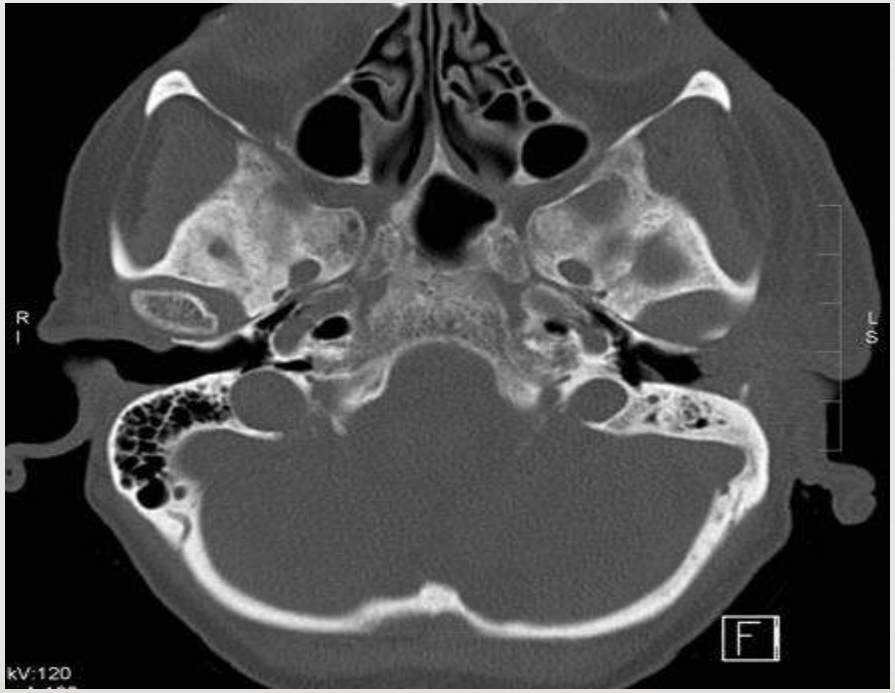
- **ESR** only laboratory abnormality and may be markedly elevated.
- Although nonspecific, the ESR indicates a state of inflammation in the body and can be used to **follow treatment response** and recurrence.
- Bacterial and fungal cultures should be collected if MOE is suspected, and tissue sent for histopathology to rule out neoplasm.
- SCC of the temporal bone may present with similar otalgia and otorrhea, and imaging studies alone cannot differentiate between MOE and malignancy.

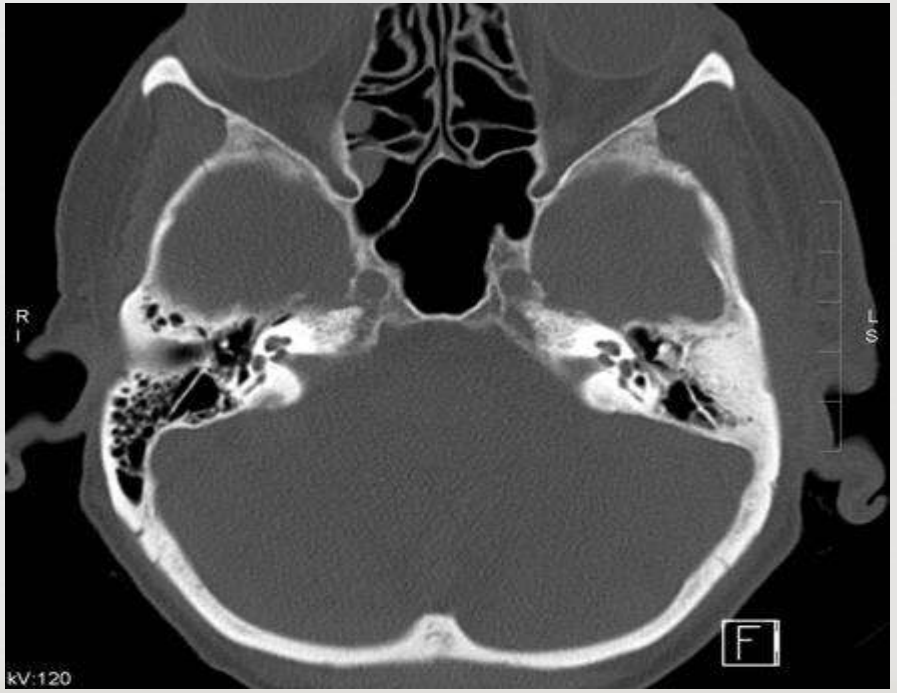
MOE

- Anatomic and physiologic imaging is fundamental to the diagnosis and monitoring of MOE.

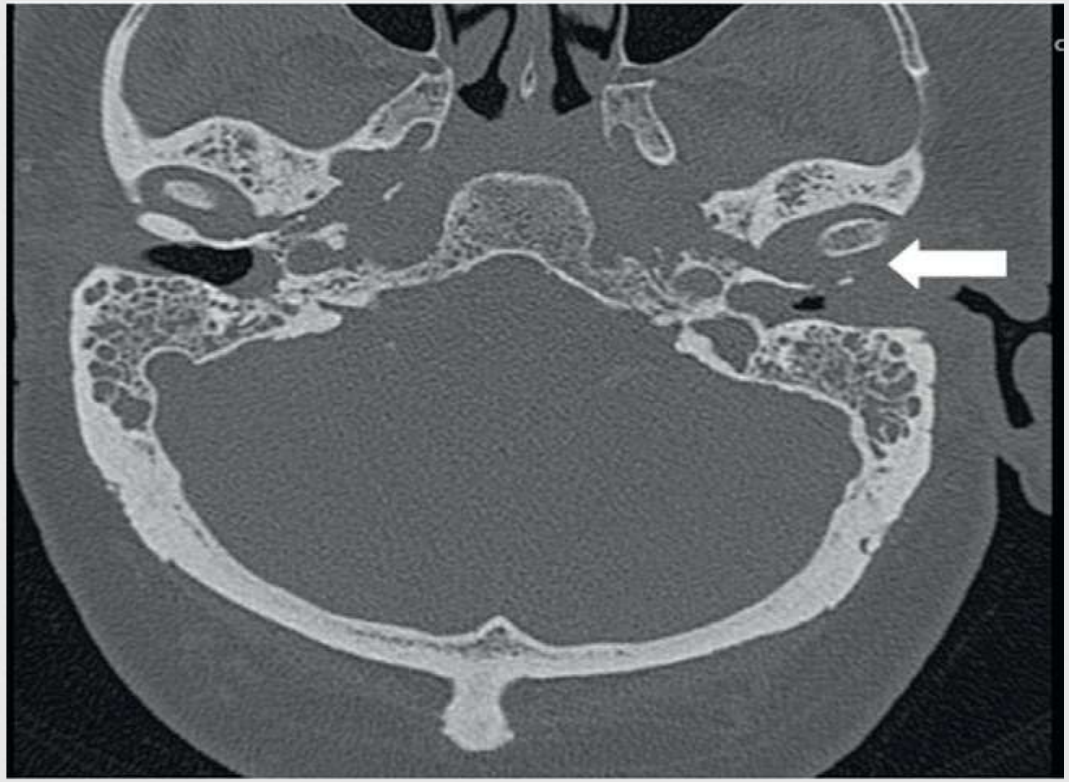
Imaging

- High-resolution CT scans are useful first-line test relatively inexpensive.
- Findings on CT : cortical bone erosion(even small cortical erosion of the tympanic bone) and abnormalities of the soft tissues inferior to the temporal bone and along the skull base .





Imaging



Imaging

- Disadvantages of CT :
  - underappreciation of the soft tissue and intracranial extent of disease
  - the inability to distinguish infection from malignancy.
  - limited in following the response to treatment.

Imaging

- MRI may show dural enhancement.
  - These are more likely to resolve with treatment, making MRI more useful in following the course of disease.
- Soft tissue changes in the tissues immediately surrounding the EAC will be evident on CT. If these are normal, MRI may not be necessary.

Imaging

- Technetium-99m bone scanning shows areas of **osteoblastic activity** and is highly sensitive for bony infection.
- Although magnetic resonance imaging (MRI) misses subtle bony erosion, it is superior in detecting soft tissue changes and tomography (SPECT) can be used SPECT provides good anatomic localization and may highlight areas of bony involvement before the CT scan shows structural changes, making it particularly useful when the clinical suspicion for malignant OE is high but the CT scan is negative.

Imaging

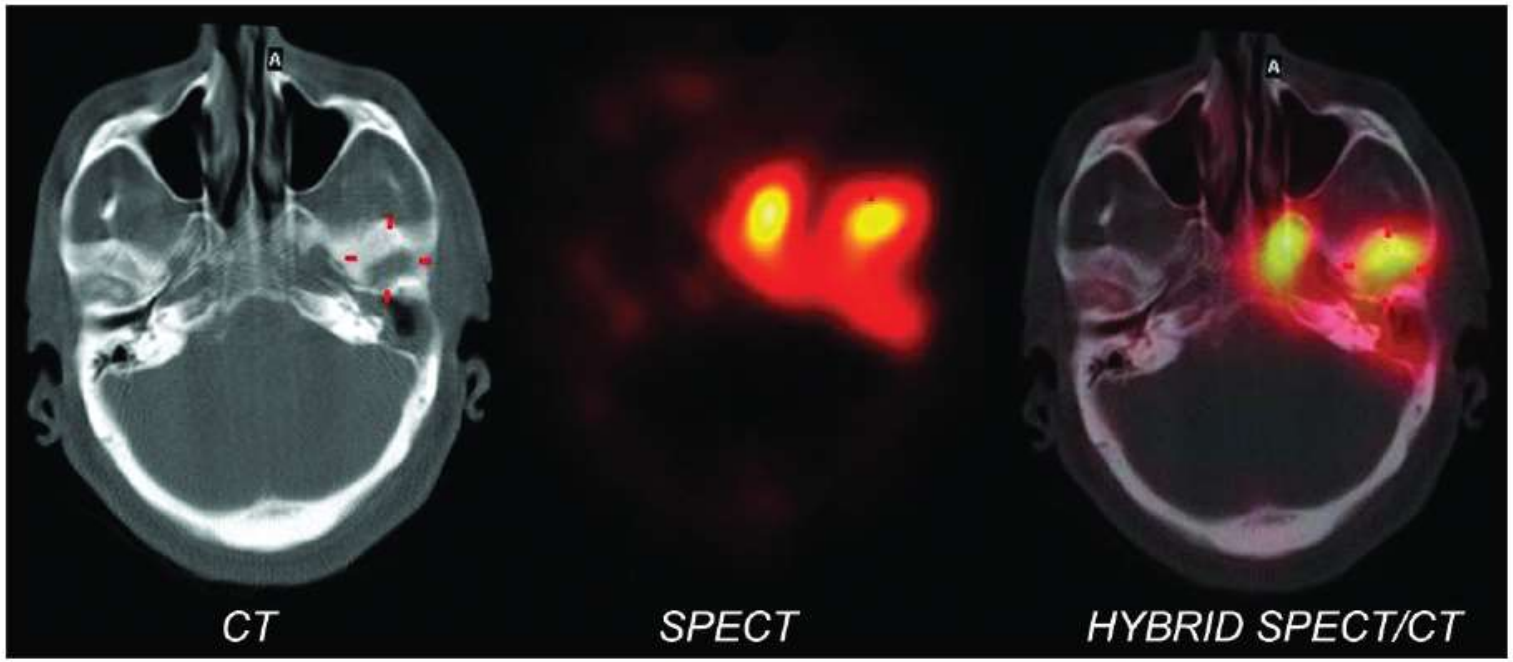


Figure 2: Hybrid single photon emission tomography/computed tomography of the skull (transaxial view) of the patient in Figure 1 shows increased trace
the petrous part of the left temporal and sphenoid bones with corresponding destructive bony changes

Imaging

- Because bony repair persists long after the infection has resolved, the technetium bone scan is not used to follow response to treatment. Caution should be exercised in interpreting these scans because, despite their sensitivity, they do not distinguish between infection and neoplasm. Thus the need for biopsy may exist despite a positive scan.

Imaging

- Gallium-67 citrate and indium-111–labeled leukocyte scans show areas of inflammatory cell activity. These tests are sensitive and uptake values return to normal quickly with resolution of infection, making them useful in following response to treatment

Imaging

- These are expensive and time-consuming tests to perform, and false-positive results may occur secondary to inflamed soft tissues surrounding bone.
- A greater degree of diagnostic accuracy (and greater expense) may be afforded by the simultaneous acquisition of a SPECT technetium-99m bone scan and indium-111–labeled leukocyte scan.

Treatment

- Treatment for MOE is dependent on early diagnosis and aggressive medical therapy with pseudomonal coverage.
- Some also advocate continuing treatment until a negative gallium scan has been obtained. (scan findings often lag behind disease resolution, and waiting may lead to overtreatment).
- Early infections may be treated with an oral fluoroquinolone (ciprofloxacin).

Treatment

- **culture-negative patients** : Ceftazidime (or aztreonam for penicillin allergic patients) IV + oral ciprofloxacin + topical aminoglycoside/steroid drops
- However, there is no evidence of the effectiveness of topical antibiotics.
- Blood glucose levels should be aggressively treated and any immunocompromised states reversed.
- Control of the patient’s diabetes may also be a sign of resolving infection case of resistant organisms.
- More advanced cases may require parenteral antibiotics initially, with transition to oral fluoroquinolones for discharge to home.

Treatment

- **Typical duration of treatment is 6 weeks, and it should not be discontinued until the clinical exam and ESR have returned to normal.**
- Hyperbaric oxygen therapy has been used as an adjunct to medical therapy. Multiple case reports have described resolution of infection in previously resistant cases , but it has never been proven effective by a randomized controlled study. Even in the absence of such evidence, some advocate its use, **especially in cases of facial nerve palsy**.

Treatment

- **Amphotericin B** is the most common treatment for fungal MOE. However, this agent carries significant side effects.
- **Voriconazole and itraconazole** have also been used on a more limited basis.
  - Voriconazole is the recommended first-line treatment for invasive aspergillosis in general, as it can be taken by mouth and obtains predictable therapeutic levels.
  - Due to the rarity of this entity, there are no comparative data evaluating the effectiveness of amphotericin versus voriconazole.

Treatment

- The role of surgical treatment for this disorder has never been critically evaluated, but it remains limited.
- Surgical debridement of nonviable sequestra of bone has been mentioned; however, it remains unclear when surgical resection is mandated.
- Involvement of bone occurs along the skull base, so traditional mastoidectomy should theoretically not be effective in debriding the infection.
- Similarly, because the facial nerve is involved in the region of the stylomastoid foramen, facial nerve decompression of the proximal segments would seem to be inappropriate.

Treatment

- The most important factor in surgical intervention is tissue biopsy, which can aid in differentiating MOE from malignancy, of which there is significant clinical and radiographic overlap.
- Medical therapy for this disorder seems paramount. Surgical resection should be reserved for cases in which bone involvement is resistant to therapy. In these cases, surgical intervention would include a wide resection of the bony skull base, including the stylomastoid foramen and jugular bulb, together with the introduction of viable, vascularized tissue (e.g., temporalismuscle flap or microvascular free tissue transfer) into the bed.

prognosis

- MEO has become a treatable disease with the advent of new antibiotics. However, despite the treatment, the prognosis worsens once skull base osteomyelitis or other complications develop.
- Many factors were believed to affect the prognosis of MEO, such as a medical history of DM, glucose level, cranial nerve involvement, and the extent of disease determined from various imaging modalities.

Prognose

- Skull base osteomyelitis is a life-threatening complication of MEO, which begins as a soft tissue infection in the EAC and spreads via the fissures of Santorini and the tympanomastoid suture to involve the cranial base
- there was a significant difference in outcome when the disease extended to the jugular foramen and petrous apex. The prognosis was poorer when greater disease extension was seen in imaging studies.
- CT and MRI are useful to help to predict the prognosis for MEO, and that the jugular foramen and petrous apex are critical points in the progression of MEO

MOE

- **rigorous glycemic control and the administration of appropriate antibiotics are key factors in the treatment of MEO.**


Thank You!