PURULENT OTITIS MEDIA

A REVIEW OF 223 PATIENTS AND AN ASSESSMENT OF TREATMENT

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Purulent discharge from the ear has become a rarity in many parts of the world, but it is still all too frequently seen in clinics dealing with large numbers of patients from a poor socio-economic environment.

The following analysis attempts to show: (1) the factors in the presentation and course of the disease which influence the prognosis adversely, and (2) that satisfactory results can be attained with a simple therapeutic regime.

CASE MATERIAL

The series includes 223 African children under 13 years of age, who attended Meadowlands Clinic, Johannesburg, for the first time between 1 October 1957 and 1 December 1958. The complaint in all cases was a purulent discharge from the ear, and a perforated drum was found on examination. Follow-up examinations after completion of treatment were as follows: last examined 4 weeks later, 16 children; 2 months later, 70 children; 3 - 6 months later, 70 children; and 6 - 12 months later, 50 children, the last examination being made on 30 April 1959. Contact with the patients was maintained by the home-visiting staff. Only 17 patients (7·6%) were lost to the survey and most of these were reputed to have left the district; this is a very low percentage for the

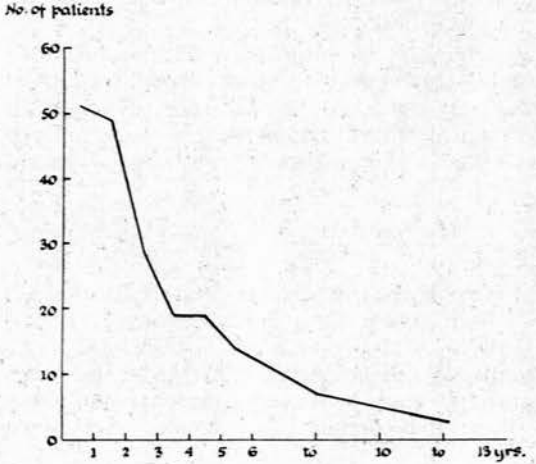

Fig. 1. Age incidence of purulent otitis media in this series.

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urban African population, which is of necessity always on the move.

There were 100 children under 2 years (40 babies were under 6 months), 110 between 2 and 10 years, and 13 over 10 years (Fig. 1). There were 118 boys and 105 girls. The results were similar in both. The highest number of first attacks was recorded at the end of winter.

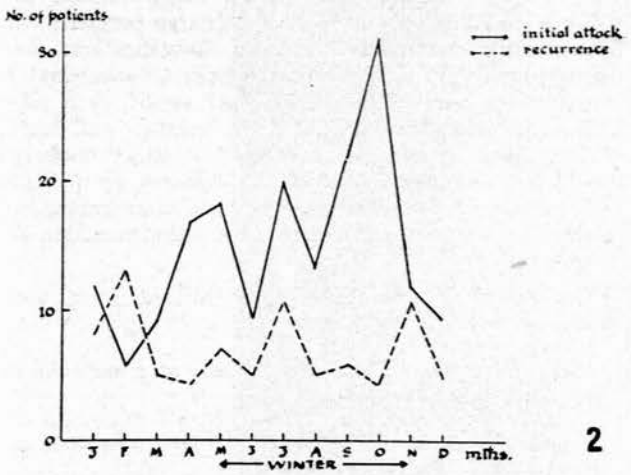

Fig. 2. Seasonal variation of attacks of purulent otitis media in this series.

Recurrence of discharge showed no such seasonal variation (Fig. 2). One ear was affected in 163 patients, and both in 60.

Aural discharge followed measles in 5 children, 4 of whom recovered completely. In 15 patients purulent otitis media was associated with severe protein malnutrition.[3] Four of these children were left with discharging ears at the end of the survey, while 2 could not be traced. A further 2 died while away from the district.

RESULTS

Of the 223 patients, 136 (61%) had completely healed drums at the end of the survey, 36 (16%) were left with dry perforations, and 34 (15%) with wet perforations. In 57 (25%) discharge recurred after clearing initially.

Table I shows a significant decrease in the percentage of complete healing over the age of 2 years. This is associated with a rise in persistent perforations from 11% in the patients under 2 years to 32% in those between 2 and 4 years, and to 54% in those between 4 and 10 years.

Table II shows that under the age of 2 healing occurred irrespective of unilateral or bilateral disease. In older children the proportion of patients who recovered was significantly higher in those with only one affected ear. There was no significant difference in healing between those with a single attack and those with recurrences. The small group of children over 10 years was weighted with children suffering from prolonged chronic disease.

Although most patients could be traced for follow-up, many attended haphazardly and irregularly. This was thought to be important in assessing the results, and the following classification was made:

'Good attenders' — such patients as completed at least their first course of treatment without interruption. This includes those who attended well at first, but became erratic later.

TABLE I. RELATIONSHIP OF DEGREE OF HEALING TO AGE OF PATIENT

State of drum at final follow-up	*Age*							
	Under 2 years		*2 - 4 years*		*4 - 10 years*		*Over 10 years*	*Total*	
	No.	*%*	*No.*	*%*	*No.*	*%*	*No.*	*No.*	*%*
Healed	81	81	27	57	25	41	3	136	61
Dry perforation	3	3	8	16	17	28	8	36	16
Wet perforation	8	8	8	16	16	26	2	34	15
Unknown	8	8	6	11	3	5	—	17	8
Total	100		49		61		13	223	

P=<0·001 (81%/57%), P=<0·01 (11%/32%), P=<0·05 (32%/54%).

TABLE II. RELATION OF AGE TO HEALING IN PATIENTS WITH UNILATERAL OR BILATERAL DISEASE, AND WITH ONE ATTACK OR RECURRENCE

	Under 2 years			*2 - 10 years*			*Over 10 years*		*Total*		
	Total	*Healed*		*Total*	*Healed*		*Total*	*Healed*	*Total*	*Healed*	
	No.	*No.*	*%*	*No.*	*No.*	*%*	*No.*	*No.*	*No.*	*No.*	*%*
Unilateral	70	56	80	85	47	55	8	3	163	106	64
One attack	50	41	82	72	42	58	6	3	128	86	66
Recurrence	20	15	75	13	5	38	2	—	35	20	60
Bilateral	30	25	83	25	5	20	5	—	60	30	50
One attack	15	14	87	18	3	16	5	—	38	17	44
Recurrence	15	11	73	7	2	28	—	—	22	13	59

P=<0·001 (55%/20%).

'Poor attenders' — those who did not attend regularly, even at first, although their total number of attendances might have been high.

There were 73% of patients with unilateral and 27% with bilateral disease in each group.

There was a total of 147 good attenders, of whom 106 (73%) recovered completely; and 76 poor attenders, of whom only 30 (40%) recovered. The 17 patients who could not be traced formed 21% of the poor attenders. Even if all these are assumed to have recovered, the difference in healing between good and poor attenders is still significant. Of the good attenders, those with unilateral disease did significantly better than those with bilateral disease, This difference was not shown in the poor attenders. Of the patients who had a recurrence, 66% of the good attenders had healed drums at the final check, in contrast to 33% of the poor attenders (Table III).

TABLE III. RELATIONSHIP BETWEEN ATTENDANCE AND RECOVERY IN PATIENTS WITH UNILATERAL OR BILATERAL DISEASE AND WITH RECURRENCE

	Good attenders (66% of 223)			*Poor attenders (34% of 223)*		
	Total	*Healed*		*Total*	*Healed*	
	No.	*No.*	*%*	*No.*	*No.*	*%*
Unilateral	108	85	78	55	21	40
Bilateral	39	21	54	21	9	43
Recurrences	42	28	66	15	5	33
Total	147	106	73	76	30	40

P=<0·001 (78%/54%) and (73%/40%).

The duration of the complaint before attendance could be divided into 3 periods — duration less than 1 week (65%), between 1 week and 1 month (6%), and more than 1 month (29%). In the small group with a history of discharge between 1 and 4 weeks there were 7 good and 4 poor attenders.

It is shown in Table IV that, of the patients with a short history of discharge, 81% recovered completely if they attended regularly. Even when the discharge had been present for a month or more before treatment (in some cases for years), 51% of the patients who attended conscientiously recovered completely. A quarter (5) of these long-standing cases had surgical treatment. The longer the complaint before treatment the higher was the percentage of persistent perforations, being 19% in acute and 50% in chronic cases, half of which remained wet.

BACTERIOLOGICAL STUDIES

Facilities for bacteriological study were limited and swabs were taken only if profuse discharge persisted after one month's continuous treatment. Investigations were carried out on 35 patients, from whom 65 aural and 34 throat swabs were cultured. The ear swabs were taken a few minutes after syringing the meatus with sterile normal saline to remove all debris and sticky discharge. Sensitivity tests were done on 31 cultures by the disc method[2] against penicillin, streptomycin, chloramphenicol, tetracycline, oxy- and chlortetracycline, sulphonamides, and neomycin.

The following organisms were isolated from aural swabs:

Organism	*No. of times cultured*
Coagulase-positive *Staphylococcus aureus*	11 (7 patients)
B. proteus	30 (11 patients)
B. coli, Strep. viridans, B. subtilis, Dip. pneumoniae	2 each
H. influenzae, B. paracolon	3 each
Friedlander's bacillus	1

'Contaminants only', which included such organisms as *Staph. albus* and diphtheroids, were grown from 4 specimens. Throat-swab cultures showed little correlation with the findings from the ear swabs.

The staphylococci were found to be sensitive to penicillin and streptomycin in 4 cultures, while 4 others were sensitive only to the tetracycline derivatives and chloram-

TABLE V. SUMMARY OF OUTCOME IN PATIENTS WITH CHRONIC DISCHARGES FROM WHICH *Staph. aureus* OR *B. proteus* WAS CULTURED

	Staph. aureus (7)		*B. proteus (22)*	
	Total	*Operated*	*Total*	*Operated*
Healed	3	—	9	5
Dry perforation ..	1	—	2	1
Wet perforation ..	3	1	11	5
Operation advised, but not completed	3		5	

TABLE IV. RELATIONSHIP OF DEGREE OF HEALING TO DURATION OF DISCHARGE BEFORE TREATMENT

Duration of discharge before treatment	*Healed*		*Dry perforation*		*Wet perforation*		*Unknown*		*Total (223)*	
	No.	*%*	*No.*	*%*	*No.*	*%*	*No.*	*%*	*No.*	*%*
Discharge less than 1 week	103	70	17	12	15	10	11	8	146	65
Good attenders	82	81	11	11	8	8	—		101	
Poor attenders	21	47	6	13	7	15	11	25	45	
Discharge 1 - 4 weeks	7		—		4		—		11	6
Discharge more than 4 weeks	26	39	19	28	15	23	6	9	66	29
Good attenders	20	51	10	27	9	23	—		39	
Poor attenders	6	22	9	33	6	22	6	22	27	

P=<0·001(70%/39%) and (81%/51) and /(.%0519%)

phenicol. Three cultures were insensitive to any of the antibiotics used.

Tests on 14 cultures of *B. proteus* showed that all were sensitive to neomycin, 11 to streptomycin and chloramphenicol in addition, and the remaining 3 either to streptomycin or chloramphenicol.

The outcome in the patients from whom *Staph. aureus* or *B. proteus* were isolated is summarized in Table V. Half the patients with *B. proteus* infection needed surgery; 5 recovered completely.

TREATMENT

The necessity for treatment was explained to the mother and the seriousness of bilateral disease in small babies was stressed.

Mothers were instructed to instil ½% solution of ephedrine in saline into each nostril 3 times daily, continuing till the ears had been dry for 1 month and recommencing as soon as the child showed any evidence of upper-respiratory-tract infection.

The ears were inspected daily, and those filled with discharge were cleaned by trained nursing staff with a ½-strength solution of 'eusol' (AFP), using a catheter and Higginson syringe. Topical antibiotic drops were prescribed in accordance with the results of the sensitivity tests, when *B. proteus* or *Staph. aureus* had been isolated from swabs. Four of these patients received streptomycin drops and 19 chloramphenicol drops. Rectified-spirit ear drops were used in a further 21 children, in whom there was a slight mucoid discharge from the drum at the end of 7 days' toilet.

The policy of cleaning was the same in all, and the occasional use of special topical preparations was felt to play a minor part in the overall results. Individual groups will therefore be analysed only in respect of general antibiotic therapy.

All patients were given intramuscular penicillin only for the first 3 days. Subsequent treatment depended on the response — if improving, penicillin was continued at least till the 6th day and sometimes longer for as long as improvement occurred. If there was no response at all, or if initial improvement was not maintained, streptomycin was added for 4 - 6 days. A longer course of streptomycin was not given. If there was still purulent discharge after that, injections were stopped, and chloramphenicol was given orally for 5 days. The dosages and preparations used are as listed in Table VI.

TABLE VI. DOSAGE AND PREPARATION OF ANTIBIOTICS USED IN CONSERVATIVE TREATMENT

Antibiotic	*Daily dosage*	*Preparation used*
Penicillin	Under 2 years: 400,000 units Over 2 years: 800,000 units	'Seclopen' (Glaxo) daily or 'triplopen' (Glaxo) alternate days occasionally
Streptomycin	20 mg./lb. body weight	Streptomycin sulphate
Chloramphenicol	Under 5 years: 500 mg. 5 - 10 years: 750 mg. Over 10 years: 1 G.	'Palmitate' (Parke Davis) Capsules

Recurrence of discharge within 1 month of the completion of a course of injections was usually treated with intramuscular penicillin and streptomycin combined for 5 - 6 days. When there had been no apparent otorrhoea for 1 month or more, any discharge was treated as if it were a first attack. A few patients who responded well to injections, but who relapsed more than once shortly after completing a course of treatment, were given oral penicillin ('distaquaine V', Distillers Co.), 125 mg. twice daily for 1 month.

Altogether 148 patients (66%) received penicillin treatment only, 36 (16%) were given both penicillin and streptomycin, and 39 (17%) had chloramphenicol.

The overall figure of recovery of 'good attenders' receiving penicillin only was 76 (84%) out of 90 patients. Of the 63 children with a single unilateral attack, 58 (92%) recovered completely with penicillin only. There were 25 good attenders treated with penicillin and strepto-

TABLE VII. RESULTS OF CONSERVATIVE TREATMENT IN CONSCIENTIOUS PATIENTS AND RELATION OF REFERRAL TO ENT SURGEON TO THE ANTIBIOTIC USED

	Penicillin only		*Penicillin followed by pen.+strep.*		*Pen.+strep. followed by chloramphenicol*	
Total	148		36		39	
Good attenders	90		25		32	
Healed	76	(84%)	11	(44%)	19	(59%)
Dry perforation	12	(13%)	4	(16%)	5	(15%)
Wet perforation	2	(3%)	10	(40%)	8	(25%)
One attack — Total	75		15		15	
One attack — Healed	64	(85%)	7		7	
Relapse — Total	15		10		17	
Relapse — Healed	12	(80%)	4		12	
Unilateral — Total	75		17		16	
Unilateral — Healed	68	(90%)	8		9	
Referred to ENT surgeon	8		15		28	
Advice only given	2		3		8	
Operation recommended	6		12		20	

TABLE VIII. RESULTS OBTAINED IN PATIENTS CONSIDERED SUITABLE FOR AURAL SURGERY

	Total	*Reconstructive*	*Mastoid*	
Recommended for surgery	38	16	22	
Performed	16	5	11	(3 cholesteatomas)
Result: Recovered	4	3	1	
Result: Dry perforation	4	2	2	
Result: Wet perforation	8	—	8	
Not performed	22	10	12	
Refused permission	9	2	7	(2 cholesteatomas)
Left district	5	4	1	
Healed while waiting (1 after T&A)	2	1	1	
Awaiting admission	6	3	3	(1 cholesteatoma)

mycin; 11 (44%) recovered, 4 (16%) had a dry perforation, and 10 (40%) still had a discharging ear.

There were 39 patients in the chloramphenicol group. Of these, 32 were good attenders and 19 (59%) recovered completely; this is 13% of all recoveries. These patients had all had a trial both of penicillin only and of penicillin with streptomycin. These results are summarized in Table VII.

Surgery

A team of 2 ear, nose and throat (ENT) surgeons from Baragwanath Hospital attended every 14 days to see those patients who had not responded to at least 1 month's conservative management. Fifty-one patients were referred, and 38 of these were recommended for surgery. The operations were performed in the ENT Department at Baragwanath Hospital, the postoperative follow-up being carried out by the clinic staff.

It was the policy of the surgeons to remove tonsils and adenoids before attempting reconstructive surgery; 16 children were recommended for plastic operations on the middle ear and 22 for cortical mastoidectomy, 6 having cholesteatomas. Of these 38 children, 16 had operations (5 reconstructive, 11 mastoid), while the parents of 9 children refused permission. At the end of the survey 6 patients were still awaiting admission, 2 others had recovered while waiting, and 5 had left the district before operation could be performed (Table VIII).

The results of reconstructive surgery were satisfying; 3 had healed completely and 2 patients had dry perforations which appeared to be getting smaller. Of the patients who had mastoid operations, 4 still had unilateral discharge and 4 bilateral discharge; 1 of these had a unilateral cholesteatoma. Two other patients with cholesteatomas were not seen again after operation. One of these recovered completely. He was the only patient on whom audiometry was performed, and the reduction of hearing, after bilateral disease, mastoidectomy, and tympanoplasty, was found to be negligible.

No intracranial complications occurred. One patient developed acute mastoiditis while on conservative therapy; this was treated surgically. One patient had recurrent subcutaneous abscesses following cortical mastoidectomy at the age of 7 months.

SUMMARY OF RESULTS

The best results were obtained in patients under 2 years old with acute onset of unilateral disease that was treated promptly and conscientiously. Adverse prognostic factors were: bilateral disease, chronicity, malnutrition, neglect, and irregularity of treatment. All of these appeared to play a greater part in children over 2 years old than in those under that age.

DISCUSSION

In order to achieve a desirable outcome, the adverse factors influencing the results must be reduced to a minimum. The patient will usually be brought to the most accessible doctor, and it is therefore the general practitioner who must be aware of the problems and institute the most effective treatment as soon as possible. The confidence he inspires, the conscience of the mother, and sometimes social circumstances, play a part in how well the patient attends after the first visit.[3]

The Medical Research Council (MRC)[4] reported the maximal number of attacks of acute otitis media in late winter and between the ages of 3 and 6 years. Bourdial and Debains[5] related such peaks to the high incidence of upper-respiratory-tract (URT) infections at these periods. In this series the initial attacks of discharge showed a seasonal distribution similar to that in the MRC report, but recurrences were distributed evenly throughout the year. This was not adequately explained. There were more children under 2 years than in any of the other age groups. The natural age peak of URT infection for the community from which these patients came is, however, not known and herein may lie part of the answer to this apparent discrepancy.

The fact that there is a physiological change in the mucous membrane as the child grows older may account for the lowered incidence of URT infection and otitis media in older age groups and might lead to the erroneous conclusion that the prognosis must also improve with increasing age. However, the proportion of patients recovering is consistently lower above the age of 2 years than below. This applies to patients with acute disease as well as to those with prolonged discharge and, even if a larger number of patients with chronic disease were included in the older age groups, this would not be sufficient to account for all the failures of treatment.

It is impossible from this study to determine which is the best treatment available at present. Hollender[6] stressed the necessity of local mechanical cleaning, as well as correction of nutritional deficiencies. Controlled studies using various regimes of general antibiotic therapy were carried out by Schmidt[7] on 425 children; from this investigation penicillin therapy emerged as the best. The good results ob-

tained in acute cases in the present series, using daily penicillin intramuscularly and simple daily toilet, support his claims and substantiate his suggestion that single large daily doses are sufficient in responsive cases. Prolonged treatment appears unnecessary in this type of patient.

The ideal treatment for chronic and unresponsive cases is less easy to determine. The bacteriological studies necessary for the selection of the correct antibiotic are not always possible in general practice, and were not carried out on all patients included here. The choice of additional antibiotics was based on bacteriological studies carried out elsewhere.[8-10] Investigations on acute otitis media with intact and perforated drums show similar bacteriological patterns, the usual organisms being β-haemolytic streptococci, *H. influenzae*, *D. pneumoniae* and staphylococci. With increasing age of the patient, the number infected with streptococci rises while that with *H. influenzae* falls. *B. proteus* was isolated from a high proportion of chronic cases,[8,10] as was found in this survey.

Infections with gram-negative organisms may account for a number of failures in patients treated with penicillin only. Some of these may be cured by adding streptomycin. Almost a quarter of good attenders on this treatment did not recover, however, and an alternative had to be found.

Schmidt[7] assessed the effectiveness of the tetracycline derivatives and found them useful; their effect on *H. influenzae* and pneumococci is, however, less certain than that of chloramphenicol.[11,12] Moreover, in this study the cultures of *B. proteus* were entirely resistant to the tetracyclines. In places with limited facilities for bacteriological investigation it seems reasonable to select the antibiotic with the broadest spectrum of effectiveness,[19,20] and chloramphenicol was therefore chosen as the one most likely to achieve control of infection when intramuscular therapy had failed. Some objections may be raised against this use of chloramphenicol because of its alleged effect on the bone marrow.[13,14] Other reports indicate that the danger has perhaps been exaggerated,[15-17] but that occasionally (1:40,000) a hypersensitivity reaction may occur.[18,19] Even sensitivity reactions against other substances, which were commonly seen in the patients attending the hospital for European children, were extremely rare in the clinic dealing with Africans at that time. The risk of administering chloramphenicol was therefore considered negligible. No adverse effects were observed, and 59% of the patients so treated recovered.

On the basis of the present study it may be concluded that surgery has a small, but important, place in the treatment of chronic otitis media, and is specifically indicated in those patients in whom complete recovery has not followed conscientious conservative therapy for 1 month. These patients should be referred to an ENT surgeon without delay.

SUMMARY

1. The history, clinical findings and treatment of 223 African patients with purulent otitis media were reviewed.

2. The maximal incidence of acute disease was in late winter.

3. The highest attack rate was in patients under 2 years of age, and these had the best chance of recovery.

4. Adverse prognostic factors were: age over 2 years at first visit; bilateral disease over the age of 2; chronicity, malnutrition, neglect, or irregularity of treatment in all age groups.

5. A simple regime of treatment, also suitable for use in general practice, was successful in 172 patients. Therapy consisted of:

(*a*) ½% ephedrine in saline nose drops;

(*b*) daily cleaning of affected ears with ½-strength eusol (AFP) solution; and

(*c*) a short course of injections of penicillin, in certain cases with streptomycin — when this failed, chloramphenicol was given orally; no adverse effects were observed.

6. ENT specialists saw 51 of the patients; 38 were recommended for surgical treatment.

7. Bacteriological studies were carried out on 35 patients with chronic discharge; *B. proteus* and *Staph. aureus* were the organisms most frequently isolated.

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