

Research Article

Efficacy of Topical Antibiotics Alone in the Treatment of Chronic Suppurative Otitis Media (CSOM)

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Abstract: This study was undertaken to find out the microbiological profile of patients suffering from chronic suppurative otitis media (CSOM) with reference to *Pseudomonas* and its various species and to evaluate the efficacy of topical antibiotics alone in the treatment of chronic suppurative otitis media. This prospective outcome study was carried out at secondary care hospital on patients attending ENT and Microbiology Department from the year March 2010 to March 2013. All the patients attending the ENT dept with chronic ear discharge of more than 1 month were examined. Swabs were taken from each affected ear. Once the culture and sensitivity report was available patients were given topical antibiotics (Quinolone and Gentamycin ear drops) and their clinical responses were observed at weekly interval for one month. A repeat swab was taken after one month of treatment to know the bacteriological elimination. Of the total 600 ear swabs, 793 organisms were isolated. *Pseudomonas aeruginosa* was the commonest organism grown in both paediatric and adult patients in chronic suppurative otitis media (Tubo tympanic type) where as MSSA was most common gram positive organism isolated. The sensitivity of *Pseudomonas* was highest to Polymyxin (90.3 %) followed by Ciprofloxacin (80.7%) and Cefepime (75.5 %) where as MSSA found to be sensitive to Clindamycin (100%), Cefazoline (92.5%) and Ciprofloxacin (67.1%) in that order. Out of 571 patients of csom, who have completed follow up, 478 had dry ears. 21 patients had persistent mucoid discharge inspite of organism being susceptible to used antibiotic. In conclusion, *Pseudomonas aeruginosa* is the commonest organism in chronic suppurative otitis media without cholesteatoma even in paediatric patients. Topical ciprofloxacin ear drop is most effective in clearing the infection and making the ear dry. There is no need for systemic antibiotic in uncomplicated chronic suppurative otitis media.

Keywords: Chronic suppurative otitis media (CSOM), Tubotympanic type, Ciprofloxacin, Topical antibiotic ear drops, *Pseudomonas aeruginosa*.

INTRODUCTION

Chronic suppurative otitis media is one of the commonest infective conditions seen not only in paediatric patients but in adults as well. It occurs due to chronic infection of middle ear resulting in persistent otorrhoea, deafness and can lead to life threatening complications if not treated in time. There are very few follow up studies on effectiveness of topical antibiotic ear drops in chronic suppurative otitis media in clearing the ear discharge and bacteriological elimination. With the growing resistance to commonly used antibiotics and increasing isolates of pseudomonas organism even from simple type of csom it is imperative to know current microbiological profile.

This prospective study was undertaken to find out the recent trends in microbiological profile of csom especially with reference to pseudomonas organism and also to evaluate to what extent, topical antibiotic eardrops are effective in stopping the ear discharge.

MATERIALS AND METHODS

This study was approved by institutional ethics committee. The study was carried out from April 2010 to March 2013. All the patients attending the ENT department with the complaint of chronic ear discharge (for more than 1 month) were examined for CSOM. Any patient who had used antibiotic ear drops or systemic antibiotics in the last 5 days, patients with foreign body in the ear and patients with systemic diseases were excluded from the study.

The details of CSOM were recorded by the ENT surgeon in a specially designed proforma. Ear swabs were taken by the ENT surgeon using specially prepared thin ear swab, after cleaning the outer ear canal with normal saline. Two swabs were taken from each affected ear, and immediately transferred to Stuart's medium then the specimens were sent immediately to a microbiological lab for a culture and

sensitivity study. Swabs were directly plated on sheep blood agar, Macconkey agar and chocolate agar. The plates were incubated at 37⁰ C aerobically and under 5% carbon dioxide (chocolate agar) for 24 to 48 hrs. in an incubator.

Any fungi that were isolated were subcultured onto Sabourauds agar, corn meal agar and Hicrome candid agar. Direct smear examination was also done by staining the smear by Grams method. Aerobes and fungal isolates were identified by using standard conventional methods based on morphological, cultural and biochemical characteristics. The antibiotic susceptibility of isolates was determined by modified Kirby-bauer disc diffusion method as per CLSI guidelines. After every 20 swabs, one swab was taken from normal ear as a control.

Once the culture report was available, patients were put on appropriate antibiotic ear drops and their clinical response observed at weekly interval for 1 month. After 1 month repeat ear swabs were taken from treated ears.

RESULTS

600 swabs from patients with chronic suppurative otitis media were enrolled in the study. 501 were general patients where as 99 were tribal patients (Grassias). Out of these 571 were having Tubo Tympanic type of CSOM and 29 were suffering from AAD type. Among TT Type 326 were adults and rest were paediatric patients. Out of 600 swabs 585 were culture positive and 798 organisms were isolated. Aerobic organism were 768 and Fungal organisms were seen in 25 patients. 15 were culture sterile (Table1).

Table 1: Result of culture (Total No. of Cases= 600)

	No.	%
Culture positive	585	97.5
Culture negative(sterile)	15	2.5
Mono microbial swab	337	59.4
Polymicrobial swab	248	42.3
Total isolates	798	

Table 2: Microbiological profile of Chronic Otitis Media in adult and paediatric patients

A	AEROBIC ORGANISM	Tubotympanic Type (T T)		
		Paediatric	Adult	Total and % of T T Type
	<i>Pseudomonas aeruginosa</i>	71	117	188 - 32.92%
	<i>Ps. Fluorescence</i>	09	11	20 - 3.50
	<i>Ps. Stutzeri</i>	09	09	18 - 3.15
	<i>Ps. Putida</i>	00	01	01 - 0.17
	<i>Ps .alcaligenes</i>	00	03	03 - 0.52
	<i>E.coli</i>	37	52	89 - 15.58
	<i>Proteus mirabilis</i>	22	15	37 - 6.47
	<i>Proteus vulgaris</i>	07	06	13 - 2.27
	<i>Klebsiella pneumoniae</i>	20	22	42 - 7.35
	<i>Klebsiella oxytoca</i>	02	04	06 - 1.05
	<i>Citrobacter diversus</i>	11	17	28 - 4.90
	<i>Citrobacter freundii</i>	09	09	15 - 2.62
	<i>Acinetobacter baumani</i>	08	12	20 - 3.50
	<i>Brahmella catarrhalis</i>	15	19	34 - 5.95
	<i>Serratia marscens</i>	02	01	03 - 0.52
	<i>Haemophilus influenza</i>	05	07	12 - 2.10
	<i>Enterobacter aerogenes</i>	07	07	14 - 2.45
	<i>Burkholderia Cepacea</i>	01	02	03 - 0.52
B.	Gram Positive Bacteria			
	<i>Staphylococcus aureus</i> (MSSA)	51	79	130 - 22.76
	<i>Streptococcus pyogenes</i> (B-haemolytic) group-A	14	12	26 - 4.55
	<i>Streptococcus pneumoniae</i>	07	11	18 - 3.15
	MRSE	01	00	01 - 0.17
C.	Fungal isolates			
	<i>Aspergillus niger</i>	02	09	11 - 1.92
	<i>Aspergillus flavus</i>	01	04	05 - 0.87
	<i>Candida albicans</i>	02	05	07 - 1.22
	<i>Candida tropicalis</i>	03	04	07 - 1.22

Pseudomonas aeruginosa was the commonest gram negative bacteria grown not only in both paediatric (71 pts) and adult (117pts) patients with Tubotympanic type of chronic otitis media but also in attic antral disease(19pts), whereas MSSA (130) was the commonest Gram positive organism in both age groups. The different species of *Pseudomonas* found were *Pseu. Aeruginosa* (188), *Pseu. alkaligenes* (3), *Pseu. stutzeri* (18) and *Pseu. fluorescens* (21). Among anaerobic organism *Bacteroides* species were the commonest followed by *Peptostreptococcus* species. The other organisms which were isolated are *Burkholderia cepacia* (3), *E. coli* (96), *Citrobacter diversus* (29), *Citrobacter freundii* (19). *Proteus mirabilis* (43), *Proteus vulgaris* (18), *B. catarhalis*

(31), *Kleb pneumonia* (47), *Strept.pneumoniae* (18), Beta haemolytic *S. pyogenes* (29) and one isolate of methicillin resistant *Staph. Epidermidis* (MRSE). Table 2 shows the different organism isolated.

The sensitivity of *Pseudomonas*, both in paediatric and adult patients was highest to polymyxin (90.3%) followed by ciprofloxacin (80.7%) and cefepime (75.5%). Ciprofloxacin was found sensitive in higher percentage against other gram negative organism such as *Proteus* species (96.7%), *Klebsiella pneumoniae* (85.7%), *E. coli* (74.4%), *Citrobacter* species (84.1%). Ofloxacin was found slightly inferior to ciprofloxacin in most of the other gram negative bacteria as shown in the table 3.

Table 3: Sensitivity of Gram negative bacteria to different antibiotics

	G	Ne	Cu	Ci	Cpm	Cf	Of	Ao	C	Pb	Ac	Ca	CaC	Tb
<i>Pseudomonas Species</i> (199)	62.2	63.1	9.9	45.6	75.5	80.7	76.2	66.0	64.25	90.35	6.9	73.8	52.3	68.5
<i>E. coli</i> (93)	62.9	45.2	33.8	58.2	64.3	74.4	67.6	55.0	68.0	58.6	19.4	57.8	65.8	61.7
<i>Proteus species</i> (56)	94.1	98.7	83.6	86.5	98.0	95.1	96.7	91.0	92.0	0.00	69.5	93.3	93.6	94.3
<i>Klebsiella pneumoniae</i> (49)	78.2	68.2	40.1	70.7	92.5	85.7	87.1	66.9	76.2	75.9	47.6	70.8	71.3	72.8
<i>Citrobacter species</i> (48)	76.5	53.8	58.8	64.7	89.4	84.1	81.0	53.2	58.2	61.2	65.5	78.2	60.8	69.5
<i>Acinetobacter baumannii</i> (57)	54.1	37.7	4.0	15.5	54.1	65.1	58.3	43.2	52.2	29.7	14.3	10.9	16.5	59.6
<i>B. catterhalis</i> (35)	53.7	46.5	32.2	47.6	31.1	70.8	66.2	28.5	50.0	22.9	45.7	53.3	49.6	47.5

N.B.: G-gentamycin, Tb-Tobramycin, Ne-Neomycin, Cu-Cefuroxime, Ci-Ceftriaxone, Cpm-Cefepime, Cf-Ciprofloxacin, Of-Ofloxacin, Ao-Aztreonam, C-Chloramphenicol, Pb-Polymyxin-B, Ac-Amoxylav, Ca-Ceftazidime, CaC-Ceftazidime/clavulanic acid, ()-No. of isolates.

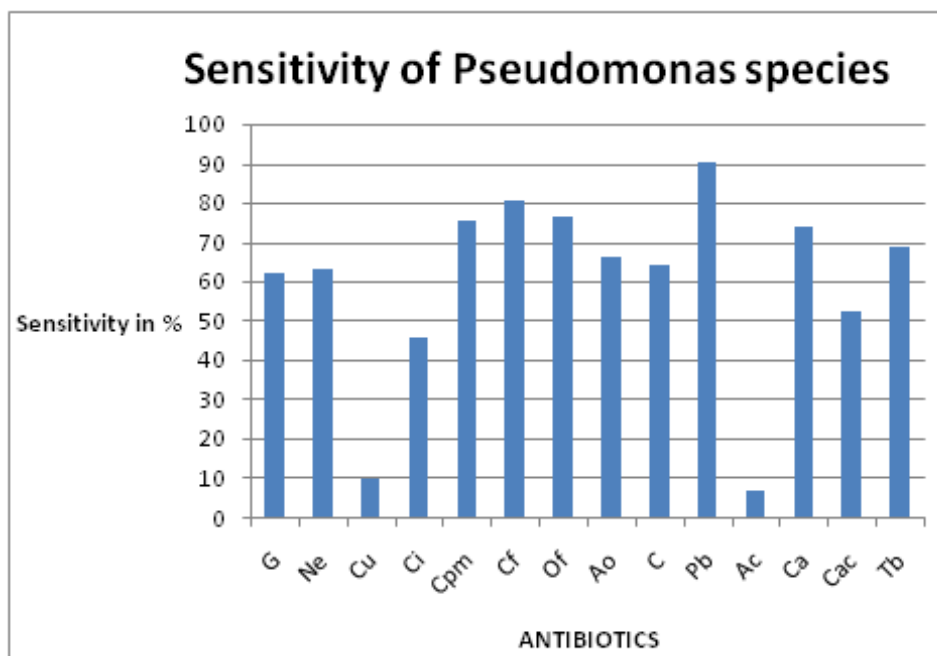


Fig. 1: Sensitivity of Pseudomonas species

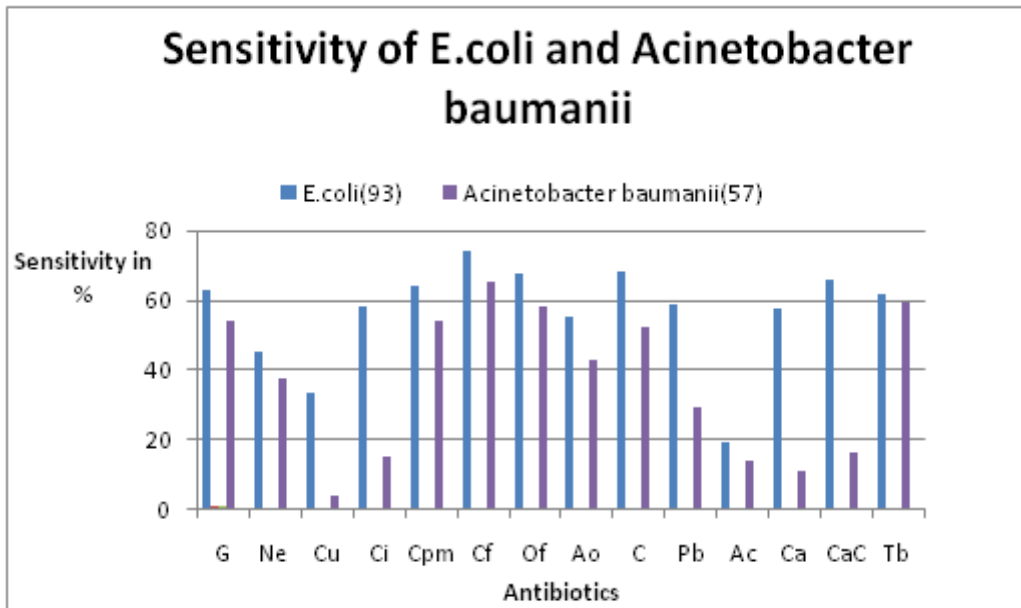


Fig. 2: Sensitivity of *E. coli* and *Acinetobacter baumannii*

Among gram positive bacteria *Methicillin sensitive Staphylococcus aureus* found to be sensitive to Clindamycin (100%), Cloxacillin (82.3%) and Ciprofloxacin (67.1 %) in that order (Table 4).

Table 4: Sensitivity of Gram positive bacteria to different antibiotics

	G	Ac	Cd	Cu	Cf	Of	Cz	Ci	CN	Cx	Lz	At
MSSA(134)	59.0	62.1	100	85.4	67.1	60.7	92.5	22.0	100	82.3	100	45.4
<i>S. pyogenes</i> (29)	73.0	83.0	95.0	69.5	74.5	70.0	66.2	33.7	82.7	48.2	98.0	49.5
<i>S. pneumoniae</i> (18)	76.3	79.5	90.2	60.5	78.0	74.6	90.0	20.0	74.2	40.0	94.4	66.3

N. B.: G-Gentamycin, Cu-Cefuroxime, Ci-Ceftriaxone, Cf-ciprofloxacin, Of-Ofloxacin, Ac-Amoxylav, Cd-Clindamycin, Cz-Cefazolin, CN-Cefoxitin, CX-cloxacillin, Lz-Linezolid, At-Azithromycin (-)-No. of isolates

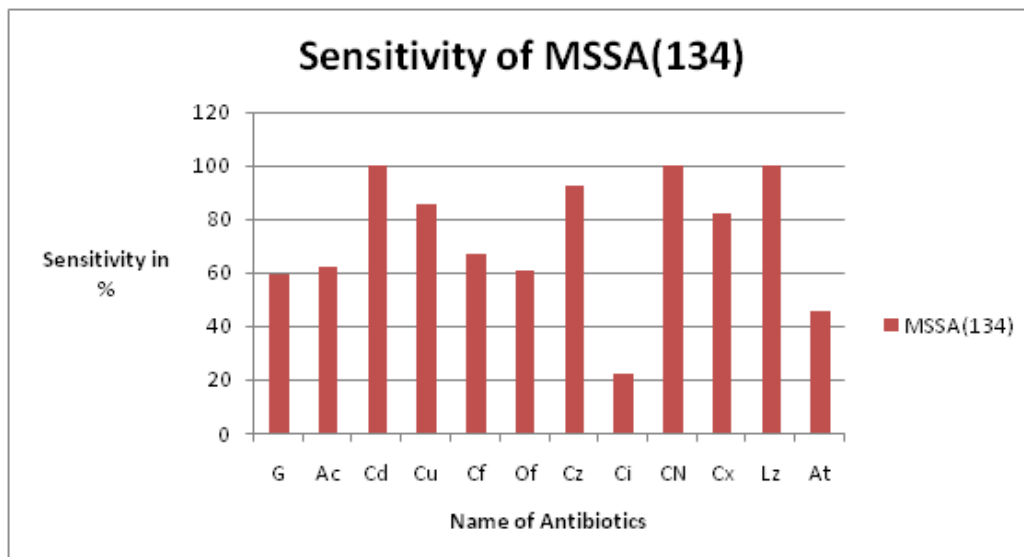


Fig. 3: Sensitivity of MSSA (134)

Among the three antibiotics that are commonly available as ear drops, Ciprofloxacin has highest

sensitivity (77.5%), followed by Ofloxacin (73.8%) and Gentamicin (69.0%) as shown in Fig. 4.

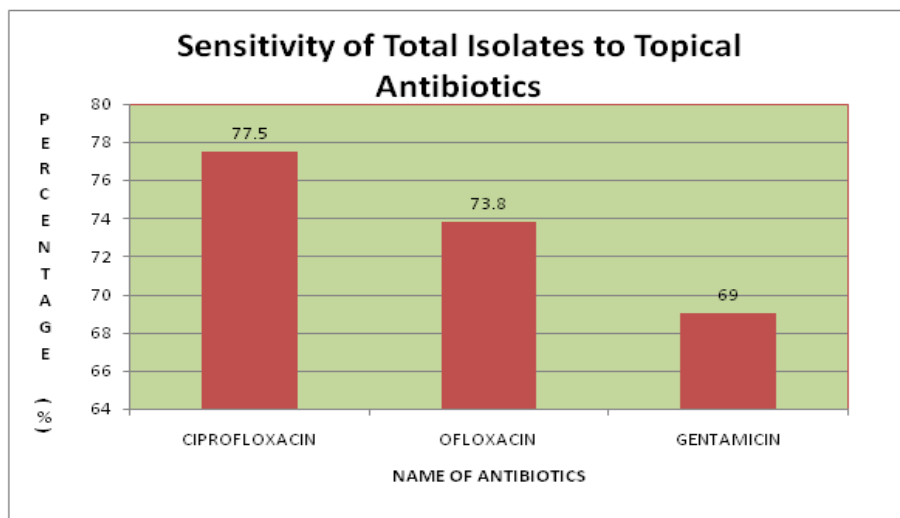


Fig. 4: Sensitivity of total isolates to topical antibiotics

Table 5: Microbiological profile and treatment outcome (T T Type)

	Paediatric patients	Adult patients	Total
No of patients	245	326	571
No of patients followed up	212	287	499
Pseudomonas isolates	71	117	188
MSSA isolates	51	79	130
Response to ototopical AB	199 (93.86%)	279 (97.21%)	478 (95.79%)
Response to ototopical ciprofloxacin	185 (93.43%)	264 (97.05%)	449 (95.53%)
Healing of perforation	9	14	23

DISCUSSION

Chronic suppurative otitis media is a major health problem in India and other developing countries though its actual prevalence in general population is not known. If remains untreated, it can lead not only to medical complications but social implications too. As traditionally known it is of two types Tubo tympanic type or Bone eroding attic antral disease. Management of tubotympanic type of chronic otitis media requires both medical and surgical treatment.

600 patients were studied from clinico microbiological point of view. Age varied from 6months to 75 years. Studies done in the past on the microbiology of CSOM show the predominant growth of *Staphylococcus aureus* and *Pseudomonas* with the latter particularly in attic antral type (cholesteatomatous) [1, 2]. In our series *Pseudomonas aeruginosa* (188 no. 32.92 %) was the commonest organism grown followed by MSSA (130no, 22.76%), both in paediatric and adult patients as well. Some other researcher have also reported the dominance of *Pseudomonas* [3, 5, 7] where as others have reported *Staphylococcus aureus* as main organism [1, 4, 8, 9] In our study we also found the growth of other species of *Pseudomonas* such as *P. stutzeri*, *P. alkaligenes* and *P. fluorescens*.

Kenna and Bluestone were the first to report separately the bacteriology of paediatric patients with tubo tympanic type of CSOM but their report included only 36 patients [6]. In our study out of 245 children having tubo tympanic type of otitis media, 71 pts (28.97%) showed the growth of *pseudomonas aeruginosa* where as *Staphylococcus aureus* was found in 51patients (20.81%). Saini *et al.* have reported that in paediatric CSOM *staphylococcus aureus* was the commonest isolate while in adult CSOM *Pseudomonas* was the commonest one [10]. Recently it has been observed that more cases of tubotympanic type of CSOM are showing a predominant growth of *Pseudomonas* species which respond to limited antibiotics. Our results are in accordance with the other researcher’ finding of predominant growth of *Pseudomonas aeruginosa* in patients with simple type of CSOM [3, 21]. This is alarming development, considering the increasing resistance to broad spectrum antibiotics and it has considerable implication on clinical outcome.

Jang and Park have found the growth of ciprofloxacin resistant *Pseudomonas aeruginosa* in their study [17] but in our study only 3.5% of *Pseudomonas aeruginosa* were resistant to ciprofloxacin.

The effective management of chronic otitis media requires knowledge of local pattern of disease, prevalence of organisms and their sensitivity to different antibiotics. Persistent discharge in chronic suppurative otitis media can be either due to presence of resistant aerobic organism, anaerobic or fungal organisms or because of use of ineffective antibiotics. The microbiologist can guide the physician in choosing most appropriate antibiotic. Treatment of chronic suppurative otitis media is medical and surgical. The mainstay of treatment is cleaning of ear discharge and instillation of topical antibiotic ear drops. In our study *Pseudomonas aeruginosa*, the commonest isolate was found sensitive to Polymixin (99.3%), Ciprofloxacin (80.7%), Cefepime (75.5%), Ofloxacin and Gentamycin. Other studies have also shown increased sensitivity of pseudomonas to Polymixin and Ciprofloxacin. In our study almost all the gram negative bacteria were sensitive to ciprofloxacin in higher percentage. Among all the antibiotics which are available in topical form, quinolones found to be most effective against gram negative as well as gram positive bacteria, ciprofloxacin being slightly better than ofloxacin. Oral antibiotics which are effective against *Pseudomonas aeruginosa*, can not be given to paediatric patients because of growth related problems hence oral treatment does not alter the natural course of tubotympanic type of chronic otitis media. Cefepime although more effective against *Pseudomonas*, is available only in injectable form.

Follow up examination of patients and post treatment culture from treated ear (499) showed that ototopical antibiotics are most effective in clearing the infection and drying the ear as 95.79% patients became discharge free. Out of 470 patients who received ciprofloxacin ear drops, 95.53% patients (449) had their ears free of infection. There was no difference in response to ototopical ciprofloxacin in both paediatric (185no.93.43%) and adult patients (264no.97.05%) ($\chi^2=3.37$, p value less than 0.05). Ototopical ciprofloxacin also caused the regression of granulation in 58 patients. In 23 patients perforation healed. In a study by Fareed *et al.*, ototopical ciprofloxacin resulted in dry ear in 80% patients [15]. The effectiveness of topical ciprofloxacin in the treatment of chronic otitis media is also reported by some other researchers [7, 12, 13, 14, 15]. In a review of several randomized controlled trials comprising systemic antibiotics and topical treatment for chronic otitis media, it was found that quinolone antibiotic ear drops were better than oral or injected antibiotics at drying the ear [11, 16]. Among the quinolones, ciprofloxacin has the greatest activity against *Pseudomonas* and also effective against *Staphylococcus aureus*, the other major pathogen in chronic otitis media. In our study we used 0.3% topical ciprofloxacin three times a day for two week and none of the patient had any adverse effect. One patient had fungal infection of external canal. A Ciprofloxacin ear

drop with minimal side effects is better than Gentamycin as ototoxicity of Gentamycin ear drop is well documented [18]. Other advantages of ototopical ciprofloxacin are its availability and safety. The concentration of topical antibiotic far exceeds the MIC of relevant organism at the site of infection so that eradication is more rapid and complete [19]. Also it makes the emergence of bacterial resistance extremely improbable [20]. In our series only 21 patients had persistent discharge in spite of organism being sensitive to antibiotic used. Out of these only 10 required systemic antibiotics as rest responded to addition of decongestant. Thus it is clear from our study that systemic antibiotic has limited role in uncomplicated otitis media. Anti fungal drops were used in those patients where fungal organisms were found.

CONCLUSION

Pseudomonas aeruginosa is the commonest organism in chronic suppurative otitis media both in adult and paediatric patients. Topical ciprofloxacin ear drops is most effective in clearing the infection and making the ear dry and also it is quite safe. Microbiological study of ear discharge is must so as to institute correct antibiotic treatment and thereby prevent emergence of resistance. Systemic antibiotics usually are not required in uncomplicated chronic otitis media.

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