

## **TREATMENT OF RECURRENT ACUTE OTITIS MEDIA CHEMOPROPHYLAXIS VERSUS VENTILATION TUBES**

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Several approaches have been advocated for the treatment of recurrent acute otitis media (rAOM). A prospective clinical trial was carried out in order to determine the efficacy of sulfamethoxazole and trimethoprim (SMZ-T) chemoprophylaxis with that of ventilation tube (VT) insertion.

A total of 53 subjects completed the study. All the children were under the age of 3 years. Thirty-one patients underwent VT insertion, and 22 received a prophylactic dose of a combination of SMZ-T. Significant improvement of rAOM was observed in both groups. Although treatment failures were more frequent in the medically treated children; the difference in the outcome was not statistically significant.

Recurrent acute otitis media (rAOM) has long been recognized as a significant health problem in childhood. The concept of an "otitis prone condition" was described by Howie et al (1975). They defined it as AOM that **occurred 6** or more times before the age of 6. Teele et al (1980), in a prospective 3-year study, noted that 33% of **2,565 children** experienced three or more episodes of AOM by 3 years of age. Recurrence of AOM causes a considerable morbidity and great parental concern with each attack. The disease may also cause long-term middle ear damage, endangering the hearing. Every effort must be made to reduce the frequency of the attacks.

Several modalities have been suggested to modify the recurrence of AOM. These include: antimicrobial prophylaxis, vaccination, adenoidectomy with or without tonsillectomy, and ventilation tube (VT) insertion. The present study investigates the role of chemoprophylaxis and VT insertion in the prevention of rAOM; and provides a discussion of other approaches advocated for the prevention of middle ear infections.

### **Materials and Methods**

Patients included in the study were referred to the Otolaryngology unit of King Abdel Aziz University Hospital, Riyadh, by their pediatricians and family physicians. Subjects were included if they had at least three attacks of AOM diagnosed, documented, and treated by their referring physician in the six-month period prior to referral. Only children who were under 3 years of age

were included. Children were excluded if they had a documented immune insufficiency or a cervicofacial abnormality (e.g., cleft palate, Down's syndrome). The presence or absence of middle ear effusion did not preclude participation in the study.

The parents were informed about the two treatment modalities: chemoprophylaxis and ventilation tube insertion. Some children (8 of 64) were placed on a predetermined treatment regime on the basis of the parents concern. Financial reasons were not an important deciding factor because all treatment offered by this institute is provided free of charge. The majority of subjects, however, were randomized into two groups: medical and surgical. Ethically, it was not possible to have a control group by giving placebo or by keeping some children without treatment. The number of AOM episodes in the six months preceding and following the study was therefore used to evaluate the efficacy of the *treatment*.

The medical group children were placed on a combination of sulfamethoxazole and trimethoprim (SMZ-T) syrup, 12 mg/kg per day administered once daily at bed time for 6 months. The patients in the surgical group had myringotomy and tube insertion under general anesthesia.

All participants were seen at two month intervals and as necessary when AOM was suspected. Compliance within the medication group was monitored by assessment of the residual syrup in bottles returned by parents. In the medical group, diagnosis of AOM was based on the inflammatory otoscopic findings and the acute onset of earache with or without otorrhea. For the surgical group, the diagnosis of AOM was contingent on ear discharge. In this group, no attempt was made to separate the superinfection cases (as a complication of tube insertion) from the other cases. In the event of AOM occurrence, chemoprophylaxis was discontinued to be replaced by a 10 days cefaclor treatment course. The numbers of AOM bouts were calculated as episodes per patient during the study period. Bilateral involvement was considered as a single episode.

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## Results

Of a total 68 children entered the study, 53 completed at least a 6-months follow-up. There were 32 (60.4%) boys and 21 (39.6%) girls. The ages ranged between 9 months and 3 years. The number of children who completed SMZ-T prophylaxis was 22 (41.5%); while 31 (59.5%) had VT insertion. There was no statistically significant difference in the population characteristics between the two groups as shown in Table 1. Non completion was due to non-compliance with medication (7 children) and loss of follow-up (8 patients).

Table 1.

Age and sex distribution of 52 children with recurrent acute otitis media treated by chemoprophylaxis or by ventilation tube insertion.

	VT Insertion	SMZ-T Prophylaxis	Total
Male/female	17/14	12/10	29/24
Mean age	19.9	19.7	19.8

In the medical group, there were no new episodes in 10 (45.5%), partial improvement (1-2 attacks) in 7 (31.8%), and 5 cases (22.7%) were considered as treatment failures. Treatment failure was defined as more than two episodes of AOM during the 6 months period. Side effects of medication were uncommon, and only two patients reported skin rash.

In the surgical group there were no new episodes in 20 (64.5%), partial improvement in 7 (22.6%), and no improvement in 4 (12.9%). None of these children had persistent ear discharge. Two patients had re-insertion of their tubes due to early extrusion. The results are summarized in Table 2.

Table 2.

Number (percentage) of patients with episodes of acute otitis media during a 6-months follow-up after starting chemoprophylaxis and tympanostomy tube insertion.

Number of acute infections	Medical group	Surgical group
No episodes	10 (45.4)	20 (64)
1-2 episodes	7 (31)	7 (22.6)
3 or more episodes	5 (22.7)	4 (12.9)
Total	22 (100)	31 (100)

The Chi-square test was used to compare the results of the two regimes. This showed the difference in the treatment outcome (64% of no episodes versus 45.4% in the surgical and medical groups respectively) to be statistically insignificant ( $P=0.3729$ ).

## Discussion

Recurrent AOM is not an uncommon disorder. Primary care physicians, pediatricians, and otologists frequently

see the child who has an attack of AOM that responds to antibiotic therapy and, within a few weeks, recurs. Ear examination often returns to normal between episodes. Several approaches have been suggested in order to reduce the number of AOM episodes. These include: antimicrobial drugs, vaccination, adenoidectomy with or without tonsillectomy, and VT insertion.

The use of antimicrobial drugs for preventing rAOM episodes is based on the generally accepted finding that the bacterial etiology of rAOM is not different from that of AOM (Howie et al 1975). In the literature, there are several papers reporting the clinical efficacy of various regimes of antimicrobial prophylaxis in reducing the recurrence of AOM. For example, Maynard et al (1972) conducted a double-blind study using continuous ampicillin prophylaxis for a period of one year in Eskimo children with an overall 47% reduction in episodes of otorrhea and a 67% reduction where medication compliance was good. Perrin et al (1974) noted a 72% reduction in AOM episodes in children who received sulphafurazole twice daily for 3 months during a single winter season. However, they found no benefit from chemoprophylaxis in children older than 5 years of age. Biedel (1978) reported a 71% reduction in the incidence of rAOM by giving a full treatment dosage of sulfisoxazole or trisulfapyrimidines at the time of onset of upper respiratory tract infection. He suggested that limiting the medication to short periods, on a specific basis, would lessen the reactions and the opportunity for the development of resistant organisms. Schwartz et al (1982) reported a significant reduction in the rate of recurrence by giving a single dose of sulfamethoxazole for two months. Moreover, they noted a lower incidence of middle ear effusion following such chemoprophylaxis. Liston et al (1983) reported a statistically significant improvement in patients taking a sulfisoxazole chemoprophylaxis for three months and the benefits seemed to persist for several months after cessation of prophylaxis. They hypothesized that decreased rates of AOM lead to improved Eustachian tube function with time, and that this improvement in turn decreases patient susceptibility to further attacks of AOM. Persico et al (1965) reported a 60.4% clinical improvement with 3 months treatment using potassium phenoxymethylpenicillin. They found a poor response in children who reported that the initial AOM episode occurred before the third month of life. In a more recent study, Principi et al (1989) in a single, blind, randomized, placebo-controlled study found the rate of recurrence of AOM was lower in children receiving either amoxicillin or SMZ-T than in children receiving placebo. Children attending day care had a statistically significant, better outcome.

Insertion of a VT for the control of rAOM is supported by the results of a number of publications. Gebhart (1981), in a prospective randomized study, compared the infection rates among 41 patients treated with conventional antibiotics for each attack and 54 patients who had VT placement. He found a significant decrease in the number of AOM episodes in patients treated by tubes. Gonzalez et al (1986), in a controlled comparative randomized study, demonstrated that VT insertion significantly decreased the number of the AOM attacks in children who had presented with middle ear effusion at

their Initial visit. A statistically significant decrease in the "umber of AOM bouts was not demonstrated with sulfisoxazole prophylaxis, although a positive trend was observed. 0" the other hand, Bernard et al (1991) reported a" equally significant reduction in recurrent AOM episodes using VT and sulfisoxazole versus placebo. However, subjects treated medically had more episodes of AOM between 6 and 12 months and 12 and 18 months than over the 0 to 6 month treatment period.

It has bee" suggested that ventilation tube insertion may prevent the development of AOM by providing aeration to the middle ear space. Stenström et al (1991) demonstrated that otitis-prone children have significantly poorer active Eustachian tubal function than healthy controls. Further, Söderberg et al (1985) demonstrated that the insertion of a VT can prevent the development of purulent otitis media that invariably occurs after cleavage of the soft palate in a" animal model. However, poor middle ear aeration is not the only etiologic factor in recurrent AOM, and this may explain the failure of the VT to control the recurrences in some cases (Gebhart 1981, Gonzales et al 1986).

The role of adenoidectomy, with or without tonsillectomy, in preventing rAOM has been investigated by Paradise et al (1990). They reported 28% and 35% fewer episodes of AOM than control subjects at first and second year follow-up, respectively. They recommended the procedure only after adequate trial of chemo-prophylaxis or VT insertion.

The greatest promise for the prevention of AOM lies in active immunoprophylaxis with microbial vaccines. Conjugate vaccines, in which the capsular polysaccharides of AOM-causing pneumococcal serotypes are linked to protein carriers, were found to provide immunogenicity during infancy (Anderson and Betts 1989). Similarly, H. Influenzae type B polysaccharide-protein conjugate vaccines have show" remarkable efficacy in preventing invasive H. Influenzae disease in infants (Eskola et al 1987). The combined use of H. Influenzae and pneumococcal vaccine, if effective, may prevent the majority of cases of AOM in young children.

The results of this study (and many other studies) should be assessed against the natural history of recurrent AOM, which shows lower attack rates with increasing age. I" order to minimize the effect of advancing age on the frequency of episodes, only children under 3 years of age were enrolled. However, the possibility exists that some of the episodes occurring before the institution of treatment were misdiagnosed, and were not true AOM.

The choice of treatment for rAOM should be individualized, depending on each patient's situation. The selected option should have advantages that outweigh its disadvantages and risks. The "se of SMZ-T appears to be safe with no serious side effects in most cases. Potential problems of long-term "se of any antimicrobial prophylaxis include the emergence of resistant organisms, and the occurrence of a" adverse drug reaction. Furthermore, the administration of antimicrobials may suppress the symptoms of otitis media and the disease may be masked rather than being eliminated or reduced (Paradise 1981). 0" the other hand, the insertion of a VT not only reduces the frequency of AOM episodes (even in cases not controlled by chemoprophylaxis), but also

provides drainage of the discharge in the event of infection. This effect is the same as a" early myringotomy in relieving the earache. However, insertion of a VT entails both greater risk and cost. Complications of VT placement include superinfection, tympanic membrane perforation, cholesteatoma, ossicular chain disruption, and tympanosclerosis. The tube otorrhea represents a" inconvenience to both child and parents, and may require tube removal if it persists. The long term effect of tympanosclerosis is not clear.

In order to reduce the frequency of AOM, certain other factors associated with the propensity of children to rAOM must be taken into account. These include the favoring of breast-feeding, the promotion of home-care for small children, and the avoidance of smoking at home (Pukander et al 1985). The treatment of rAOM must be tailor-made to fit the patient. Tympanostomy tube insertion should be considered if the patient develops AOM while on prophylactic drugs or if compliance with prolonged antimicrobials is not likely to be successful. In the present study, there was a good rate of compliance with medication. However, lower rates have bee" found in other studies. Goldstein and Sculerati (1994) reviewed the literature and found that the estimates of compliance vary from 18 to 90% for a variety of prescribed regimes and medical illness. Factors that have bee" associated with low compliance include poor socioeconomic status, poor patient education regarding the illness, and the personality characteristics of the parents. I" a study carried out on 77 patients placed on a daily low dose antibiotic for prevention of AOM, only 23 (29.9%) families claimed compliance.

## Summary

I" the present study, both SMZ-T chemoprophylaxis and VT insertion brought about a significant reduction in the number of rAOM episodes. The difference in the response was not statistically significant, although the surgically treated patients tended to have a better outcome. Further studies, with a longer period of observation, are needed.

## References

- ANDERSON P., BETTS R. (1989) Human adult immunogenicity of protein-coupled pneumo-coccal antigens of serotypes prevalent in otitis media *Pediatr. Infect. Dir. J.* 8, 50
- BERNARD P.A.M., STENSTROM R.J., FELDMAN W., DURIEUX-SMITH A. (1991) Randomized, controlled trial comparing long-term sulfonamide therapy to ventilation tubes for otitis media with effusion. *Pediatrics* 88, 215-222.
- BIEDEL C.W. (1978) Modification of recurrent otitis media by short-term sulfonamide therapy. *Am. J. Dis. Child.* 132, 681-683.
- ESKOLA J., PELTOLA H., TAKALA A.K. et al (1987) Efficacy of Haemophilus influenzae type B polysaccharide-diphtheria toxoid conjugate vaccine in infancy. *N. Eng. J. Med.* 317, 717.
- GEBHART D.E. (1981) Tympanostomy tubes in the otitis media prone child. *Laryngoscope* 91, 849-866.
- GOLDSTEIN N.A., SCULERATI N. (1994) Compliance with prophylactic antibiotics for otitis media in a New York city clinic. *Int J. Pediatr. Otorhinolaryngol.* 28, 129-140.

- GONZALEZ C., ARNOLD J.E., WOODY E.A., ERHARDT J.B., PRATT S.R., GETS A., GUESSER T.J., KOLMER J.A.W. (1986) Prevention of recurrent acute otitis media: chemoprophylaxis versus tympanostomy tubes. *Laryngoscope* **96**, 1330-1334.
- HOWIE V.I.M., PLOUSSARD J.H., SLOYER J. (1975) The otitis prone condition. *Am. J. Dis. Child.* **129**, 676-678.
- LISTON T.E., FOSHEE W.S., PIERSON W.D. (1983) Sulfisoxazole chemoprophylaxis for frequent otitis media. *Pediatrics* **71**, 524-530.
- MAYNARD J.E., FLESHMAN J.K., TSCHOPP C.F. (1972) Otitis media in Alaskan Eskimo children: prospective evaluation of chemoprophylaxis. *J.A.M.A.* **219**, 597-599.
- PARADISE J.L. (1981) Antimicrobial prophylaxis for recurrent acute otitis media. *Ann. Otol. Rhinol. Laryng. Suppl.* **84**, 53-57.
- PARADISE J.L., BLUESTONE C.D., ROGERS K.D. (1990) Efficacy of adenoidectomy for recurrent otitis media in children previously treated with tympanostomy tube placement. Results of parallel randomized and non-randomized trials. *J.A.M.A.* **263**, 2066.
- PERRIN J.M., CHARNEY E., MAC WHINNEY J.B. Jr. (1974) Sulfisoxazole as chemoprophylaxis for recurrent otitis media: A double-blind crossover study in pediatric practice. *N. Eng. J. Med.* **291**, 664-667.
- PERSICO M., PODOSHIN M., FRADIS M., GRUSKHKA M., GOLIN D., FOLTIN V., WELLISCH G., CAHANA Z., KOLIN A., WINTER S. (1985) Recurrent otitis media – prophylactic penicillin treatment: a prospective study. Part I. *Int. J. Pediatr. Otorhinolaryngol.* **10**, 37-46.
- PRINCIPI N., MARCHISIO P., MASSIRONI E., GRASSO R.M., FILIBERTI G. (1989) Prophylaxis of recurrent acute otitis media and middle-ear effusion. Comparison of Amoxicillin with Sulfamethoxazole and Trimethoprim. *Am. J. Dis. Child.* **143**, 1414-1418.
- PUKANDER J., LUOTONEN J., TIMONEN M., KARMA P. (1985) Risk factors affecting the occurrence of acute otitis media among 2-3 year-old urban children. *Acta Otolaryngol. (Stockh)* **100**, 260-265.
- SCHWARTZ R.H., PUGLISE J., RODRIGUEZ W.J. (1982) Sulphamethoxazole prophylaxis in the otitis-prone child. *Arch. Dis. Child.* **57**, 590-593.
- SÖDERBERG O., HELLSTRÖM S., STENFORDS L., THORE M. (1985) Tympanostomy tubes for prevention of purulent otitis media. *Otolaryngol. Head Neck Surg.* **93**, 601-606.
- STENSTRÖM C., BYLANDER-GROTH A., INGVARSSON L. (1991) Eustachian tube function in otitis-prone and healthy children. *Int. J. Pediatr. Otorhinolaryngol.* **21**, 127-138.
- TEELE D.W., KLEIN J.O., ROSNER T.A. (1980) Epidemiology of otitis media in children. *Ann. Otol. Rhinol. Laryngol. suppl.* **68**, 5-6.

*Our judgment of the distance of objects by means of hearing is founded on the intensity of the sound; and the intensity that corresponds to each distance is known by experience only, which renders the judgment liable to error. We know, by experience, the ordinary tone and loudness of conversation at ordinary distances. When, by reflection of sounds from concave surfaces, the same tones are heard louder than usual, we judge the distance of the speaker to be less than the reality; and in the state of syncope, when the same tones are heard fainter than usual, we judge the distance to be greater than the reality.*

*Those persons who can articulate distinctly during inspiration, produce sounds which have nearly the same tones as are heard in ordinary conversation, but are much more faint, and therefore deceive us as to distance; and this is an essential part of the art of the ventriloquist. But he has no such means of imitating those differences of sensation by which we judge of the direction of sounds; and can only attempt that by misleading the imagination.*

*What is properly called a Musical Ear differs from the mere perception of minute differences of sounds, and recollection of their successions; and is characterized by the pleasure those possessing it derive from certain successions of sounds only; and by immediate observation of any deviation from the successions fitted to give this pleasure. The circumstances of organization on which it depends are quite unknown. By the habit of minute attention to the differences of sounds, it is susceptible of much improvement; but the pleasure derived from it being complex and much connected with associations, is probably by no means strictly proportioned to the degree of accuracy in which it is possessed.*

WILLIAM PULTENEY ALISON M.D., F.R.S.E.  
Edinburgh, 1833