

## Ventilation tubes and prophylactic antibiotic eardrops

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Insertion of ventilation tubes has successfully remedied chronic otitis media with effusion in millions of children, but the procedure has been complicated by secondary infections and otorrhea in as many as 34% of the cases. Because infection at the time of surgery was suspected as the primary cause of these postoperative complications, short-term prophylaxis with antibiotic eardrops was proposed for averting secondary infections. To evaluate this hypothesis, we conducted a 6-month prospective study in which 200 children had bilateral tube insertions. Antibiotic eardrops were administered to patients' right ears intraoperatively and for 3 days after surgery; left ears received no eardrops and served as controls. The prophylactic strategy did not significantly decrease the incidence of postoperative otorrhea in treated right ears compared with controls. (OTOLARYNGOL HEAD NECK SURG 1992;106:193.)

Insertion of ventilation tubes—also called pressure-equalizing tubes—is the most common surgery that requires general anesthesia that is performed on children in the United States.<sup>1-3</sup> With more than two million ventilation tubes inserted annually, tube insertion is a proven procedure for treating pediatric cases of chronic otitis media with serous or mucoid effusion.<sup>1,4,5</sup> Ventilation tubes were conceptualized by Politzer and Cassells<sup>6</sup> in 1868, but it was not until the 1950s that this method of treatment was used effectively.<sup>7</sup> The procedure has provided a safe and effective treatment for chronic otitis media with effusion, markedly reducing the incidence of chronic mastoiditis and acquired cholesteatoma and improving the lives of millions of children, but postoperative recovery has been complicated by infection and otorrhea in as many as 34% of the cases.<sup>1,4</sup>

Many factors may contribute to the development of mucoid, mucopurulent, or purulent otorrhea after ventilation tube insertion. Infection appears to persist in children with purulent effusion; nasopharyngeal secre-

tions reflux into the middle ear in children with cleft palate; and contamination during surgery is suspected as a cause in otherwise unimpaired children.

In this prospective study of 200 children, we tested the use of short-term prophylaxis with antibiotic eardrops and analyzed the rates of postoperative otorrhea.

### PATIENTS AND METHODS

The study was designed to evaluate the influence of a prophylactic regimen of antibiotic eardrops in reducing postoperative infection and otorrhea. After the parents or primary caretakers were informed about the study, they were asked to sign a release if they agreed to their children's participation.

From August 1989 through January 1990, we prospectively studied 200 pediatric patients who had bilateral pressure-equalizing tubes inserted. The study group consisted of 120 boys and 80 girls, whose ages at the time of surgery ranged between 3 months and 12 years. All of these patients were otherwise healthy children who were treated for clinically confirmed chronic otitis media with effusion or recurrent otitis media. They were followed postoperatively for 4 to 12 weeks (mean, 6 weeks).

All bilateral tube insertions were performed on the children while they were under general anesthesia. Preoperative middle ear effusions and the type of ventilation tubes were documented at the time of surgery. No pathogen testing was done before surgery. The ears were cleaned by using a wax curette and suctioning, but there was no further preparation with povidone iodine or other antiseptic solution.

Three drops of Cortisporin (otic suspension) (Bur-

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**Table 1.** Type of ventilation tubes and postoperative infection

Type of tubes	No. of patients	Rate of postoperative otorrhea (%)	
		Right ear*	Left ear
Titanium Blue Reuter-Bobbin	120	9	10
Armstrong	30	14	15
Goode T-tube	45	15	16
Paparella	10	14	15
TOTALS	200	11	13

\*Prophylactic antibiotic eardrops were administered to the right ear intraoperatively and for 3 days after surgery. The left ear served as the control. Postoperative infection was diagnosed if otorrhea developed in a patient within 3 weeks after surgery.

**Table 2.** Type of middle ear effusion and postoperative infection

Type of effusion	No. of patients	Incidence of postoperative otorrhea (%)	
		Right ear*	Left ear
No effusion	33	9	9
Thin effusion	34	9	11
Thick effusion	76	11	12
Purulent effusion	57	14	19
TOTALS	200	11	13

\*Prophylactic antibiotic eardrops were administered to the right ear intraoperatively and for 3 days after surgery. The left ear served as the control. Postoperative infection was diagnosed if otorrhea developed in a patient within 3 weeks after surgery.

roughs-Wellcome Co., Research Triangle Park, N.C.) were placed in the right ear after tube insertion; the left ear served as the control. Parents were asked to administer three drops to the right ear only, three times daily for 3 days after surgery. Patients who required oral antibiotics or who used the eardrops for longer than 3 days were excluded from this study.

Postoperative infection was diagnosed if a patient developed otorrhea within 3 weeks after surgery. Three weeks was arbitrarily chosen as an adequate period in which short-term otorrhea might occur.

## RESULTS

A total of 400 pressure-equalizing tubes were inserted in 200 children in bilateral surgeries. The Titanium Blue Reuter-Bobbin tubes (Microtek, Columbus, Miss.) were used in 116 of 200 patients. Thirty-one patients received Armstrong tubes, 45 patients had Goode

T-tubes; and 10 patients had Paparella tubes [Armstrong, Goode, and Paparella tubes are available from Richards (Smith & Nephew), Memphis, Tenn.].

The overall rate of postoperative infection among the 200 patients was 11% for the treated right ears and 13% for the control ears (Tables 1 and 2), a difference that was not statistically significant ( $p < 0.05$ ).

The rate of postoperative otorrhea varied with the type of ventilation tubes used (Table 1). The Titanium Blue Reuter-Bobbin tubes were associated with a 9% or 10% incidence of postoperative otorrhea, and the Goode T-tubes were associated with a rate of secondary infection, as high as 16%. Although the difference appeared significant, these data were not compelling. Because the study was designed to evaluate the use of prophylactic eardrops, the effect of tube type was an inadvertent finding, and it was impossible to resolve the potential influence of tube composition or diameter. The value of comparing tube types is also questionable because of the disparity in our sample sizes. Confirmation or revision of these results require larger series and multicenter studies.

The incidence of postoperative otorrhea also varied with the type of middle ear effusion (Table 2). There was a significantly higher incidence of postoperative infection associated with earlier cases of purulent effusions than for other types of middle ear effusions, and there was a statistically significant difference ( $p < 0.05$ ) in the rate of postoperative infection between the treated and untreated ears for the group of patients with purulent effusions.

The use of antibiotic eardrops influenced the patency of the tubes. There were more obstructed tubes in the untreated ears of the patients than in the treated ears. Obstructions occurred in only nine (4.5%) of 200 tubes inserted in the treated right ears, but tubes were obstructed in 17 (8.5%) of 200 control ears within 3 weeks of surgery.

There was no difference in the overall otorrhea rate between primary and repeat procedures. Similarly, neither age nor sex of the patients influenced postsurgical outcomes.

All patients with postoperative otorrhea were treated with systemic oral antibiotics. Infection was controlled in 90% of these patients. For those with persistent infections, the results of ear cultures determined further antibiotic treatment.

Two of the 200 patients required further evaluation for systemic diseases, such as immotile cilia syndrome, cystic fibrosis, or immune deficiencies. Another patient required removal of both tubes because postoperative otorrhea persisted despite treatment with oral antibiotics and topical antibiotic eardrops.

## DISCUSSION

Ventilation tubes provide safe and effective treatment for patients with recurrent or chronic otitis media with effusion who have had unsuccessful optimal medical therapy. The most frequent complication is postoperative otitis media with otorrhea through the tube.<sup>1,3,4</sup>

In cases of cleft palate, postoperative otorrhea can be caused by reflux of nasopharyngeal secretions into the middle ear.<sup>8,9</sup> Otorrhea occurred in 67% of infants with unrepaired cleft palates who had ventilation tubes inserted.<sup>8,9</sup> This does not explain postoperative otorrhea, however, in otherwise healthy children. In these patients, the cause may be persistent infection or contamination during surgery.

In 1986, Gates et al.<sup>10</sup> reported that the preparation of the ear canal with povidone iodine and postoperative use of antimicrobial-corticosteroid topical preparations provided optimal control of post-tympanostomy otorrhea. These results implied that the prophylactic use of antibiotic eardrops might decrease the rate of postoperative infection.

Rates of 3.6%, 15.7%, 19%, and 34.5% have been reported for postoperative otorrhea.<sup>1,3,4,11</sup> Among the 200 patients (400 tubes) in our study, there was an incidence of 13% within 3 weeks of surgery. In our series of patients, the prophylactic use of antibiotic-steroid eardrops (Cortisporin) did not significantly decrease the incidence of postoperative otorrhea.

Although the inadvertent finding that tube type or size influenced the rate of post-tympanostomy otorrhea was provocative, the study was not designed nor controlled for evaluating this factor. One problem in assessing the contribution of tube type was the relative paucity of procedures done with Armstrong, Goode T, and Paparella tubes compared with Titanium Blue Reuter-Bobbin tubes (Table 1).

Patients with infection indicated by purulent middle ear effusion had significantly higher rates of postoperative otorrhea than patients in the other group (Table 2).

Although there have been reports of higher rates of postoperative otorrhea in younger children and in boys,

we found that post-tympanostomy otorrhea was unrelated to the age or sex of patients.<sup>10,12</sup> Our findings agree with a recent report by Gates et al.<sup>13</sup>

Otorrhea after ventilation tube insertion remains the most frequent complication of this routine surgical procedure. Our results indicate that the prophylactic use of antibiotic eardrops provides only minimal control of postoperative otorrhea and subsequent tube occlusion.

Despite substantial advances in treating chronic otitis media with effusion, the number of patients with infections after surgery remains high. Larger series and multicenter studies are needed to resolve the pathophysiology of postoperative otorrhea and determine its successful management.

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