

Necrotizing External Otitis: Which Antibiotics Are Proposed: Report of 12 Cases

Chekh hammoud Z, Ouahidi Y, Belatik H, Hmidi M, touiheme N, Attifi H, Elboukhari A, Nadour K

ENT Department and Head and Neck Surgery, Moulay Ismail Military Hospital, Meknes, Morocco

Abstract: *Necrotizing otitis externa is a rare disease, difficult to diagnose, often dangerous. It is an infection that occurs mainly on poor ground such as immunocompromised subjects, or most often elderly diabetic subjects. Pseudomonas aeruginosa is responsible for infection in 90% cases. Aim and methods:* the main object is to discuss through a retrospective study of a series of 12 cases of malignant otitis externa collected at the ENT department of the HMMI in Meknes over a period of 6 years from January 2014 to December 2019, the therapeutic modalities of patients with necrotizing otitis externa in order to highlight the associations of antibiotic therapies recommended and to avoid therapeutic failures. The secondary objectives were to study the epidemiological, clinical, paraclinical, and evolutionary aspects of otitis externa malignancy. **Results:** The average age of our patients is 60 years; the sex ratio is 5 (10 men and 2 women). 83% of our patients were diabetic. The clinical picture was dominated by a severe and insomning otalgia. Purulent otorrhea was a reason for consultation in 67% of cases. Peripheral facial paralysis was noted in 2 cases (17%). Otoscopy showed stenosis and congestive ear canal with granulation tissue in all patients. Bacteriological sampling isolated Pseudomonas aeruginosa in 62.5% of cases. The CT scan was requested to confirm the diagnosis and to judge the extension. Patient monitoring is based on clinic, biology and radiology. All our patients have been hospitalized with daily local care, balanced diabetes and antibiotic treatment using mainly fluoroquinolones. Otitis evolution was favorable in 67% of cases. The recidivism rate was 8%. The attainment of cranial pairs was partially reversible under treatment in one patient. The prognosis of this pathology seems to be improved dramatically with the advent of new active molecules on Pseudomonas.

Introduction:

Necrotizing otitis externa, formerly called (malignant otitis externa) given the gravity of this infectious pathology but not tumor, is an osteitis of the base of the skull, starting with the external auditory canal with temporal bone adjacency infection that can propagate to the base of the skull resulting in progressive bone erosion, cranial nerves deficit, abscess or death (1,2)

This is a diagnostic and therapeutic emergency. It occurs very mostly in elderly diabetic subjects or immunocompromised but not exclusively (3,4)

The pathogen involved is often pseudomonas aeruginosa (90%), other germs may be implicated including candida and aspergillus (3-4)

Advances in Imaging especially scintigraphy has contributed to the diagnosis and monitoring of this pathology. The treatment is based on prolonged bi-antibiotic therapy.

Prognosis improved dramatically with the advent of new active molecules on pseudomonas and hyperbaric oxygen therapy which has allowed for almost complete abandonment of all surgery. (4,5,6)

The objective of this work is to report a retrospective study in the service of Otorhinolaryngology at the Moulay Ismail Military Hospital in Meknes (Morocco) was to study the therapeutic modalities of patients with necrotizing otitis externa in order to highlight the associations of recommended antibiotic therapies and to avoid therapeutic failures.

Materials and methods: it is a retrospective study carried out in the service of Otorhinolaryngology of the HMMI hospital center of Meknes over a period of 6 years ranging from January 2014 to December 2019, about 12 cases of patients suffering from necrotizing otitis externa.

Epidemiological, clinical, paraclinical, therapeutic and evolutionary data were collected from the medical records of these patients.

The diagnosis was evoked in the face of association of some arguments (debility terrain, the presence of otitis externa not improved by the usual antibiotic treatment, otoscopy data, the result of the bacteriological sample)

It was then confirmed by the imaging data and the anatomo-pathological study.

Results:

The average age of our patients was 60 years with extremes ranging from 54 to 76 years. Our patients were divided into 10 men (83%) and 02 women (17%). Our series included 10 diabetic patients (9 patients had type 2 diabetes) and two patients with kidney

failure, one of whom was in the hemodialysis stage. Two patients reported the notion of ear trauma, as a triggering factor, during an ear wash. The majority of our patients consulted in our service within an average of 30 days with extremes ranging from 15 days and 45 days.

Clinically, severe insomnia otalgia was present in all cases and was associated with purulent otorrhea in 8 patients (67%). Symptomatology was unilateral in all cases (Left ear: 8 cases either (67%) - Right ear: 4 cases either (33%)). The associated signs were reported such as hypoacusis in 5 cases, facial paralysis in 2 cases, a limitation of mouth opening by extension of the infectious process to the temporal-mandibular joint in only one case. We found a perichondritis during the inspection of the pinna and the external auditory meatus in 2 cases redness with swelling of the retro auricular region in 1 case, a purulent otorrhea present in 8 patients. Palpation objecting pain to compression of tragus and traction of the pinna in all patients. Otoscopic examination showed congestive narrow external auditory canal in 10 patients, granulation tissue was found in 5 cases, fetid purulent auricular discharge was found in 8 patients. Pathogen was identified in 6 cases ((*Pseudomonas Aeruginosa* was identified in 5 patients or 62.5%, and *Candida parapsilosis* in 1 case) The culture was negative in 2 cases. Moreover, the study of the sensitivity of germs to antibiotics was systematic to adjust antibiotic therapy. Biologically, sedimentation rate (VS) was accelerated in 5 patients with an average of 75.

Excision of granulation tissues found in otoscopy was possible in all patients whose result was non-specific inflammatory tissue.

An axial and coronal CT scan with and without contrast injection was performed in all patients. It has highlighted (a filling of the external auditory canal in 8 cases - [figure 1](#), osteolysis of tympanic bone and mastoid in 6 cases - [figure 1, 3,4](#), Damage to the peri-auricular soft parts in 4 cases - [figure 2](#), Mastoid cell filling in 4 cases - [figure 3, 4](#), Infiltration of the deep spaces of the face in NONE of our patients, An extension of the inflammatory process to the TMJ in 1 case, a lysis of the shell of the 3rd portion of the facial nerve in NO case.

All patients received general parenteral antibiotic therapy for an average of 14 days followed by oral therapy on discharge. In all our patients the antibiotic therapy was probabilistic at the beginning and then adapted to the results of the sample (The germ targeted in probabilistic was *Pseudomonas aeruginosa*) Ciprofloxacin was the leader of antibiotics used. The different associations used in our series: Ciprofloxacin + ceftriaxone: 6 cases, Ciprofloxacin + aminoglycoside: 3 cases, Ciprofloxacin + metronidazole: 2 cases, Ciprofloxacin + ceftazidime: 1 case. The oral route was relayed in most cases by Ciprofloxacin monotherapy for an average of 4 weeks. The average duration of total treatment (parenteral and oral) was 6 weeks with extremes ranging from 5 weeks to 11 weeks.

All our patients received daily local treatment including aspiration of the purulent secretions, cleaning with aspiration of the external auditory canal, debridement of the granulation tissue in 3 cases, local antibiotic therapy (quinolone) (OFLOXET 5drops/bath x2/day), a calibration of the external auditory canal using an expansive dressing by the pop-oto-wick bit. Diabetes control was carried out in collaboration with endocrinologists. Our patients were monitored based on clinical, biological (sedimentation rate) and radiological (CT scan of the temporal bone) data. The evolution was favorable in 84% of cases, one recurrence was noted in 1 case (2 years average decline).

Discussion: Our series included 90% of diabetic patients. This is consistent with the literature since necrotizing otitis externa (NOE) occurs most often in elderly or immunocompromised diabetic subjects ([7,8](#)).

The more frequent occurrence of NOE in diabetic subjects is explained by the precariousness of tissue perfusion usually found in these patients and which is related to microangiopathy. The vasculitis induced by *Pseudomonas aeruginosa* as well as the high pH of cerumen in diabetics would also be incriminated in the pathophysiology of the infection ([5,9](#)).

Infection usually develops as a result of a local trauma of the external auditory canal causing a break-in of the skin barrier ([9](#)). Subsequently the infection spreads from near to near through the Santorini fissures and venous structures to the adjacent soft tissues, cartilage, bone, and then extends to the base of the skull and involving the prognosis of life ([2,10](#)). In our series, bacteriological sampling isolated a *Pseudomonas aeruginosa* in 75% of cases, according to the literature, *Pseudomonas aeruginosa* is the offending germ in more than 95% of cases, but other germs may also be involved such as *Staphylococcus epidermidis*, and more rarely fungal agents such as *Aspergillus fumigatus* ([2,11](#)).

The fungal origin should be suspected given the negativity of repeated bacteriological samples and the lack of improvement despite well-conducted antibiotic treatment. This form of NOE is increasingly described in the literature in young immunocompromised subjects ([10,12](#)).

Our patients reported severe otalgia in all cases, associated with purulent otorrhea in 67% of cases. The clinical picture of NOE as described in the literature is initially characterized by a discrete otalgia explaining the diagnostic delay. Thereafter, this otalgia will gradually intensify becoming severe to nocturnal exacerbation and will be accompanied by a classically purulent greenish and nauseating otorrhea ([9,13](#)).

The otoscopic examination of our patients showed a reduced-caliber duct in all cases and the presence of granulation tissue in 61% of cases, these otoscopic data are consistent with those described in the literature (9).

In our series, facial paralysis was noted on the initial examination in two cases, Facial paralysis is the most common nerve complication due to the proximity of the pen-mastoid foramen (9), Mixed nerves can also be affected by extension of the infectious process to the jugular foramen. Much more rarely, one can note a breach of the V and the VI indicating the reach of the petrous apex or a contralateral extension (11), The involvement of the cranial nerves is a factor of poor prognosis for some (7,14), while for others, this involvement does not influence the prognosis provided the treatment is adapted and optimized (11).

In our series, a biopsy with anatomopathological study was performed in all cases where granulation tissue was objectified to the examination. The systematic biopsy of the granulation tissue at the external auditory canal makes it possible to eliminate certain differential diagnoses such as tubercular otitis or cholestasis, Wegener granulomatosis, but especially the epithelium of the external auditory canal which can be a source of serious diagnostic error (2,9)

Biologically, sedimentation rate is typically accelerated and can be used in monitoring as an indicator of response to treatment (9,10).

In our study, CT-scan was done in all cases, It showed a thickening of the soft parts of the external auditory canal in all cases and osteitis lesions with lysis of the bone cortical tympanal bone and mastoid, According to the literature, CT can assess the extent of lesions, particularly at the bone level (temporal bone, base of the skull, temporomandibular joint, etc.). (13,14) The MRI is of interest in the evaluation of the extension of lesions in the lateral pharyngeal soft parts, nerve foramens, bone marrow, meninges and intracranial (9).

Scintigraphy with Gallium 67 is particularly indicated in therapeutic follow-up. It confirms the cure and thus allows the cessation of treatment (2). It is then performed every 4 weeks to follow the progression of the disease under treatment (14).

The treatment of NOE is essentially medical, it must be introduced as early as possible in a specialized environment. It combines immunosuppressive correction or diabetes control, daily local treatment and extended systemic antibiotic therapy (9, 7). The antibiotic therapy must be synergistic and active on the germ in question, anti-Pseudomonas molecules will be prescribed first line and the treatment can be adjusted subsequently according to the results of microbiological samples (9, 7). Active antibiotics on Pseudomonas aeruginosa are represented by aminosides, fluoroquinolones (ofloxacin and ciprofloxacin) and certain beta-lactamines (penicillins (piperacillin, tazobactam), third generation cephalosporins, particularly ceftazidime, imipenem) (9,7). In limited forms of NOE, some authors recommend oral ciprofloxacin mono-antibiotic therapy at a dose of 1.5 g/d in two doses for 6 to 8 weeks (5, 10). Parenteral treatment should be extended for 4-6 weeks and then relayed orally by fluoroquinolone for an average of 6 weeks, The duration of the treatment should be adapted according to the clinic, the sedimentation rate and the weeks data. In case of mycosic disease, treatment should be extended for 3 to 6 months (7,9).

In case of mycosic disease, treatment uses amphotericin B intravenously and itraconazole orally (12,10).

Surgical treatment has been indicated for eight patients, according to literature data, surgery has a limited role in the treatment of osteitis of the base of the skull. It is carried out in case of unfavorable evolution under medical treatment and must be reduced to purely local gestures in order to avoid the extension of lesions to the healthy bone. It consists of bone removal, debridement of infected tissue and drainage of purulent collections (2, 5).

Hyperbaric oxygen therapy is proposed by some authors in advanced forms with significant damage to the base of the skull and intracranial extension and in case of recurrence or lack of response to medical treatment (14,15). In these cases, and in the absence of contraindications, it is recommended after two weeks of parenteral treatment. However, its results remain controversial (14.7).

Regular patient monitoring is required and is based on clinical, biological and radiological criteria. Follow-up should be extended as recurrences may occur within one year of treatment (14). According to the various published series, recurrences occur in 10 to 25% of cases and are generally related to early cessation of antibiotic therapy (4). Overall mortality ranges from 0% to 15%, whereas it was initially around 50% (16.17). It may be related to intracranial complications or complications secondary to prolonged antibiotic treatment such as spinal aplasia (9).

Conclusion: Necrotizing otitis externa is a severe infection. Its prognosis has improved markedly since the advent of antibiotics effective on Pseudomonas aeruginosa. Its management must be started without delay and its treatment must be prolonged.

References :

- 1- L'otite externe nécrosante progressive : ce que le radiologue attend de l'imagerie. Le 41ème congrès annuel de la société française de neuroradiologie, Service de neuroradiologie- Hôpital de spécialités de Rabat,2014

- 2- Martel J, Duclos Jy, Darrouzet V, Guyot M, Bebear Jp. Malignant or necrotizing otitis externa: experience in 22 cases. *Ann Otolaryngol Chir Cervicofac* 2000 ;117 :291.
- 3- Otite externe maligne : le paradigme changeant du traitement. Daniel A. Carlton, Enrique E. Perez, Eric E. Smouha 14 mai 2017
- 4- CHNITIR S. L'otite externe maligne à propos de 45 cas. Thèse médecine Tunis 2005
- 5- Rubin Grandis J, branstetter Bf 4th, yu VI. The changing face of malignant (necrotising) external otitis: clinical, radiological, and anatomic correlations. *Lancet Infect Dis* 2004;4:34-9.
- 6- Akre Ee, Akre A, Tanon Mj et al. Necrotizing external otitis in children in Abidjan (Ivory Coast). *Rev Laryngol Otol Rhinol (Bord)* 2002;123:225-30.
- 7- Handzel O, Halperin D. Necrotizing (malignant) external otitis *Am Fam Physician* 2003;68:309-12.
- 8- Glynn F, Walsh Rm. Necrotizing otitis externa: a new trend? Report of 6 atypical cases. *Ear Nose Throat J* 2009;88:1261-3.
- 9- Hariga I, mardassi A, belhaj Younes F et al. Necrotizing otitis externa: 19 cases' report. *Eur Arch Otorhinolaryngol* 2010;267:1193-8.
- 10- Carfrae Mj, kesser Bw. Malignant otitis externa. *Otolaryngol Clin North Am* 2008; 41:537-49.
- 11- Mani N, sudhoff H, rajagopal S, moffat D, axon PR. Cranial nerve involvement in malignant external otitis: implications for clinical outcome. *Laryngoscope* 2007;117:907-10.
- 12- Mani R, belcadhi M, krifa N, abdelkefi M, ben Said M, bouzouita K. Fungal necrotizing external otitis. *Ann Otolaryngol Chir Cervicofac* 2008;125:40-5.
- 13- Eleftheriadou A, Ferekidis E, Korres S et al. Necrotizing otitis externa: an often unsettling disease in rural and remote Greek areas. The crucial role of family physicians in prevention and treatment. *Rural Remote Health* 2007;7:629.
- 14- Sreepada Gs, kwartler JA. Skull base osteomyelitis secondary to malignant otitis externa. *Curr Opin Otolaryngol Head Neck Surg.* 2003;11:316-23.
- 15- Sudhoff H, rajagopal S, mani N, moumoulidis I, axon Pr, moffat D. Usefulness of CT scans in malignant external otitis: effective tool for the diagnosis, but of limited value in predicting outcome. *Eur Arch Otorhinolaryngol* 2008;265:53- 6.
- 16- Okpala Nc, siraj Qh, nilssen E, pringle M. Radiological and radionuclide investigation of malignant otitis externa. *J Laryngol Otol* 2005;119:71-5.
- 17- Peleg U, perez R, raveh D, berelowitz D, cohen D Stratification for malignant external otitis. *Otolaryngol Head Neck Surg* 2007;137:301-5.



Figure 1: Scan the left temporal bone in a coronal slice through the external auditory canal. Showing an inflammatory filling of the right external auditory canal and a lysis of the anteromedian wall of the left tympanic bone. (Image of the ENT department of the Moulay Ismail-Meknes military hospital in Morocco)

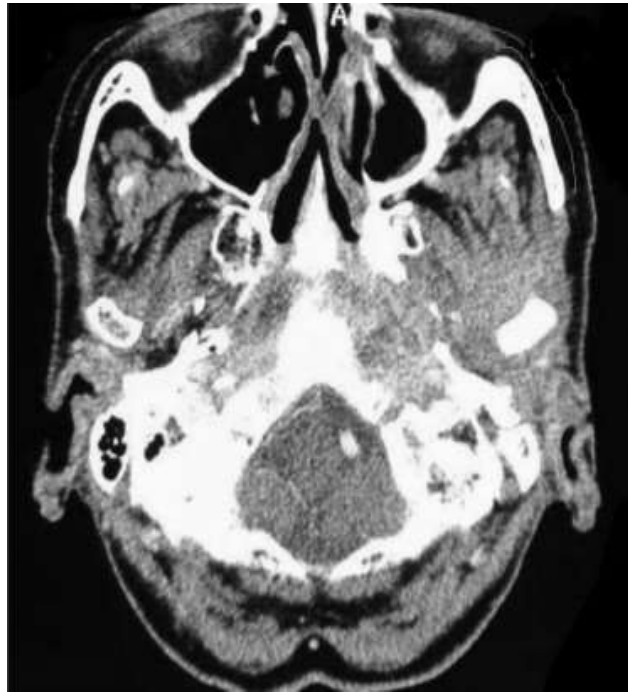


Figure 2: axial section passing through the rock in parenchymal window showing bone lysis with soft parts. (Image of the ENT department of the Moulay Ismail-Meknes military hospital in Morocco)

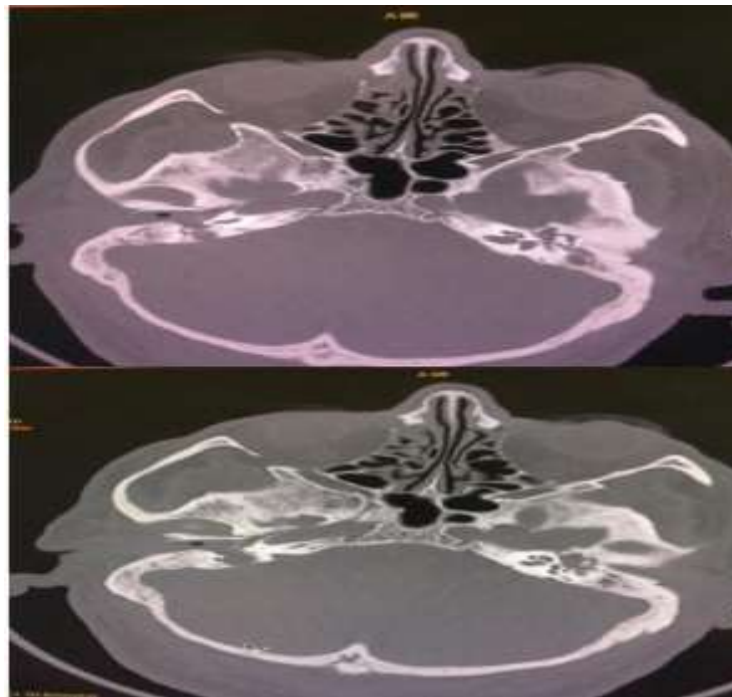


Figure 3: CT of the rock in straight axial section also showing a demineralized and localized lysed appearance of the different right ossicles. (Image of the ENT department of the Moulay Ismail-Meknes military hospital in Morocco)



Figure 4: CT of the rock right side in axial section objecting a total hypodense filling of the external auditory canal and the right middle ear associating a bone lysis of interest to the mastoid den and the tympanic part of the homolateral temporal bone related to osteolysis. (Image of the ENT department of the Moulay Ismail-Meknes military hospital in Morocco)