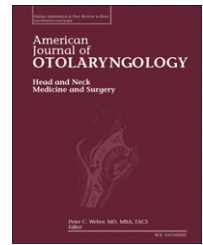


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Malignant external otitis: Factors predicting patient outcomes☆☆☆

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ABSTRACT

Objective: Malignant external otitis (MEO) is an aggressive infection, primarily affecting elderly diabetic patients. It begins in the external ear canal and spreads to adjacent structures. This study investigated the clinical characteristics of patients diagnosed and treated for MEO and analyzed factors affecting patient outcomes.

Study design: Historical cohort.

Setting: Tertiary medical center.

Methods: Medical records of all patients diagnosed and treated for MEO from 1990 to 2013, were retrospectively reviewed. Clinical features, laboratory, imaging and outcomes were analyzed.

Results: 88 patients were included, mean age was 73 ± 11.5 years, 61 (69%) were male. Of these, 75% had diabetes. Mean follow-up was 60 months. The most common presenting symptoms were otalgia (89%), external ear canal edema (86%) and otorrhea (84%). *Pseudomonas aeruginosa* was isolated in 61% of ear cultures. All patients were treated with antibiotics, 22% had surgery and 8% hyperbaric oxygen. Overall survival rate was 38% in 5 years, with disease specific mortality 14%. DM, facial nerve palsy, positive CT scan and age above 70 were found to correlate and predict disease-specific mortality.

Conclusions: MEO carries a grave prognosis. The presence of two or more of the following features, DM, facial nerve palsy, positive CT scan and age above 70, predicts poor outcome, and highlights the need for prolonged, vigorous treatment.

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1. Introduction

Malignant (necrotizing) external otitis (MEO) is an aggressive infection. It begins in the external ear canal and spreads to adjacent structures. It was termed “malignant” by Chandler in

1968 due to the high, disease-specific mortality rate of over 50% prior to the introduction of appropriate antibiotic treatment [1]. MEO predominantly affects elderly patients and those with diabetes, although it has been described among non-diabetics as well [2]. *Pseudomonas aeruginosa*, the

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most common pathogen known to cause MEO, is responsible for over 90% of cases. *Staphylococcus aureus*, *Proteus mirabilis* and fungi, mostly aspergillus and candida species have also been described [3-5].

In 1987, Cohen and Friedman described diagnostic criteria to stratify disease severity. Major criteria include otalgia, otorrhea, edema, granulation tissue, positive 99mTc scan, failure to respond to treatment after more than a week and *P. aeruginosa* isolation. Minor criteria are positive radiograph, diabetes mellitus, old age and cranial nerve involvement [6]. MEO is diagnosed if all major criteria are present. If some are absent, then a 1-3 week trial of intensive local and systemic treatment is recommended; failure to respond clarifies the diagnosis [7]. Treatment includes systemic anti-pseudomonas antibiotics for at least 6 weeks and topical therapy. If insufficient response, modalities such as surgery and hyperbaric oxygen treatment are considered, as well as additional antibiotic or antifungal treatment.

Due to the difficulty of diagnosis and its low incidence, evidence-based knowledge is derived from small case series or historical cohorts, several of which are based on our institutional experience [2,4,7-9]. The goals of the current study were to evaluate and identify characteristics and factors predicting outcomes and to design a prognostic tool to predict mortality.

2. Materials and methods

The computerized database of the Department of Otolaryngology-Head and Neck Surgery of a university-affiliated medical center was retrospectively reviewed for all adult patients admitted for MEO between January 2009 and December 2013. The medical center is a major referral site for MEO. Patients were diagnosed with MEO if presenting with all of the following criteria: (1) external otitis with compatible physical examination - severe otalgia, external ear canal edema, exudate and granulations, (2) failure to respond to antibiotic treatment for at least one week, (3) positive finding on bone scan (technetium with or without gallium) or evidence of bone destruction on CT scan, (4) histological findings compatible with inflammation (patients with diagnoses such as squamous cell carcinoma of the external ear were excluded), and (5) microabscess in specimens obtained at surgery, if performed. If one criterion was lacking and disease failed to improve after 1 week of intravenous antibiotics and aggressive local treatment, MEO was diagnosed, as well.

According to departmental protocol, all patients undergo technetium scan for diagnosis of MEO. Those with a positive scan undergo gallium scan to strengthen the diagnosis. CT is routinely performed to identify disease spread. All patients undergo biopsy of the external ear canal for histological confirmation of inflammation and to exclude squamous cell carcinoma. Antibiotics are prescribed for at least 6 weeks. Follow up examinations, CRP and ESR measurements, and gallium scans are repeated as needed until disease resolution. Cure from disease is defined as a complete resolution of clinical symptoms, normal sedimentation rate and negative gallium scan.

All patients who met the diagnostic criteria for MEO ($n = 31$) were added to the previous cohort of patients diagnosed with MEO in our department from 1990 through 2008 ($n = 57$) [9]. Diagnosis and treatment for all patients was according to the departmental protocol, which was not altered from 1990 till 2013. The following information was collected from the medical records: age, sex, comorbidities, physical examination features, treatment, biochemical results, culture and biopsy results, imaging, follow-up data and prognosis for all 88 patients.

2.1. Statistical analysis

All statistical analyses were carried out using SAS 9.2 software. Continuous variables are presented as mean and standard deviation. Normally distributed variables were compared using t-test and categorical data were analyzed using chi-square or Fisher exact test, as appropriate. Kaplan-Meier with log Rank test was performed for univariate analysis. Multi-variable and hazard ratios were calculated using Cox regression and the Fine and Gray model for competing risks. Logistic regression was performed to design a prognostic model. Statistical significance was inferred at $P < 0.05$.

3. Results

3.1. Ethical considerations

The study protocol was approved by the local Institutional Review Board. Informed consent was not required.

From 2009 through 2013, 31 patients were diagnosed with MEO and added to the previous cohort of patients with MEO diagnosed in our department from 1990 through 2008. Overall, mean follow up was 60.6 ± 54 (range 1-268) months. The mean age was 73 ± 11.5 years and 61 (69%) were male. Most patients (72%) had 2 or more comorbidities and 9 (10%) had more than 4. The most common were diabetes mellitus (DM) (66/88, 75%), hypertension (HTN) (64%) and ischemic heart disease (IHD) (34%).

3.2. Physical examination and imaging

Among the 88 patients, all but 13 had unilateral MEO, only 3 presented with simultaneous bilateral ear disease. Mean duration of otalgia prior to hospitalization was 41 ± 38 days. All patients failed to improve after at least one week of topical and oral antibiotics prior to diagnosis. Physical examinations signs at presentation included: otalgia in 79 patients (90%), edema 76 (86%), otorrhea 74 (84%), granulations 66 (75%), facial nerve palsy 15 (17%), bone erosions 4 (4.5%) and trismus 1 (1%).

Technetium scan was performed on 85/88 patients. Three patients with aggressive disease died before having the scan; all 3 had a positive CT scan. Almost all technetium scans (95%) demonstrated positive findings in the petrous (32%), mastoid (25%), other temporal bone location (28%) or multiple locations. Fifty patients underwent gallium scan to strengthen the diagnosis, of which 64% had positive gallium absorption.

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