# **Original Research Article**

DOI: http://dx.doi.org/10.18203/issn.2454-5929.ijohns20195627

# Descriptive study on malignant otitis externa in diabetic patients at a tertiary care hospital at Madurandhagam

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**Received:** 10 November 2019 **Revised:** 08 December 2019 **Accepted:** 09 December 2019

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#### **ABSTRACT**

**Background:** Malignant otitis external (MOE) is a destructive infection, principally affecting ageing diabetic patients. The present study directed for analysing various forms of clinical presentations, causative organisms and management of such diseases.

**Methods:** We conducted a descriptive study of patients with MOE in the ENT Department of Karpaga Vinayaga Institute of Medical College and Hospital, Madurandhagam. Haematological, biochemical and epidemiological parameters were taken and result analysis was carried out.

**Results:** They affect both the soft tissue and bones of immunocompromised patient's predominantly diabetic patients. Various forms of clinical presentations such as ear discharge which proved to be due to *Pseudomonas aeruginosa*. Facial nerve involvement, osteonecrosis and bony erosion was noted in MOE patient.

**Conclusions:** MOE or external otitis progressing necrosis is a serious infection of the subject often older and diabetic by *P. aeruginosa*.

Keywords: Malignant external otitis, P. aeruginosa, Infection

#### INTRODUCTION

Malignant otitis external (MOE) is a sporadic entity, the initial point is the external ear canal violation and infection dissemination to the soft parts and the adjacent bone, hard a diagnostic and whose evolution can be very serious.<sup>1</sup>

Pseudomonas aeruginosa, Staphylococcus epidermidis and Staphylococcus aureus are the most common isolates in descending order in bacterial otitis externa. The infection starts as an external otitis that develops into temporal bone osteomyelitis.<sup>2</sup> Extend of the disease exterior to the external auditory canal arises through the santorini fissures and the junction of osteocartilage.<sup>3</sup> Toulmouche was possibly the principal physician who reported an MOE case in 1838.<sup>4</sup> In 1959, Meltzer stated a

case of pseudomonal osteomyelitis of the temporal bone. Elective on debility ground, like immunocompromised, or more commonly the elderly diabetic, is an essential diagnostic measure.<sup>5</sup> The signs and symptoms might comprise severe otorrhoea, earache, and achievement of several crannies, often instigated by P. aeruginosa is also of other agents can rare mentinclure to other bacteria (S. Proteusmirabilis, Klebsiellaoxytoca, aureus. Pseudomonas cepacia) or fungi (Aspergillus, pseudallescheria, Candida pityrosporum).6

The existence of tissue granulation in the external ear canal, a higher rate of sedimentation of red, and imaging studies abnormalities are also parameters for diagnosis. It is so significant to create the diagnosis of MOE at the earliest, at the commencement, it is very comparable to severe acute external otitis, but MOE is emerging as

chronic osteomyelitis of the temporal bone, attaquantles cranial nerves adjacent (VII, XII), soft tissue and the blood vessels. At last, if it is not treated, it results in death due to the progression of osteomyelite of the skull and thromboembolism septic disseminated brain. Chronic inflammations of the mastoid cavity and middle ear results in chronic suppurative otitis media (CSOM). Therapy must be done with the assistance of otolaryngologists in cooperation with the neurologist, endocrinologist, radiologist, internist and microbiologist.

Local treatment (with removal of bone sequestered) and treatment with systemic antibiotics conferring to the outcomes of bacteriological tests (aminoglycosides, semisynthetic penicillins, third- and fourth generation cephalosporins, fluoroquinolones) are usually accepted.9 Principal treatment of MOE comprises management of pain, removal of debris in the external auditory canal (EAC), topical medication administration for controlling edema and infection and prevention of contributing aspects. Treatments of topical antimicrobials result in a higher cure rate than placebo, and preparations of corticosteroid lessen swelling, secretions and erythema. Oral antibiotics are specified if the infection has extended outside the ear canal or in patients with immunesuppression or poorly controlled diabetes mellitus. Many of such cases can be treated with over-the-counter analgesics and topical eardrops. Generally used eardrops comprise acetic acid drops, which alters the pH of the ear canal and antibacterial drops, controls bacterial growth; and also acts as antifungal preparations. MOE is an destructive infection, principally affecting ageing diabetic patients. Therefore the present study designed to study the MOE infection in ageing diabetic patients. The study was directed for analysing various forms of clinical parameters, causative organisms and management of such diseases.

#### **METHODS**

The descriptive study was conducted at Department of Karpaga Vinayaga Institute of Medical College and Hospital, Madurandhagam including ten patients with an MOE for evaluating the different forms of clinical presentations, causative organisms and management of MOE. The study was conducted in the period January 2018 to April 2018. Epidemiologic characteristics as well as biochemical and haematological parameters were assessed. High-resolution computed tomography (HRCT) and biopsy were performed as a highly preferable method of imaging. Bacterial species were identified according to the standard microbiological methods manually.

# Histology study

Infected ears tissues fixed in 10% formaldehyde. After 12-24 hr of fixation, tissue slices were embedded in paraffin. Sections at 3-5 mm thick were stained with conventional H&E, and analysed by light microscopy.

### Analysis of various parameters

Two milliliters of venous blood were drawn from each participant's antecubital vein in the sitting position and collected in a test tube containing Ethylenediaminet-etraacetic acid anticoagulant. The samples analysed for haematological parameters, such as white blood cell (WBC) count, red blood cell count; biochemical parameters such as urea and creatinine were evaluated. The parameters like epidemiologic characteristics of population such as age, sex and diabetes characteristics like type, age of onset, treatment and glycemic balance were analysed.

### HRCT image

In many of the cases imaging studies are not performed; the necessity for imaging originates once complications are suspected or when treatment is not operative. The present paper deliberates the signs for temporal bone imaging studies. Therefore, HRCT of the temporal bone has been selected as a better imaging method. Biopsy examination was also done on patients having granulation in the ear canal.

## Detection of pathogenic bacteria

Clinical presentation characteristics incidence such as earache, ear discharge, edema of EAC, facial palpsy and granulations in EAC were observed among the ten patients. All samples were taken using standard microbiological technique. At the microbiology laboratory, using swab techniques by cotton-wool, pus swab from discharging ears were taken and it was then inoculated on MacConkey agar, blood agar, mannitol salt agar and chocolate agar. Blood and chocolate agar plates were kept in a candle jar at which can produce about 5% CO<sub>2</sub>, incubated for 18-24 hr at 37 °C. Bacterial species were recognized by standard microbiological methods manually. The antibiotic susceptibility profiles were inferred depending on the Clinical and Laboratory Standards Institute 2014 guidelines.

## **Topical Treatment**

Once the EAC has been cleansed as much as possible and a wick was inserted in case of severe swelling, topical antibacterial therapy must be started. Since topical agents can be kept in straight contact with the bacteria, simple acidification with 2% acetic acid is typically effective, but a wide spectrum of other agents is also offered.

#### Statistical analysis

The results was tabulated in an excel sheet MS Excel Version 2016 and descriptive statistical analysis (Mean, SD Frequency and percentages) was done using IBM SPSS Statistics for Windows, Version 20.0.

#### **RESULTS**

The diagnosis was made based on the clinical presentation, bacterial growth from the ear discharge and computed tomography findings. The clinical presentations of these patients are shown in the Table 1 and Figure 1. All of them presented with ear discharge. Nine of them presented with unilateral earache there was no associated fever. On examination nine of them presented with granulation tissue in the EAC. Seven of them had edema in the EAC. Facial palsy was observed in four of them. No signs of co-existing CSOM were noticed.

Table 1: Clinical characteristics of MOE infected diabetic patients (n=10).

Clinical characteristics	Incidence (N)		
Earache	9		
Ear discharge	10		
Edema of EAC	7		
Facial palsy	4		
granulations in EAC	9		

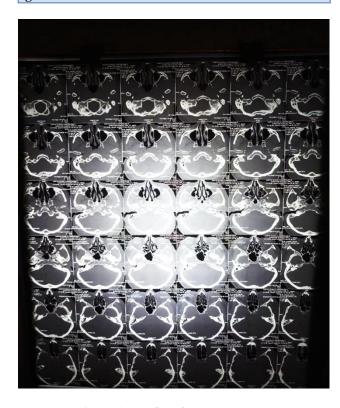


Figure 1: HRCT of temporal bone

Figure 1 is showing thickening and heterogeneous contrast enhancement of the soft tissue around auricle, in masticator space and in the bone window. Subtle bone erosion is observable and mastoid air cells are packed with fluid. Annihilation of mastoid segment of petrous bone can also be observed. There were also subtle cortical damages visible in tympanic bone. This depicts

the bony erosion of external ear canal and erosion of the mastoid segment of the facial nerve canal.

All the ten cases of MOE were followed up. All of them aged 50-80 yrs were type 2 diabetic patients on oral hypoglycaemic agents and insulin treatment. The total leucocyte count was found to be normal. Erythrocyte sedimentation rate was elevated. Fasting blood glucose levels were raised in all of the patients ranging from 200 mg/dl to 400 mg/dl. Blood urea and serum creatinine were found to be within normal limits for all of them. The ear discharge showed positive growth of *P. aeruginosa*. Out of 10 patients, 7 proved sensitive to ceftazidime and 3 patients proved sensitive to ciprofloxacin. Table 2 depicts the raw data of all the clinical parameters given in the present study.



Figure 2: Edema leading to osteonecrosis of external auditory canal of MOE affected diabetic patient.

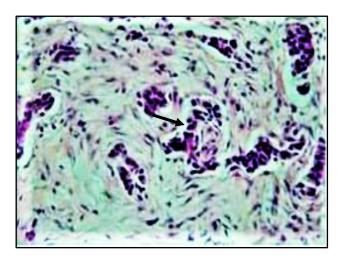


Figure 3: Histology of MOE tissue at 20x magnification.

The photograph showed the presence of vacuolated and heavily parasitized macrophages indicated by the arrow mark.

Pus taken from the EAC was directed for microscopy, culture and sensitivity before starting parenteral antibiotic therapy in every patient. *P. aeruginosa* was isolated in all the ten patients, who had long standing diabetes. The patients were given intravenous antibacterial medications conferring to the sensitivity test report. Seven patients were given ceftazidime and three with ciprofloxacin. Topical acetic acid drops were instilled for every patient.

In patients with granulation in the ear canal, a biopsy was taken. Biopsy results showed features of inflammatory granulation tissue necrosis of external auditory canal (Figure 2). The average duration of treatment was 22 days. Facial nerve palsy did not improve in spite of physiotherapy during the study period. Histology results showed an extensive collection of vacuolated and heavily parasitized macrophages at the lesion site (Figure 3).

Table 2: General biochemical and haematology parameters of MOE infected diabetic patients.

Sex	Age (in years)	Blood glucose (mg/dl)	Urea (mg/dl)	Creatinine (mg/dl)	ESR (mm/hr)	WBC (×10 <sup>3</sup> cu mm)
Male	50-80	256.4±10.5	37.6±2.1	1.1±0.08	56.3±1.1	9000±24.8
Female	50-80	320.3±16.4	32.5±1.9	$0.93\pm0.06$	72.6±1.2	8100±18.6

Results were expressed as Mean±SD.

#### DISCUSSION

The infection typically initiates from the EAC and develops through the stages of cellulitis, chondritis, periostitis, osteitis and lastly osteomyelitis. It is discussed to as "skull base osteomyelitis" when the bone infection is established and also identified to be necrotizing otitis externa because of extensive soft tissue participation. 13 The current study results displayed EAC edema resulting in necrosis. The disease most frequently affects elderly diabetic and other immune-compromised people. The most common organism concerned is P. aeruginosa, however, organisms like Proteus, methicillin resistant S. aureus, Klebsiella and S. epidermidis, are also convoluted. 15 P. aeruginosa was isolated in every study subjects which reach agreement with the study of Kroonenburgh et al. 15 Since *Pseudomonas* is the chief causative organism involved, where systemic antipseudomonal antibiotics are the principal therapy. For the past 15 years, oral fluoroquinolines particularly ciprofloxacin had substituted the parenteral therapy. The appearance of quinolone resistant Pseudomonas is the main issue now.

MOE pathogenesis in non-diabetic patients is perhaps connected to immune dysfunction or a grouping of impairments. Infection can include the temporomandibular joint and parapharyngeal space. Further extension of the infection that results in lateral sinus thrombosis, inferior and superior petrosal sinuses thrombosis. Secondary osteomyelitis at the petrous apex can extend to the middle cranial fossa floor. <sup>16</sup> The MOE diagnosis is typically depending on clinical presentations and bacteriological research. The imaging role has frequently been supportive. HRCT scan of temporal bone and head and neck MRI assist in evaluating bony and soft tissue participation correspondingly. <sup>17</sup> In the present study HRCT of temporal bone was done among patients. It was beneficial in defining the degree of the disease process and presence of any intracranial complications.

Emin et al did a retrospective study who determined that the most operative treatment is to regulate diabetic status and to defence against infection with proper antibiotic, debridement and at times if needed surgical management. B Devoid of adequate host defences results in spreading cellulitis and osteomyelitis. Local micro angiopathy and varied function of leucocyte are repressed by diabetes mellitus. These conditions may create an alkaline pH in the cerumen, reduced immune response (impaired phagocytosis, poor leukocytic response, and impaired intracellular digestion of bacteria), hypoperfusion, and microangiopathy, which incline the patient to MOE. Devote the surgical management.

MOE is an aggressive disease that needs conservative management, and haematological parameters were shown to be a noble indicator of treatment response. Long-term antibiotherapy are suggested for treatment as the erythrocyte level found to be greater in the present study result. Advanced skull base osteomyelitis can lead to multiple cranial nerve palsy and facial nerve paralysis. The present study could not find facial palsy in any of the patient. The prognosis appears to be related to the stage that the disease has extended at the onset of treatment. This in turn needs great awareness of the condition.

## **CONCLUSION**

MOE left with uncommon pathology in otorhinol-laryngological practice globally. Early diagnosis with prompt, timely and suitable management will create good outcome. It is thus advised that diabetes patient with earache must be promptly referred by their handling physician.

## **ACKNOWLEDGEMENTS**

The authors would like to thank all the staff involved hospitals as well as chairs of Otolaryngology departments at these hospitals for their kind assistance and cooperation.

Funding: No funding sources Conflict of interest: None declared

Ethical approval: The study was approved by the

Institutional Ethics Committee

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Cite this article as: Thirumalaipriya V, Madanagopal R. Descriptive study on malignant otitis externa in diabetic patients at a tertiary care hospital at Madurandhagam. Int J Otorhinolaryngol Head Neck Surg 2020;6:45-9.