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A Review on *Otitis externa*: An Approach to a Etiopathogenesis, Epidemiology, Clinical Features and Management Protocol

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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Review Article

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ABSTRACT

Introduction: The external ear is the part of our ears which is seen from outside. It is made up of the auricles (pinna) and external auditory canal; and, includes the outer wall of the middle ear, i.e. the eardrum. Otitis externa is a regular presentation when on call for ENT or at the emergency ENT health clinic or centre. Infective and reaction groups of otitis externa are classified.
Methodology: The articles reviewed in this narrative review article have been traced from a variety of links and sources over the internet like PubMed, NCBI, ScienceDirect, NHSINFORM, Uptodate, WebmedCentral, American family physician, ClevelandClinic, StatPearls, and many more. References from high yielding sources were taken and the articles were properly assessed.
Results: Paying attention to the scientific elements while performing an operative procedure can give a physician extended results. Which operative modality to be chosen depends on the patient. The patient's choices are also important in the decision making of the operation.
Discussion: External otitis is possibly spotted in almost every peer category. Approximately ten percent (10%) of humans may face this condition during their lifetime. Most of the time, the infection is mixed. Medical intervention of the ear can prove painful for most cases, therefore, post-surgery analgesics must be utilized for a time period which the treating physician prescribes. The

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aim of curing the patient is to free him/her from the symptoms and getting rid-off any pathogen causing a specific infection.
Conclusion: The efficacy of operative modalities of extremes of otitis externa will rely on complete patient examination, history and lab results. Selection of the correct intervention, proper knowlege of the regional anatomy, paying attention to scientific elements and good post-operative care is necessary. It is never easy to avoid otitis externa, but we can make an effort to decrease the risk of developing this problem.

Keywords: Otitis externa; gallium 67; Tc 99 test; neurodermatitis; eczematous otitis externa; Radical surgery.

1. INTRODUCTION

When the external canal of our ears are inflamed, developing either in a short period, or over a longer span of time, it is termed as otitis externa. Around 10% of humans develop the problem during their life, and the risk after the first episode rises [1]. Hence, otitis externa is a regular presentation when on call for ENT or at the emergency ENT health clinic or centre.

The external ear is the part of our ears which is seen from outside. It is made up of the auricles (pinna) and external auditory canal, and includes the outer wall of the middle ear, i.e. the eardrum. Together with the eardrum and the middle ear, the pinna plays a role to boost up the sound. The pinna behaves like a funnel to transfer the sound to the external meatus, and the external meatus focuses sound onto the eardrum for further transferring [2].

1.1 Classification

In the infected group, bacterial swellings consist of furuncle and otitis externa which is diffuse. Otomycosis comes under fungal, viral are herpes zoster oticus and otitis externa haemorrhagica. In the reactive group, there is neurodermatitis, both the eczematous and the seborrhoeic varieties.

2. DISCUSSION

2.1 Epidemiology

External otitis is possibly seen in every peer category. 10 percent humans may face this condition during their lifetime. Yearly number of visits to the Physician in the United States for this is highest before and during youth and decrease with age:

-7/100 people aged 0-4 yr
-19/100 people aged 5-9 yr [3].

2.2 Aetiopathogenesis

Organisms which are responsible may be *S. aureus*, *P. pyocyaneus*, *Bacillus proteus* and *E. coli*, but, after, the infection is mixed [4]. Swimming is one of the most common risk factors, and amplifies the problem five fold in comparison to people who do not swim. Other elements are:

-Humid domain
-Injury or devices in external ear (cotton, earphones, hearing devices)
-Skin may exhibit eczema or psoriasis
-Ear duct which is narrow and inadequate
-Ear passage obstruction (occlusion of cerumen, foreign material)
-Radiation or chemotherapy
-Stress
-Impaired immune mechanism

2.3 Clinical Features

In the bacterial category, furunculosis is caused by *S. aureus*. As the hair exist only in the cartilaginous fragment of the meatus, furuncle is spotted only in this region [5]. In general they are single, but may also be multiple. The sufferer has a tender ear and severe aching [6]. Movements of the pinna become painful. Any jaw activity, like chewing, also lead to pain in ear. A furuncle, if present on the posterior meatal wall, will lead to edema over the mastoid with occlusion of the retroauricular groove.

The diffuse form of *Otitis externa* causes discomfit, pruritus, edema and severe ache. The canal may be blocked entirely, and the pinna and nearby skin may also be involved. Mild fever may be present. If the temperature is found to exceed 101°Fahrenheit, it may indicate infection beyond the auditory canal [7].

Diffuse *Otitis externa* may be acute or it may be chronic. The *Acute phase* is marked by hot

flaring or a burn like feeling in the earhole, after which pain is felt which gets provoked and increases by movements of jaw. Thin serous discharge is ejected which later converts into thick and purulent type. The meatal lining becomes swollen. Accumulation of detritus and emitted discharge along with meatal swelling leads to conductive hearing loss. The chronic phase is marked by vexation and strong craving to scratch. This is the reason for awful exacerbations and repetition of infection. Discharge is limited and may change into crusts when drying [8]. It is an inflammatory state originated from pseudomonas usually in the geriatric population, suffering from diabetes, or in those getting treated with immunosuppressive drugs. Its initial features bear a resemblance to diffuse otitis externa but there is agonizing pain and advent of granulations in the earhole. Facial paralysis is seen commonly. Infection may lay out to the base of the skull and also to the jugular foramen causing multiple number of cranial nerve palsies. It is found to be rare but can also be lethal [9].

Otomycosis takes place due to *A. niger*, *A. fumigatus* or *C. albicans* and is evident in warm and humid ambience of the tropics and subtropics. Fungal growth which is incidental to topical antibiotics is also seen. The *clinical features* of otomycosis include pruritus, discomfit, scale formation and aches in the ear, water like discharge with a musty odour and ear block [10].

When examined with an otoscope, *A.niger* appears as black-headed filament-like growth, *A.fumigatus* as light blue or greenish and Candida as whitish or cream like deposit. The meatus skin is sodden, reddened and swelled.

Eczematous otitis externa is the sequel of hypersensitivity to certain organisms that are infectious or, some eardrops. It is marked by intense vexation, forming of vesicles, oozes and, crusts in the ear passage [11].

Herpes Zoster Oticus is marked by vesicles, evident on the ear membrane, meatal skin and the concha. It is also, sometimes, evident on the post-auricular groove. It is found that the VIIth and VIIIth nerves may be the culprits [12].

2.4 Complications of *Otitis externa*

Even though the complications linked with external otitis are less seen, there can be worry due to problems that may develop ahead of this. A few of the significant complications of this are described here:

Abscess: Abscess in this situation is aching, usually filled with pus, it can be seen in and near the area of interest in ear after an infection.

Sometime they cure by themselves, but, also, the General Physician may require to drain the filled pus from the abscesses [13].

Narrowing or atresia of the earhole: If you are having very long-span i.e., chronic variety of otitis externa, thickened, bulky and dried skin can develop inside your ear passage.

This causes the ear canal to stenose (atresia), which will influence your hearing capability and, in very few cases, can even make you deaf. But, it can be treated using some eardrops.

Swelled or pierced membrane: It is normally possible for any sort of infectious organism to reach to your ear membrane. In few of the cases, the infection caused by an organism can cause pus to form inside a person's inner ear and can tear the tympanic membrane of ear. This is termed as a pierced or perforated membrane.

Features are:

-Transient losing of the sense of hearing

-Aching in ears or discomfit

-an ejected discharge from the ears which is mucus

-a feeling of ringing sound in the ears

In some patients, a perforated eardrum cures without doing anything in a span of weeks or months. Surgical intervention may be necessary if no evidence of healing is found after this period of time.

Cellulitis: Cellulitis is defined as an infection of bacteria in skin that can take place ahead of otitis externa. This is what happens when the bacterial organism that was living peacefully on the superficial part of your skin enters the inside layers through injured regions. Cellulitis make the harmed parts of skin turn red, painful, warm and tender while touching.

Remaining symptoms are:

-feeling unwell
-quivering
-chills

Many of the cases of cellulitis can be cured within a week with regimen of antibiotic medicines. If cellulitis come about in a human who was extremely unwell from before or who is vulnerable to the consequences of infection, they are required to be admitted in a hospital as a safety measure.

Necrotizing variety of otitis externa: The necrotizing variety of otitis externa is an alarming and rare complication of otitis externa, in which the infection reaches to the osteon that borders your ear canal. It usually has more effect on the adult population as compared to children. Adults who have a less competent immune system are usually at more risk of developing the problem. This group of people:

-getting any chemical therapy

-with any long-span health co-morbidities, such as DM/diabetes mellitus or a person with AIDS

Signs & symptoms of necrotizing external otitis can be:

-excruciating aches in the ear and aches in the head

-exposed osteon visible in the ear passage

-Facial nerve palsy – in which the face is found to droop on the side of the diseased ear

In absence of any treatment, necrotizing external otitis can become lethal. But, it's a relief that, it can be properly treated with help of antibiotics and operative procedures to get rid-of any deteriorated tissue [14].

2.5 Management Protocol

The aim of treating the patient is to free him/her from the symptoms and getting rid-of any pathogen causing a specific infection [15].

Otic surgery is needed if there has been partial or transient response to non-surgical approach. Total earhole ablation + bulla osteotomy, is surgery that may heal. In a few patients, slight non-invasive treatment (lateral ear resection or vertical earhole ablation) + right long-span medical regimen will help extend the aim of the procedure. Which operative modality is chosen depends on the patient and physician. The patient's choices are also responsible in the decision making of the surgery.

In case of malignant otitis externa, CT scan may display bone ruination but is not very helpful in general. The Gallium-67 test has more utility in making a decision and for investigating the case further. It is taken up by monocytes and reticuloendothelial cells, and hence, suggests soft tissue infection. The test can be done again in 3 weeks. Tc 99 bone scan reveals bone infection but it may remain positive for 12 months and is not used to check on the disease.

Management:

(i) Controlling body sugar, especially in diabetic patients

(ii) Ear canal cleaning: Remove ejected discharge, detritus and granulations or any necrosed tissue or osteon.

(iii) Antibiotic regimen against the responsible organism, which in most ears is P.aeruginosa. Antibiotics are taken for about 1.5-2 months, sometimes even further. Antibiotics found effective are:

-Gentamicin + Ticarcillin (given intravenously); Gentamicin has toxic effect on ears as well the excretory system, Ticarcillin may produce Penicillin-like reactions.

-Third-generation Cephalosporins, e.g. Ceftriaxone (1–2 g/day i.v. or Ceftazidime 1–2 gram/day i.v.) + Aminoglycoside.

-Quinolones (Ciprofloxacin, Ofloxacin and Levofloxacin) are also effective and can be given orally. Quinolones + Rifampin can be given.

If patient does not seem receptive, culture and sensitivity of ear discharge will help the physician in making further decisions [16]. Extension of antibiotic regimen has replaced radical surgery and resections done earlier in this context [17].

Treatment of otomycosis usually comprise of proper ear cleaning to remove all the waste discharge and epithelial detritus provide conduction for the nourishment of the fungal organism. It can be done by syringing, suctioning

or mop. Some specific antifungals can be used. Nystatin is found to be effectual in case of Candida. Other broad-spectrum antifungal agents are Clotrimazole and Povidone iodine. 2% Salicylate added in alcohol is also effectual. It leads to keratolysis which peels the epidermal surface coverings, and along with that, the fungal mycelia growing into them. Antifungal regimen should be given for 7 days even after complete cure to avoid repetition. There is a strict requirement of keeping ear in a dry state. Bacteria are generally associated with the condition and cure with an antibiotic/steroid medicine helps to decrease swelling and oedema and thus permits better entrance of antifungals.

Treatment of eczematous external otitis is stoppage of the topical antibiotic which is creating sensitivity and steroid cream should be used.

3. RESULTS

Paying attention to scientific elements while performing an operative procedure can surely give a physician extended results. Meticulously get remove the tissue of target, and precisely approximate the tissues, especially nearby the aural passage (lateral aural resection & vertical otic hole ablation). Ear operative intervention can prove painful for most cases, so, post-surgery analgesics must be utilized for a time period which the physician prescribes. Use of the analgesics before the operation and using local anesthetics during surgical procedure (e.g., Bupivacaine HCl) can make patient comfit better in the initial post-operative span. Any self-imposed harm by safeguarding the operative wound site with dressings ahead of surgery. Utilize hot towels to reduce postoperative inflammation in nearby region and to promote easy removal of the detritus from the surgical site incision. Using the systemic antibiotic drug(s) that are selected on the culture and sensitivity procedure report outcomes. Use them for about 1-1.5 months, or as the physician recommends. Removal of the dressings can be done in a fortnight.

On a conclusion note, the efficacy of operative modalities of extremes of otitis externa will rely on complete patient check. Selection of the correct intervention, proper knowlege of the regional anatomy, attention to scientific elements and good post-operative care is necessary [18].

Some external otitis and certain ear problems have been found in animals. There’s no specific gender distribution for this condition. Younger animals can be affected more often. Breed qualities for otitis indicate the ones for skin problems (e.g., allergy in the retrievers & the terriers). Certain signs may comprise of any amalgam of head shakiness, aches with ear handling, bad odour, exudate, erythema, eroded part, ulcer formation, inflamed part, or hyperplasia of the ceruminous glands [19].

4. CONCLUSION

It is never easy to avoid otitis externa, but we can make an effort to decrease the risk of developing this problem.

Try to avoid or minimize damaging the ears: - Don't put the cotton plugs or any other material deep inside the earhole. Wax finds the way out on its own because the skin there migrates outwards and it has its own mechanism of auto-clean. Cotton plugs or buds should only to be utilized to wipe in the external ear canal.

-If earwax building up is a becoming a big issue, get it cleaned only by an ENT Doctor.

Keep the ears dried:

-Do not let water enter, and soap, shampoo, conditioner enter in the earhole while you wash your hair. Protect your head with a shower-cap when you use shower or wear going to swim.

-When washing hair is done, make sure you dry your ears with a hair-dryer from a distance, so that your facial skin does not get damaged by the heat. Never force the thick edges of a napkin into the ears for drying them, since this will cause pain.

-If you go to swim frequently, utilize a swim-cap that will cover the entire head and the ears, just using cotton ear plugs won’t do. (Hence, make sure you do not use them, because they will get wet immediately as soon as your ears come in contact with the water).

-Don't swim in dirty water. Everyone is not that immune, hence, act keeping your immunity level in mind.

-Move your head downwards bending it on both sides after coming out of pool. This will make the water draining easy from the ears.

-Do not put or attach anything inside the earhole for fun. These are pen, pencil, rounder and

divider of geometry box, hair-pin or sand, dirt, etc. Cotton swabs should be utilized only for the outer part of ear.

Treat and prevent other skin conditions:

-If you get sick with otitis externa, inform your General Practitioner. Eardrops having specific substances, like neomycin, are more possibly causing allergic reactions. The Physician, or practicing nurse can suggest which eardrops are the best fit for your ears.

-Get appropriate guidance for certain other skin problems, such as psoriasis or eczema, for curing them with the appropriate medication.

-Avail the acidification eardrops or some sprays to make the ears untidy, especially some time ahead of and after swimming activities. They can be obtained without the need of a medical prescription in many pharmacies and they help in avoiding external otitis repetition.

If you think the symptoms are very dangerous and they have somewhat failed in giving a good response to the initial therapies, your physician may refer you to a specialty hospital for more advice and higher treatment modalities [20-25].

CONSENT AND ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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