

What causes acute otitis externa?

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Abstract

External otitis is an extremely common condition and can affect between five to twenty per cent of the patients attending ENT clinics (Hawke *et al.*, 1984).

Its precise pathogenesis remains unclear, despite several aetiological classifications in the literature. The aim of this study was to investigate the relationship between infection, water exposure and trauma and the development of acute otitis externa. The study comprised 100 patients with their first attack of otitis externa and 150 age and sex matched controls. In only 40 per cent of cases could a primary microbiological cause be found.

There was no significant statistical difference found between the two groups regarding the use of agents capable of traumatizing the external canal. Regular swimming, showering and hair washing were significantly more common in patients with acute otitis externa. Allergic disorders were nearly three times more common in the external otitis group suggesting a possible immunological aetiology.

Key words: Otitis externa, acute

Introduction

External otitis is very common in otolaryngological practice. Numerous authors claim that between 20 and 30 per cent of their patients are seen for this condition (Anderson and Steel, 1948; Gill, 1950; Hawke *et al.*, 1984). It is a painful and distressing disease which often follows a protracted and relapsing course. Its first description was by Mayer in 1844, who believed that it was a fungal infection of little significance. This view was changed during World War II when otitis externa caused considerable morbidity among Army personnel in the Middle and Far East (McDowall, 1974).

The pathogenesis of otitis externa is complex. Since 1844 many predisposing factors have been described. Branca (1953) stated that swimming either initiated the attack or was responsible for its recurrence. Senturia *et al.* (1980) considered warmth, humidity and trauma to the epithelium of the external auditory canal were important. Hawke *et al.* (1984) found exposure to water and the use of cotton bud applicators predisposed to both acute and chronic otitis externa. Primary infection of the external canal has also been considered important (McLaurin *et al.*, 1965; Barton *et al.*, 1979; Senturia *et al.*, 1980; Hawke *et al.*, 1984).

Several aetiological classifications have been proposed in the past. Mawson (1967) described an infective group and a reactive or allergic group. Peterkin (1974) described four subgroups: (i) genetic, e.g. narrow canal, excessive wax, inherited tendency to eczema; (ii) environmental,

e.g. heat, humidity and swimming; (iii) traumatic, e.g. hairgrips, cotton buds and matches; (v) infective, e.g. *Staphylococcus aureus*, *haemolytic streptococcus*, *Escheria coli*, *Pseudomonas pyocyanea*. Even chronic eustachian tube dysfunction has been proposed as an underlying cause in some patients with otitis externa (Morrison and Mackay, 1976).

Despite the above proposed aetiologies and classifications, their precise interrelationship and significance in the development and progression of external otitis remains unclear.

The present study aimed to examine the role of the three major proposed aetiological factors, i.e. water exposure, infection, and trauma, in the development of otitis externa.

Patients and methods

One hundred patients presenting to the Royal Victoria Eye and Ear Hospital, Dublin, with their first ever attack of otitis externa were studied from October 1988 to March 1989. There were 41 males and 59 females, with ages ranging from five to 80 years. All patients were questioned regarding the frequency of nine different social habits (Table I) and only those carried out on a regular basis were recorded. This was defined arbitrarily as three or more times a week in relation to the insertion of cotton buds, matches, hair clips, fingers and towel corners into the external canal. Hair washing and showering were considered regular if practised three or more times a week.

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TABLE I
SOCIAL HABITS

Cotton buds	Hairwashing
Hair clips	Showers
Matches	Ear syringing
Fingers	Swimming
Corner of towel	—

Swimming was thought to be significant if performed once weekly or more often and lastly, ear syringing was considered to be important if required monthly. All cases were asked about the presence or absence of allergic disorders, e.g. hay fever, asthma and eczema (Table II). Otoscopy was performed in every patient and ear swabs were taken for microbiological analysis. Patients with chronic otitis externa and chronic middle ear disease were excluded from the study.

One hundred and fifty age and sex matched controls were recruited over a three-day period, from a large Dublin shopping area. They received the same set of questions and also had an otological examination. The results from the two groups were statistically analysed using the Chi-squared test.

Results

Otitis externa was found in all age groups from five to 80 years, with a peak age incidence between 25 and 45 years. Seventy per cent of cases had unilateral disease and 54 per cent had disease involving the entire ear canal; 62 cases (62 per cent) had an associated aural discharge. The remaining patients had dry, erythematous, oedematous meatal walls.

Interestingly, 22 per cent of the otitis externa group had one or more of the allergic disorders mentioned above compared to only eight per cent of the control group (Table II). The microbiology results are presented in Figure 1. Thirty-two external otitis patients had a pure growth of pathogenic bacteria isolated on culture, five cases had a mixed culture of bacteria, 10 patients yielded fungi and in the remaining 46 cases commensals were obtained. The most significant gram-positive organism was *Staphylococcus aureus* while *Pseudomonas aeruginosa* was the most prominent gram-negative organism. The other gram-positive organisms were mainly group D and G streptococci while the other gram-negative organisms consisted of *Haemophilus influenzae*, *Proteus sp.* and *Escheria coli*. The chief anaerobes were bacteroides, clostridii and anaerobic streptococci. The principal fungus was *Candida albicans* with eight cases as opposed to two *Aspergillus niger*. Lastly the majority of commensals were either *Staphylococcus albus* or diphtheroids.

There was no significant difference between the two groups in relation to the use of agents capable of trau-

matizing the external canal, e.g. cotton buds, matches, fingers, corners of towels and hair clips. The frequency of ear syringing was the same in both groups. Frequent hair washing and swimming were more common in otitis externa patients, the difference being statistically significant ($p < 0.05$). Interestingly regular showering also appeared to be a significant predisposing factor ($p < 0.001$) (Table III).

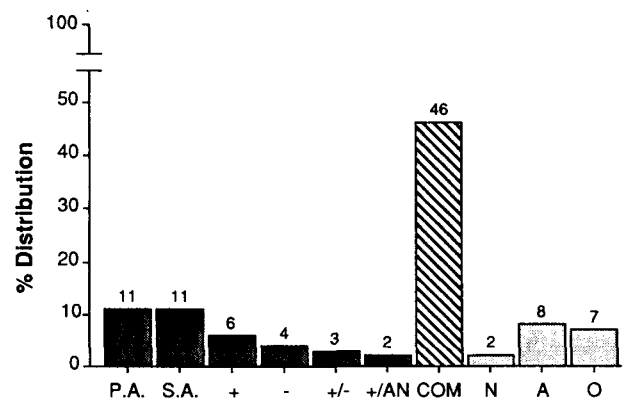
Discussion

Acute otitis externa is an important condition both in terms of its prevalence and chronicity. It is a disease often characterized by numerous exacerbations and remissions and often appears in different forms in the same patients (Branca, 1953).

The numerous forms of treatments available demonstrate our incomplete understanding of the condition. The aetiology has been changed several times during the course of the last 148 years since Mayers's first description of the disease in 1844. For years it was thought to be a fungal disease and fungicides were the mainstay of treatment. In the 1950s external otitis was considered to be primarily bacterial in origin based on the experience of cases during World War II. This led to the introduction of numerous antibiotics with different antibacterial spectra. However, these too have proved ineffective and have failed to offer more permanent cures.

Our results do confirm that the role of fungal infections is small and only 10 per cent of patients yielded these pathogens. Our findings also demonstrated that pathogenic bacteria play a part. Their role, however, appears to be less than in previous studies.

Hawke *et al.* (1984) isolated pathogenic bacteria from the majority of the acute otitis externa patients. Several other authors have confirmed the importance of colonization of the external canal by exogenous bacteria (Wright and Alexander, 1974; Hoadley and Knight, 1975;



	Cases
<i>Pseudomonas aeruginosa</i> (P.A.)	11
<i>Staphylococcus aureus</i> (S.A.)	11
Other gram-positive organisms (+)	6
Other gram-negative organisms (-)	4
Combined gram-positive/gram-negative organisms (+/-)	3
Combined anaerobes/gram-positive organisms (+/AN)	2
Commensals (<i>staphylococcus epidermis</i> , diphtheroids) (COM)	46
<i>Aspergillus niger</i> (N)	2
<i>Candida albicans</i> (A)	8
No growth (O)	7

FIG. 1
Microbiology.

TABLE II

	Control N = 150	Otitis externa N = 100
Eczema	5	6
Asthma	7	3
Hay fever	—	7
Hay fever + asthma	—	4
Eczema + asthma	—	1
Eczema + asthma + hay fever	—	1

TABLE III

	Test group (%)	Control group (%)	Odds ratio	95% Confidence interval
Cotton buds	56	52	0.97	0.58–1.62
Hair clips	15	21	0.65	0.33–1.27
Matches	16	16	1.00	0.50–2.00
Fingers	56	52	1.17	0.71–1.95
Corner of towel	52	47	1.21	0.73–2.00
Ear syringing	11	8	1.42	0.60–3.35
Hair washing	54	38	1.86	1.12–3.10 $p < 0.05$
Swimming	31	20	1.80	1.01–3.21 $p < 0.05$
Showers	69	42	3.07	1.82–5.20 $p < 0.001$

Cassisi *et al.*, 1977). A primary bacterial cause could only be attributed to 40 per cent of our cases. Interestingly 46 per cent of patients yielded commensals on culture. These results do not contradict the belief that pathogenic bacteria have a role but question the importance of their role. One must also be aware that commensals could become pathogenic given the appropriate conditions. This would imply however that these commensals are secondarily involved and not the primary aetiological factor. Our findings may explain why antibiotics do not provide more permanent cures, as the primary cause is often not treated.

Mawson, in 1967, classified the aetiology of otitis externa into two groups, an infective one due to bacteria, fungi or viral agents, and a reactive group due to eczema or seborrhoeic dermatitis, yet the significance of allergy in the development of otitis externa is unclear. The finding that otitis patients were almost three times more likely to suffer from one or more of the allergic disorders already mentioned is interesting. It may explain why local steroids used singly are effective in treating some cases of otitis externa.

Peterkin, in 1974, described four major predisposing factors: (i) genetic; (ii) infective; (iii) environment, e.g. heat, humidity and swimming and (iv) traumatic, e.g. hair grips and matches. McDowall, in 1974, believed that trauma was important. He stated that scratching and poking the ears with dirty or contaminated objects such as a match stick, was the mechanism by which pathogenic organisms invaded the external canal. It is interesting that both controls and patients with otitis externa admitted to using agents capable of traumatizing their external canals to a similar degree. This was also the finding of Agius *et al.* (1992). It is therefore difficult to conclude that trauma plays a primary role in the initiation of the disease. It may be more important in prolonging and aggravating the disease once it has started, by allowing the invasion of both pathogenic and commensal organisms.

Senturia (1973) believed that prolonged exposure of the canal to water and local trauma caused a defect in the epithelial layer allowing invasion of exogenous bacteria. Swimming has been shown to be a significant aetiological factor (Hoadley and Knight, 1975; Agius, 1992). Our findings suggest that regular hair washing and showering are also important, implying that prolonged water exposure may be more relevant than the type of water contamination.

Conclusions

A review of the results of this study leads to the following conclusions:

- (1) The pathogenesis of acute otitis externa is complex and unclear.
- (2) Patients with acute otitis externa are almost three times more likely to suffer from one or more of the following allergic disorders, i.e. eczema, asthma and hay fever.
- (3) Commensals may play a role in the disease process.
- (4) Trauma of the external canal does not appear to be as important as is commonly believed.
- (5) Prolonged and frequent water exposure appears to be a significant predisposing factor in external otitis ($p < 0.001$).

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