Otitis Externa

Prof Dr Balasubramanian Thiagarajan (drtbalu)

Drtbalu's Otolaryngology online

Introduction

Definition

Otitis externa is defined as a generalized condition of the skin of the external auditory canal. It is characterized by edema and erythema. There is also associated itch, pain and discharge. It can range in its severity between mild infection to a more severe one. It is one of the most common disease involving the external ear.

Classification:

1. Acute diffuse otitis externa (commonly caused by bacteria)
2. Acute localized otitis externa (commonly furuncle)
3. Chronic otitis externa
4. Eczematous otitis externa
5. Fungal otitis externa
6. Keratosis obturans
7. Primary auditory canal cholesteatoma
8. Malignant otitis externa

Pathology

In stage I the protective lipid/ acid balance of external canal is lost and the stratum corneum becomes oedematous thereby blocking off the sebaceous and apocrine glands. There is aural fullness and itching.

Clinical course of otitis externa goes through following stages:
Stage I - Preinflammatory
Stage II - Acute inflammatory (mild, moderate, severe)
Stage III - Chronic inflammatory

In stage II there is progressively thickening exudate. Further oedema, obliteration of the lumen cause increasing pain. There is also associated cervical adenopathy.

Stage 3 is characterized by thickening of the external canal skin.

Predisposing factors

Removal of cerumen by ear buds. The act of removal traumatizes the skin lining of external canal making it vulnerable to infections

Absence of cerumen. It plays an important role in the protection of external auditory canal from moisture. It also has antibacterial properties which helps in the protection of external canal. It also lowers the pH of the external canal making it difficult for the bacterial pathogens to colonize.

Type	Factor
Anatomical	Narrow external auditory meatus (EAM) (hereditary, iatrogenic, exostoses, trauma, etc.) Obstruction of normal meatus (kerratosis obturans, wax, foreign body, hearing aid, in-ear head phones, hirsute canal, etc.)
Dermatological	Eczema, sebhorrhoeic dermatitis, psoriasis
Allergic	Atopy, non-atopic allergy, exposure to topical medications
Physiological	Humid environment, immunocompromisation
Traumatic	Skin maceration (bathing or irrigation), ear probing, laceration, radiotherapy, ear candling
Microbiological	Active chronic otitis media, exposure to P. aeruginosa or fungi

Frequent exposure to water. The presence of water macerates the skin lining of the external canal. It also increases the pH of the external canal making it more faourable for bacterial colonisation. This condition is common in swimmers.

Acute diffuse otitis externa

Symptoms:
Itching
Tenderness on palpation
Aural fullness
Rarely stenosis of external canal

This condition involves external canal in a diffuse manner. This condition is common in swimmers.

Swimmer's Ear

Signs:
Erythema of external canal
Oedema of external canal
Secretions from external canal
Pain on mastication
Tragal tenderness
Cervical adenopathy (rare cases)

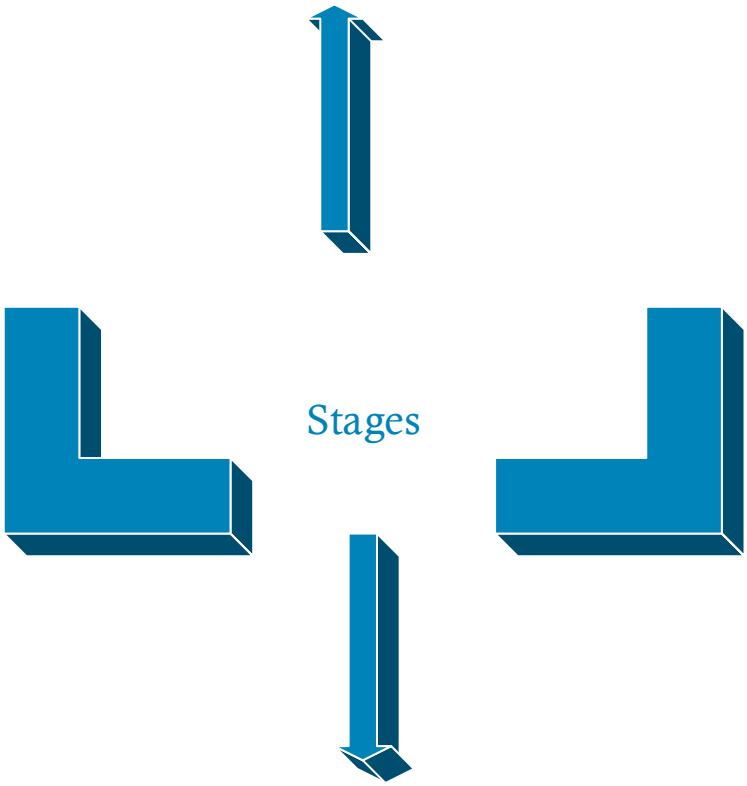
Stages of diffuse otitis externa:

Preinflammtory stage
Mild acute inflammatory stage
Moderate acute inflammatory stage
Severe acute inflammatory stage

Organism involved:
Pseudomonas aeruginosa
Staph aureus
Normal commensals like staph epidermidis and corynebacteria are absent

Stages of Acute diffuse otitis externa

Preinflammatory stage:
Intense itching, edema, sensation of fullness in the ear



Inflammatory stage:
May be divided into mild, moderate and severe

Mild acute inflammatory stage:
Itching, pain, mild erythema and edema of external canal skin. In later stages exfoliation of skin with minimal amount of cloudy secretions

Moderate acute inflammatory stage: Itching and tenderness of external canal intensifies. The external canal is narrowed due to oedema and accumulation of epithelial debris.

Severe acute inflammatory type:
Pain is intolerable. Lumen of external canal is totally obliterated due to oedema and accumulated epithelial debris. Otorrhoea becomes purulent.

Management of acute diffuse otitis externa

Aim is twofold:

1. Resolving the infection

2. Promoting the external canal skin's recovery to its original state

Cleaning the canal:

Should be done by cleaning it atraumatically by gentle suctioning and debridement under microscope.
Topical hydrogen peroxide solution is instilled to help the process of debridement.

Cotton wick dipped in IG paint can be inserted into the external canal and is allowed to stay for a day. This will reduce the external canal skin oedema and will increasethe size of the meatus.

Ear drops (mixture of neomycin and 1% hydrocortisone) can be instilled into the ear atleast thrice a day.

In severe cases oral antibiotics and anti-inflammatory drugs can be resorted to.

Definition of Furuncle

It is a localized form of otitis externa resulting from infection of a single hair follicle. Hair follicles are only present in the lateral (cartilaginous) portion of the external auditory canal. It is hence confined to the lateral portion of the external auditory canal.

Bacterial invasion of a single hair follicle results in a well circumscribed deep skin infection. As it progresses, a pustule forms and progresses to local abscess formation. There is also associated cellulitis and oedema. Initially bacteria attach to the cells of stratum corneum and proliferates around the ostium of the hair follicle. There is deeper invasion of the hair follicle between the inner and outer root sheath.

Diagnosis

Symptoms of this disorder don't usually differentiate furunculosis from diffuse otitis externa

Histology is the gold standard for diagnosis of furunculosis, but is never obtained in routine clinical practice.

Postaural swelling and pinna being pushed forwards is a feature seen in both otitis externa and mastoiditis. In otitis externa there is tenderness while attempting to move the pinna while there is no tenderness in mastoiditis

Clinical features

1. The affected ear is painful.
2. It feels blocked.
3. There is scanty serosanguinous discharge
4. The pinna and tragus are tender on palpation
5. Otoscopic examination may be difficult because of tenderness
6. Oedema is restricted to the lateral portion of the external auditory canal
7. In advanced infections, the abscess may be seen to be pointing into the external auditory canal, or could discharge into the external auditory canal.
8. There could be oedema and cellulitis spreading to the post auricular crease pushing pinna forwards

Etiology & Epidemiology

Staph aureus is commonly implicated

Colonization of the external nares could also contribute to furunculosis of external auditory canal

Etiology

S aureus is known to express genes for Panton-Valentine leucocidine (PVL). This gene is known to release leucocidal toxin that could cause lysis of phagocytic cells.

Other predisposing factors include:
Hypogammaglobulinaemia
Diabetes Mellitus
Dysphagocytosis

If untreated this infection progresses to localized abscess which discharges into the external auditory canal. If it drains then infection could resolve spontaenously. Infection can also spread towards deeper tissues spreading to the pinna, post auricular skin and parotid gland. Repeated infections can cause permanent scarring and fibrosis of external canal with subsequent meatal stenosis. Ultimately, this could predispose to chronic diffuse otitis media.

Management

Bing a painful condition the primary concern is alleviating pain.
Tretment choices include:
Oral / systemic antistaphylococcal antibiotics (penicillinase resistant penicillin, macrolides, cephalosporin, clindamycin etc).
Anti inflammatory drug like ibuprofen can be given

If abscess has formed and has not drained into the external canal then incision and drainage can be performed.

Treatment options

Correction of nutritional deficiency:
Hypoferraemia
Low serum zinc
Correction of these deficiencies can help

Topical:
Antibiotic cream
Astringents
Hygroscopic agent like icthamol glycerine impregnated cotton wick can be placed inside the external auditory canal

In recurrent furunculosis the following options are available:
1. Eradication of focal infection with nasal mupirocin
2. Eradication therapy with oral flucloxacillin / azithromycin for 14 days
3. Bacterial interference therapy: This is done deliberately by implanting a non-pathogenic strain of S. aureus (strain 502A is the most popular) to recolonize the nares and skin

Chronic Otitis Externa

Symptoms:
Unrelenting pruritis
Mild pain
Presence of dry skin in external canal

This is chronic infection / inflammation involving the skin lining of external canal. There is also thickening of the skin lining of the external canal due to persistent low grade infection.

Chronic otitis Externa

Signs:
Asteatosis (lack of cerumen)
Hypertrophic external canal skin
Presence of dry flaky skin in the external canal
Mild tenderness on ear manipulation
Rarely mucopurulent otorrhea

Management:

Use of acetic acid drops. This reduces the pH of the skin lining making it more resistent to bacterial infections. In intractable cases steroid drops can be tried. Antibiotic drops may not be useful in these patients.

Surgery is indicated in extreme cases. Canalplasty is performed to widen the canal. The involved skin may be removed to be replaced by a split thickness graft.

Eczematous otitis externa

Erythema of external canal skin may be seen. There may also be associated scaling and oozing from canal skin.

Common allergens include:
Nickel containing ear rings
Hair sprays
Hair dyes

Can be caused by skin conditions like:
Atopic dermatitis
Contact dermatitis
seborrheic dermatitis
Neurodermatitis

Management:

Success lies in the management of underlying dermatologic condition
Burrow's solution (dilute aluminium acetate solution) can be applied as frequently as possible.

Inflammation and itching can be reduced with topical steroids. If this condition becomes diffuse, then antibiotic therapy may be required.

Otomycosis

Also known as fungal otitis externa.
This is associated with increased ear canal moisure / or following treatment of otitis externa by prolonged use of topical antibiotics.
Protective cerument layer is absent in these patients

Symptoms:

1. Intense itching
2. Pain when otitis externa is coexistent
3. Blocking sensation due to presence of fungal balls

Signs:

Inflammed external canal skin
External canal tenderness
Fungal debris

Management:
Aural toileting to remove fungal balls
Aural syringing is the best way to remove fungus from ear canal
Antifungal ear drops (clotrimazole) can be administered
Antibiotic drops can be administered if secondary infections are present

Keratosis obturans

This is a different clinical and pathological entity from primary auditory canal cholesteatoma and benign necrotizing otitis media.

Definition:
It is defined as accumulation of a large plug of desquamated keratin in the external auditory meatus

In keratosis obturans, a geometrically patterned kerating plug within the lumen of an expanded external auditory canal is seen. The keratin squmaes are shed from the complete circumference of the deep ear canal forming a onion skin arrangement.

Bacteriology:

Proteus Mirabilis

Staphyloccous epidermidis

Klebsiella pneumoniae

Betahemolytic streptococi

Staphyloccous aureus (most frequent)

Etiology of Keratosis Obturans

Keratosis obturans is considered to be due to abnormal epithelial migration of the ear canal skin. The movement of the surface epithelium of the pars flaccida was reversed such that it migrated downwards to the pars tensa and then moved inferiorly across the whole drum. A condition known as "keratosis tympanicum" has been described with similar epithelial migration associated with unilateral tinnitus.

Two types of keratosis obturans have been described.

The first one is of inflammatory nature which occurs secondary to an acute problem such as a viral infection, causing inflammation of the ear canal skin causing a temporary alteration in epithelial migration. This condition is cured by removal.

The second one is a silent type which persists and is caused by abnormal seperation of the keratin that persists even after removal. This condition needs repeated removals.

Symptoms, Investigations & Management

Clinical symptoms:

Keratosis obturans commonly occur in younger patients. It presents as severe otalgia and conductive hearing loss. Rarely this condition could be bilateral. There may be associated bronchiectasis / sinusitis. The associated lung disease and sinusitis are better controlled these days.

Investigation:

These patients should undergo microscopic examination if need be under general anesthesia. In keratosis obturans the ear canal can become grossly widened or ballooned. The ear drum stands out in a widened ear canal.

CT scan of temporal bones has become accepted as a gold standard for staging and planning the treatment. It also allows accurate evaluation of the extent of the local bone erosion and involvment of adjacent structures.

Pure tone audiometry shows marked conductive hearing loss.

Management:

Desquamated epithelium can be removed under visualization and magnification. Granulation if present should be sent for HPE to rule out malignancy. Canalplasty is ideal for patients with recurrent keratosis obturans.

Primary auditory canal cholesteatoma

Pathologically this condition is characterized by invasion of squamous epithelium into a localized area of bony erosion with or without bony necrosis. This localized area of bone erosion could be due to surgery also.

Cholesteatoma involving the external auditory canal is rare and should be differentiated from similar conditions like keratosis obturans, malignant otitis externa and post inflammatory medial canal wall stenosis.

Etiology:

The exact etiology is still unclear.

Surgery / trauma to bony portion of external auditory canal

Canal stenosis

Pathology:

Keratin occurs in random pattern. Ear drum is normal. There is also localized osteitis with eorion of ear canal. Commonly posteroinferior portion of the ear canal is involved. There is also sequestration of bone.

Clinical features:

Mild otalgia
These patients show no hearing loss
Common in older patients
Unilateral blocked feeling is also common

Staging of Primary auditory cholesteatoma

Seung - Ho Shin clinical and radiological staging:

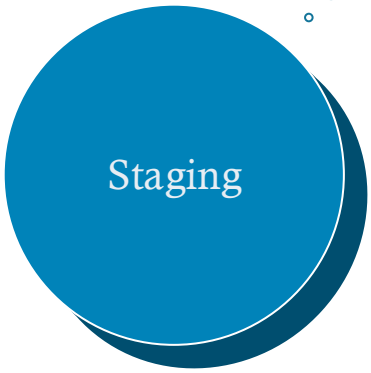
I - Limited to external auditory canal

II - Invades the ear drum as well as ear canal

III - Creates a defect of external auditory canal and involves the cortex of mastoid bone

IV - Involves areas beyond the temporal bone

Nairn staging Seung - Ho Shin clinical and radiological staging



Nairn staging:

I - Epithelial hyperplasia

IIa/b - Periostitis hyperplasia with erythema. There is no bone erosion

III - Canal wall erosion and bony sequestrum

IV - Invasion into adjacent structures

Stage IV has subclasses

M - Mastoid involvement

S - Skull base and sigmoid sinus involvment

J - Involvement of temporomandibular joint

F - Facial canal erosion

Management

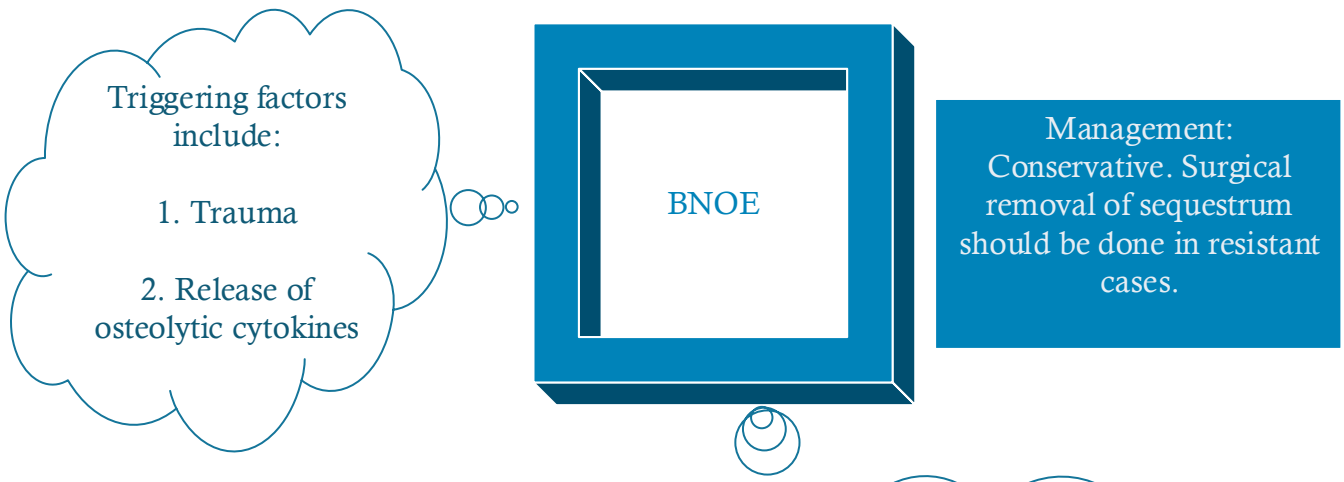
Management:

Surgical removal of cholesteatoma and the raw area is grafted with split thickness skin graft.
Other options can be tailored as per the stage of the lesion.
Stage I - Local care and canalplasty
Stage II - Canalplasty with tympanoplasty
Stage III - Canalplasty with mastoidectomy and canal wall reconstruction
Stage IV - Removal of cholesteatoma using various techniques

Benign Necrotizing Otitis Externa

This condition involves avascular bone leading to inflammation of overlying skin.

This condition is also known as benign necrotizing osteitis of the external auditory canal. Etiology of this condition is unknown. This condition is probably caused by repeated traumas to the external auditory canal meatus.



Management:
Conservative. Surgical removal of sequestrum should be done in resistant cases.

Pathology:
Show chronic inflammation. There is no associated keratin. There is no cholesteatoma deep to the sequestrum.

Symptoms & signs:
Chronic painless ororrhoea. These patients show partial response to previous therapy. There is local bone exposure of about 3-10 mm diameter. Skin is also dehiscent in this area. Bacteriology shows commensals. In contrast Malignant otitis externa patients show pseudomonas growth.

Malignant Otitis Externa

History:

1838 - Toulmousch reported the first case of otitis externa

1959 - Meltzer reported a case of pseudomonas osteomyelitis of temporal bone

1968 - Chandler discussed the various clinical features and described it as a distinct clinical entity

Epidemiology:

The typical patient with malignant otitis externa is an elderly diabetic, with males outnumbering females by twice the number. This could be due to the possibility of males being more prone to secrete wax which are more acidic in nature. Malignant otitis externa is very rare in children, if present it will be associated with malnutrition or HIV infection.

Malignant otitis externa is a inflammatory disorder involving the external auditory canal caused by psuedomonas organism. Majority of these patients are elderly diabetics. This condition is termed as malignant otitis externa because of its propensity to cause complications. Hence the term malignant must not be constured in a histological sense.

Pathophysiology

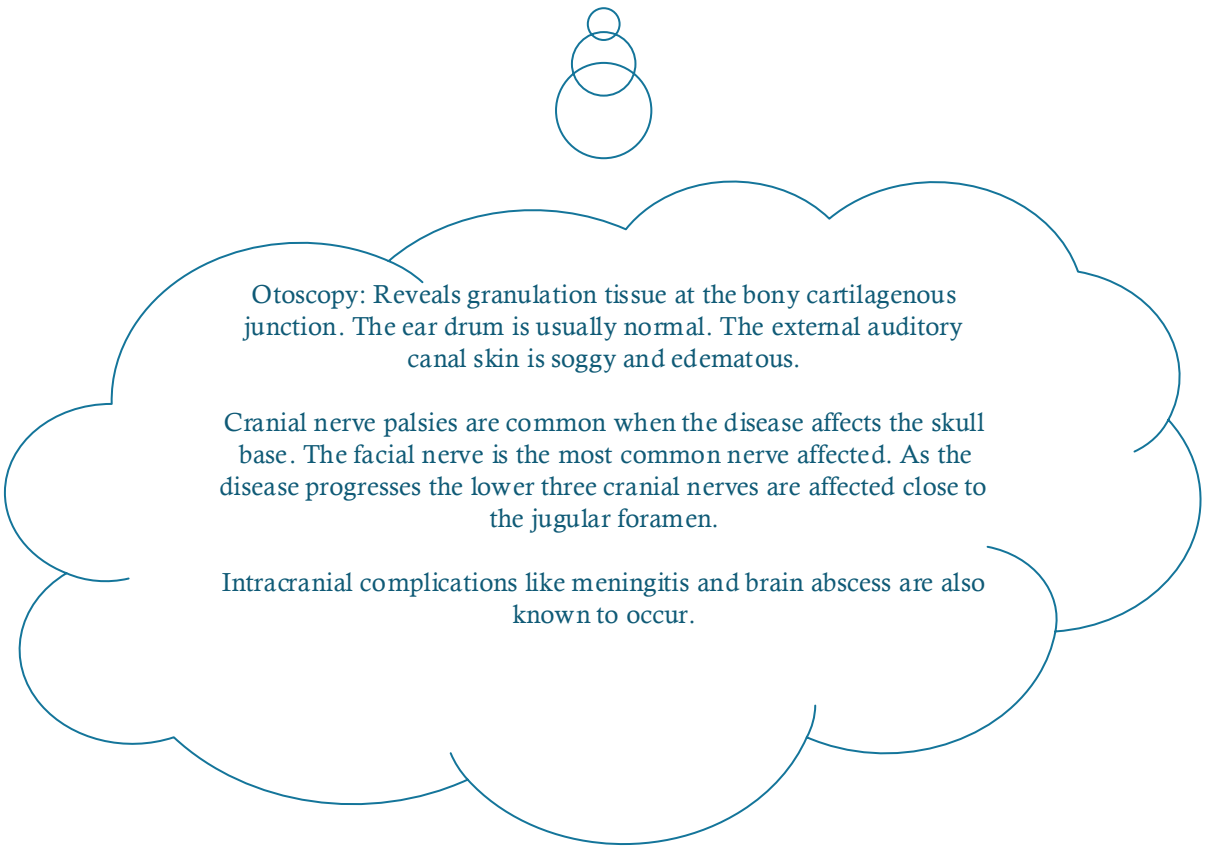
MOE is known to affect external auditory canal and temporal bone.
Causative organism is pseudomonas aeruginosa
These patients are elderly diabetics
Spread of this disease occurs through the fissures of Santorini and osteo cartilagenous junction

Pseudomonas aeruginosa is a gram negative aerobe with polar flagella. It is found on the skin. It invariably behaves like an opportunistic pathogen. The pathogenicity of this organism is due to ability to secrete exotoxin and various enzymes like lecithinase, lipase, esterase, protease etc. Since this organism is cloathed by a mucoid layer it is resistant to digestion by macrophages.

Clinical Features

Clinical features:

The patient gives history of trivial trauma to the ear often by ear buds, followed by pain and swelling involving the external auditory canal. Pain is often the common initial presentation. It is often severe, throbbing and worse during nights. It needs increasing doses of analgesics. On examination granulation tissue may be seen occupying the external canal. It often begins at the bony cartilagenous junction of the external canal. Discharge eminating from the external canal is scanty and foul smelling in nature. When the discharge is foul smelling it indicates the onset of osteomyelitis. Ironically the patient does not have fever or other constitutional symptoms.



Route of spread of infection

Spread of infection:

1. Inferiorly through the stylomastoid foramen to involve the facial nerve.
2. Anteriorly to the parotid
3. Posteriorly to the mastoid and sigmoid sinus
4. Superiorly to the meninges and brain
5. Medially to the sphenoid
6. Spread through vascular channels are also common

Imaging alogrithm in these patients are:

1. TC99 scan to seek evidence of bone involvement
2. If this is positive CT scan and MRI scan is a must to rule out bone and soft tissue involvement
3. Serial Ga 67 scans to assess the efficacy of treatment modality.

Levenson's criteria for diagnosis of malignant otitis externa:

* Refractory otitis externa

* Severe nocturnal otalgia

* Purulent otorrhoea

* Granulation tissue in the external canal

* Growth of Pseudomonas aeruginosa from external canal

* Presence of diabetes and and other immunocompromised state

Staging & Classification

Stage	Ga67	TC99	Extent of Disease
I	+	-	Soft tissue (Necrotising Otitis)
II	+	+	Ear & Mastoid (Skull base osteomyelitis)
III	+	+	Extensive skull base osteomyelitis

Treatment:

Extensive surgical procedures have failed miserably to cure this condition. The role of surgery is confined to only exclusion of malignancy by biopsy. Wound debridement is a possibility in advanced cases.

Medical management:

Carbenicillin, Pipercillin, Ticarcillin can be used. Third and forth generation cephalosporins can be used.
Ciprofloxacillin in doses of 1.5 g - 2.5 g /day in divided doses can be administered for a period of 2 weeks.
Gentamycin can also be administered parenterally in doses of 80 mg iv two times a day in adults.