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Role of fungal infections in CSOM : Prospective study

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ABSTRACT

Introduction: Otitis media is known to be one of most common childhood infections and a leading reason for antibiotic prescriptions in the developed world.

Methods: The present study was conducted on 150 cases who come for consultation in the OPD of Deptt. of ENT and Deptt. Of Microbiology, Govt. Medical College, Rajindra Hospital, Patiala.

Observations and results: Apart from the use of topical drops, the humid conditions produced by the discharge, epithelial debris and alkaline pH are the other factors responsible for the secondary fungal infections.

Conclusion: In cases of persistant otorrhoea, aural toilet, culture and sensitivity of discharge and removal of the focus of infection should be sought before using topical drops.

Key words: C.S.O.M., Bacteriology, Antibiotic sensitivity

Introduction

Otitis media is an inflammation of mucoperiosteal lining of middle ear, with or without intact tympanic membrane. Otitis media is known to be one of most common childhood infections and a leading reason for antibiotic prescriptions in the developed world. It was first described by Hippocrates as early as 450 B.C., and it continues to present itself even today as one of the most perplexing universally observed medical problems of childhood and a leading cause of hearing loss [1]. According to WHO survey, 42 million people (older than 3 years) worldwide have hearing loss. The major cause for hearing impairment

is otitis media which is second only to common cold as a cause of infection in childhood [2]. It is estimated that about 90% of the people have atleast one episode of otitis media by their second birthday. For children less than fifteen years old, the most frequent diagnosis made in clinical practice is otitis media [3]. Children from developing countries having unfavourable environment witness an extraordinary high incidence of severe episodes of otitis media with frequent perforation of tympanic membrane with persistent suppurative discharge and necrotizing process in the middle ear. Children from lower socioeconomic groups being more vulnerable

to otitis media, they have to be given special care to prevent hearing retardation [4]. Because of strategic location of tympanomastoid compartment, separated from the middle and posterior cranial fossa by the thinnest of bony partitions, otitis media has the potential for intracranial extension [5]. Chronic otitis media include both chronic suppurative otitis media and chronic perforation of tympanic membrane. The disease usually begins in childhood as a spontaneous tympanic membrane perforation due to acute infection of the middle ear, known as acute otitis media (AOM), or as a sequelae of less severe forms of otitis media i.e. secretory OM [6,7]. Acute otitis media is verbally contrasted with chronic otitis media, the differential emphasis falls upon the word chronic which carries an implication of time and is generally taken to mean long standing. It would be accurate to use the words rapid and slow as synonyms for acute and chronic with the reservation that rapid and slow correctly qualify the rate of pathological changes taking place, but not necessarily the clinical mode of presentation [8]. A permanent perforation of pars tensa can also result from insertion of a ventilation tube in the tympanic membrane which fails to heal [9]. This study has been undertaken to compare the incidence of fungal infections in cases of chronic suppurative otitis media with or without treatment with local antibiotics and steroids. It will be worthwhile to study if incidence of fungal infections is higher in cases using topical antibiotic drops with or without steroids. It will be our endeavour to know whether primary fungal infection in chronic suppurative otitis media exists or not.

MATERIAL AND METHODS

Selection of cases: A patient with h/o discharge from ear along with perforation is sufficient criteria for selecting the patients.

Source of cases : The cases were selected from OPD of ENT department, Government Medical College, Rajindra Hospital, Patiala.

Number of cases : Total 150 cases were included in research work under two groups.

(i) Control group : 50 cases of CSOM who haven't used any local antibiotics or steroids for at least one month prior.

(ii) Study Group : 50 cases of CSOM who have used only local antibiotics and 50 cases of CSOM who have used local steroids with antibiotics.

Clinical Examination : Clinical h/o patient was taken with complete local examination of ear.

Material to be used : Long needle, air tight vial with one inlet & one outlet, a rubber bulb to create a negative pressure, tubes of I/V set to be attached with needle & rubber bulb with vial, ear speculum & syringe.

Procedure of taking the sample : Patient was in supine position. Under all aseptic conditions, rubber bulb is squeezed, the needle is put in middle ear & rubber bulb is released. Secretions are sucked into the sterilized vial & sent for fungal culture to microbiology department of GMC, Patiala. If secretions are scanty in amount, may not come in vial, then needle is detached from tube & secretions are pushed on sterilized swab with syringe. If needed, small amount of saline can be pushed through needle to make pus come out of swabs.

Method of identification of fungus

Fungus will be identified by:

(A) Gram staining done to see any yeast fungus.

- (B) Small amount of material spreaded over glass slide with inoculating loop in solution of KOH & examination done under microscope for hyphae and spores.
- (C) Material cultured on SDA medium with chloramphenicol without cycloheximide (actidione). The culture tube kept at 22°C to 25°C for 2 weeks. Isolate was identified from colony characters and microscopic examination (LCB mount) was done to identify the fungus. In case of yeast fungus, germ tube formation test was done for identification of candida albicans.

OBSERVATIONS :

Present study comprised of 150 cases of chronic suppurative otitis media selected from amongst patients attending the Ear, Nose and Throat Outpatient Department of Rajindra Hospital attached to Government Medical College, Patiala. Specific emphasis was given on the type and duration of treatment with antibiotics drops with or without steroids.

Age Incidence : In the present study highest incidence of chronic suppurative otitis media was observed in first decade (26%) and second decade (24%). This constituted half of the cases. Age ranged from 3 years to 64 years with the mean age of 22.96 years. Highest incidence in group B was seen in the first decade i.e. 40%, the incidence of chronic suppurative otitis media decreased with the increase of age. In 5th and 6th decades only incidence of 14% were found in all the groups.

**TABLE I
DURATION OF DISCHARGE**

Duration years	Control group		Study group A		Study group B	
	No of cases	%age	No. of cases	%age	No. of cases	%age
0-1	8	16.0	10	20.0	6	12.0
2-5	4	8.0	6	12.0	10	20.0
6-10	18	36.0	14	28.0	16	-32.0
11-20	16	32.0	18	36.0	12	24.0
>20	4	8.0	2	4.0	6	12.0
Total	50	100.0	50	100.0	50	100.0

[Out of 50 cases studied under control group, majority of cases i.e. 36% fell between 6-10 years, in 32% cases, duration was 11-20 years. In study group A, duration of discharge was 11-20 years in 18 cases (36%). Longest duration was 22 years in two cases (4%). In study group B, duration of discharge was 6-10 years in 16 cases (32%).]

TABLE II
SIDE OF INVOLVEMENT

Side of involvement	Control group		Study group A		Study group B	
	No of cases	%age	No of cases	%age	No of cases	%age
Unilateral	38	76.0	40	80.0	40	80.0
Right	16	32.0	20	40.0	18	36.0
Left	22	44.0	20	40.0	22	44.0
Bilateral:	12	24.0	10	20.0	10	20.0
Predominantly Right	6	12.0	6	12.0	4	8.0
Predominantly Left	6	12.0	4	8.0	6	12.0
Total	50	100.0	50	100.0	50	100.0

[Unilateral involvement was found four times more than bilateral involvement (Table II). Left side involvement was comparatively higher than right side in our study. In bilateral cases, no right and left side predominance was seen.]

TABLE III
NATURE OF DISCHARGE

Nature of discharge	Control group		Study group A		Study group B	
	No of cases	%age	No. of cases	%age	No. of cases	%age
Mucoid	0	0.0	0	0.0	0	0.0
Mucopurulent	46	92.0	44	88.0	48	96.0
Purulent	0	0.0	2	4.0	2	4.0
Dirty whitish or brownish	4	8.0	4	8.0	0	0.0
Total	50	100.0	50	100.0	50	100.0

[Majority of cases were showing mucopurulent discharge (about 90%) in all the three groups. Two cases in study group A and two cases in study group B showed purulent discharge. No case with mucoid discharge was detected in our study.]

TABLE IV
DURATION OF LOCAL TREATMENT

Duration in months	Study group A		Study group B	
	No. of cases	%age	No. of cases	%age
1-3	30	60.0	34	68.0
4-6	12	24.0	6	12.0
7-12	4	8.0	8	16.0
>12	4	8.0	2	4.0
Total	50	100.0	50	100.0

[In our series majority of patients were using local drops for the last 3 months i.e. 60% in study group A and 68% in study group B. Four cases in study group A and two cases in study group B, was using topical treatment more than one year though intermittently.]

TABLE V
ISOLATED FUNGAL GROWTH

	Control group		Study group A		Study group B	
	No. of cases	%age	No. of cases	%age	No. of cases	%age
Asp niger	4	8.0	6	12.0	6	12.0
Asp flavus	4	8.0	4	8.0	8	16.0
Candida albicans	-	-	2	4.0	2	4.0
	8	16.0	12	24.0	16	32.0

TABLE VI
SPECTRUM OF FUNGUS

	Control group		Study group A		Study group B	
	No. of cases	%age	No. of cases	%age	No. of cases	%age
Asp niger	4	50.0	6	50.0	6	37.5
Asp flavus	4	50.0	4	33.33	8	50.0
Candida albicans	-	-	2	16.67	2	12.5
Total	8	100.0	12	100.0	16	100.0

[Control group showed Asp. niger in 4 cases (50%) and Asp. flavus in four cases (50%) equal ratio, no case of Candida was detected in our control study. Study group A showed Asp. niger in 6 cases (50%) and Asp. flavus in 4

cases (33.33%), only two cases (16.67%) showed *Candida albicans*. Study group B showed 6 cases (37.5%) of *Asp. niger*, 8 cases (50%) of *Asp. flavus* and 2 cases (12.5%) of *Candida* species.]

DISCUSSION

The present study was undertaken to know the incidence of fungal infection in chronic suppurative otitis media, to know the pattern of fungal flora in chronic suppurative otitis media, to evaluate whether the fungus is primary or secondary invader and to make an endeavour to know whether antibiotics drops with or without steroids are mainly responsible for development of fungus in chronic suppurative otitis media and their related incidence. The highest

incidence in the present study was seen in the first three decades i.e. 94%. The same observation was made by Baruah although the incidence was much higher i.e. 71% [12]. This is in agreement with Laxmipati and Baskaran [14].

Sex Incidence :Males showed higher incidence of fungal infections (55.5%) than female (44.45%). Present study was comparable with Laxmipati and Baskaran [14] and EO Nwankwo [15].

TABLE VII
SEX INCIDENCE

Name of author and year	Male	Female
Laxmipati & Baskaran (1965)	55.80	44.20
Arya & Mahapatra (1966)	70.70	29.30
Gulati et al (1969)	67.50	32.50
Mohammed Shafique Islam (2010)	59.33	44.67
EO Nwankwo, AD Salisu (2005)	57.5	42.5
Present study	55.55	44.45

[The male predominance may be because of their more exposed ways of life.]

Occupation:Majority of cases of chronic suppurative otitis media in present study were agriculturists (32%), labourers (17.33%) and house wives (13.30%). This constituted about 2/3 of total patients. Incidence of fungal infections was also more common in agriculturists, housewives and labourers. High incidence in labourers and agriculturists can be explained on the fact that they come in contact with soil and dust more often and work in humid conditions.

Rural versus Urban and Socio-economic Status :

In fungal positive cases, most of patients belonged to rural areas (72%), only in 28% cases urban patients were involved. Ratio being U:R 2:5. Most of patients (88%) belonged to average (32%) and poor (56%) socioeconomic status. Only approximately one-fifth cases belonged to rich socio-economic status. Unhygienic condition, poverty, illiteracy, lack of treatment, overcrowding, malnutrition, way of life style have been suggested as basis and predisposing factors for chronic suppurative otitis media. No

doubt, all these above said factors also predisposed to superadded fungal infection.

Distribution of Side of Involvement : 80% patients in this study had unilateral involvement and 20% had bilateral. Ratio of unilateral and bilateral being 4:1. Baruah noted this ratio to be 5:1[12]. Involvement of right and left side in this study was almost equal ratio (5:6). Among the 36 fungal positive patients, unilateral involvement was in 32 (88.88%) cases. Left being 56% and right being 44%. Only 4 cases with bilateral involvement were found fungal positives. (11.12%)

Type of Chronic Suppurative Otitis Media : Safe type of chronic suppurative otitis media constituted 76% as compared to unsafe pathology 24%. In our study, more of the cases with central large and subtotal perforation were fungal positives. Out of total 36 fungal positives, 30(83.3%) were of safe pathology and 6(16.7%) were with unsafe pathology. No study is available for comparison. This attributes to more exposure of middle ear cavity to exterior.

Symptomatology : Almost all the patients had profuse otorrhoea. Patients presented with various permutations and combinations of symptoms. Otorrhoea was present in 100% of cases, deafness 80%, otalgia 9.3%, itching 26.6%, vertigo 2.6%, tinnitus 6.6% and urc 6.6%. Sen Gupta reported that all cases of *Asp. niger* had pain in the ears and itching was related to fungal infections. These symptoms (otalgia and itching), according to him, indicated the presence of fungus invasion in chronic suppurative otitis media [10]. In the present study, out of total 40 cases, who complained of itching, 24 cases (60%) found to fungal positives and 14 cases who complained of pain, 8 cases (57%) grew to be fungus. Thus itching and pain is an important

symptom of fungal infections in cases of chronic suppurative otitis media.

Nature of Discharge : Kunelskaya stated that the clinical picture of fungal lesions of middle ear has a number of specific peculiarities which are mostly determined by the properties of genus or even the species [11]. The ear is full of debris looking like plug of wet news-paper and among the debris, sometimes black headed conidiophores are identified indicating *Asp. niger* infection while the *Asp. flavus* gives pale blue tinge. In the present study, majority of cases (92%) presented with mucopurulent discharge which did not differentiate between bacterial and fungal etiology. Only eight cases (5.33%) showed dirty whitish brownish discharge and only 4 cases (2.67%) had purulent discharge. All the eight cases with dirty brownish discharge grew to be fungal. Nature of the discharge usually does not help in the diagnosis of fungal infection. Only when it is either wet looking debris or dirty brownish discharge, then suspicion regarding fungus can be made.

Duration of Local Treatment : There was a definite correlation between the duration of use of local drops and fungal positive cases. Patients using local drops for longer duration grew more fungal positives as compared to short duration of treatment. There were only four fungal positive cases out of 30 cases where the duration of treatment was 1-3 months, whereas half of the cases were fungal positives when the duration was more than 4 months.

Type of Local Antibiotics and Steroids : In our studies, patients used Gentamycin, Chloramphenicol, Norfloxacin, Ciprofloxacin, Neomycin, Ofloxacin and Neosporin as antibiotic drops, Steroids in combination with antibiotic drops used were Dexamethasone, Hydrocortisone, Betamethasone. Most of the patients had used these drugs repeatedly.

No relationship could be obtained between the type of antibiotic or steroid used and fungal positive cases.

Analysis of Fungal Growth Incidence: Mycological investigations of 150 discharging ears, under three different groups had revealed as under:

Control group: Eight cases out of 50 (16%)

Study group A: Twelve cases out of 50 (24%)

Study group B: Sixteen cases out of 50 (32%)

It has been found that incidence was much higher in study group B (using antibiotic-steroids drops) than study group A (using only antibiotics drops) which was again higher than the control group (no topical drops). Average incidence of fungal positives (without taking into consideration the topical treatment) was found to be 24%.

**TABLE VIII
COMPARISON OF PRESENT STUDY WITH OTHER AUTHORS**

	Total no. of cases studied	Fungal positive	%age
Baruah (1969)	100	18	18
Pasternale (1973)	215	42	19.53
Sen Gupta et al (1978)	125	31	24.8
Talwar P, Chakrabarti A, Kaur P (1988)	344	168	49
Mittal A, Mann SBS, Panda NK, Mehra YN, Talwar P (1997)	103	42	40.77
EO Nwankwo, AD Salisu (2005)	501	20	3.9
Mirja I A, Liaquat Ali Mohammed Arshad (2008)	178	14	11
Khanna V, Chander J, Nagarkar NM, Dass A (2010)	110	26	23.63
Present study	150	36	24

[Above comparison shows that incidence of fungal infections is on rise. This may be attributed to use of systemic broad spectrum antibiotics, steroids, cytotoxic drugs and topical applications of antibiotic- steroid drops.]

[**Pattern of Fungal Flora:** In our study, Aspergillus was commonest fungus. Out of 36 fungal positives, 32 cases (88.8%) showed Aspergillus growth. Only 4 cases (11.2%) showed Candida growth. Out of 32 cases, Aspergillus flavus and Asp. niger were found in equal number (6 each). Only in 4 cases (11.2%), Candida could be cultured. These fungal isolates were compared with those of Baruah [12], Pasternale [18] and Sen Gupta [10].]

TABLE IX

Fungal isolates with no. of cases	Baruah (1969)	Pasternale (1973)	Sen Gupta et al (1978)	Present study
Asp. species:	9(50%)	13(30.95%)	23(74.19%)	32(88.8%)
A. flavus	-	-	6(19.35%)	16(44.4%)
A. niger	5(27.78%)	-	17(54.84%)	16(44.4%)
A. fumigatus	4(22.22%)	-	-	-
Candida species:	5(27.78%)	18(42.86%)	6(19.35%)	4(11.2%)
C. albicans	3(16.67%)	-	-	4(11.2%)
C. tropicalis	2(11.11%)	-	-	-
Others	3(22.22%)	11(26.19%)	2(6.46%)	-
Penicillium	-	4(9.52%)	2(6.46%)	-
Alternaris	-	4(9.52%)	-	-
Cladosporium	-	2(4.76%)	-	-
Hormodendrum	2(11.11%)	-	-	-
Mucor	1(5.5%)	-	-	-
Unidentified fungus	1(5.5%)	1(2.38%)	-	-
Total	18(100%)	42(100%)	31(100%)	36(100%)

*Species not specified

Fungus Whether Primary or Secondary Invader :

As to the question whether fungus infection is the causative factor or secondary invader in chronic suppurative otitis media, it is highly unlikely that fungus is the primary invader. Acute cases of suppurative otitis media due to fungal infection has not been reported in the literature where there was no disseminated fungal infection. In none of our cases disseminated fungal infection was present. Although in control group, there were eight cases of fungal positives, the presence of fungal infection could be due to the presence of chronic discharge. Chronicity of the discharge plays an important role in the causation of fungal otitis media as it causes humid conditions in the ear and alters the pH of the media to alkaline epithelial debris. Both these factors help in the growth of fungus. It appears that greater the

duration of discharge, more is the incidence of fungal infection. Another reason could be the use of local antibiotics in the past.

Topical Treatment : Incidence of fungal infection in patients not using any topical drops was much less (16%) as compared to the patients using local drops (28%). Further the incidence was much higher in patients using steroid drops (32%) as compared to the cases using only antibiotic drops (24%). Thus the higher incidence was obtained in patients using antibiotic and steroid drops as compared to antibiotic drops or without any local treatment. Statistically the difference between the 3 groups was not significant while applying the test of significance for difference in two binominal proportions, although the number of cases increased significantly in the three groups i.e. 8, 2 and 6 respectively in Control Group, Study Group

A and Study Group B. This may be because of the total number of the cases studied in each group is less. But it appears certain from this study that if large number of cases were to be studied, the difference would definitely be statistically significant. Similarly, Kunelskaya reported that in most cases, the fungal process in middle ear developed as a result of topically treatment with antibiotics and steroids [17]. Sen Gupta concluded in his study that all the cases of fungal otitis media received topical antibiotic ear drops previously [10]. The antibiotic drops apart from moist and alkaline medium of discharge appears to be mainly responsible for fungal growth and when steroids are added the fungal growth incidence is increased. Thus local drops should be used with great care in treating chronic suppurative otitis media.

Local drops with some anti-fungal agents may be the ideal treatment in chronic cases which certainly requires further study.

Conclusion: As the incidence of fungal positives was more in cases using antibiotic or antibiotic-steroids drops or even in chronic cases, it is suggested that treatment should not be in the form of topical drops, at the onset, patient must be given a chance with dry moppings, and systemic antibiotics. Routine use of topical antibiotic or antibiotic-steroids drops, at the onset is not justified. In cases of persistent otorrhoea, aural toilet, culture and sensitivity of discharge and removal of the focus of infection should be sought before using topical drops. In the event of mixed infections, topical antibiotics along with antifungal agents should be used.

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