# Impact of middle ear effusion in pediatric tympanostomy tubes over 10 years

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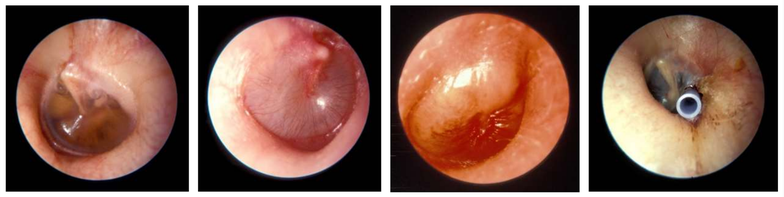
## Background

Bilateral myringotomies and tympanostomy tubes (BMT) is the most common ambulatory surgery performed in America. Indications for the surgery include persistent middle ear fluid, recurrent acute otitis media (RAOM), and infections resistant to antibiotic therapy. In addition to age of tube insertion, duration of tube retention, and family history of BMT, our prior work found intraoperative fluid as a risk factor for future BMTs in pediatric patients with RAOM. However, the influence of the type of middle ear effusion (MEE) is unknown. Here, we assessed the long term otologic outcomes of BMT patients based off their type of intraoperative MEE.

**Figure 1.** Examples of acute otitis media effusion types



A B C D

Acute otitis media with A: Serous effusion, B: Mucoid effusion, C: Purulent effusion, and D: Long term T-tube. Michael Hawke MD, otitismedia.hawkelibrary.com

## Methods

Retrospective chart review was performed on patients up to 18 years old who underwent BMT between 2008-09 at UPMC Children's Hospital of Pittsburgh. Included patients had a pre-op visit and an op report. Children with no documented pre-op visit, unilateral myringotomy and tympanostomy tube, prior cholesteatoma, or prior otologic surgeries other than BMTs were excluded. Indications for surgery included RAOM and chronic otitis media (COME) and MEE status was recorded intraoperatively. Additional variables collected included future BMTs, cholesteatoma, and otorrhea. Chi-squared tests and logistic regression with Holm's corrections were calculated using SPSS software.

## Results

**Table 1.** Patient Demographics (N=854)

| Categorical Variables | n | % |
|---|---|---|
| Female | 355/854 | 41.6% |
| Ethnicity | | |
| Hispanic | 3/487 | 0.6% |
| Race | | |
| Caucasian | 758/836 | 90.7% |
| African American | 67/836 | 8.0% |
| Asian | 11/836 | 1.3% |
| Private Insurance | 557/854 | 65.2% |
| Continuous Variables | median | range |
| Age (years) | 1 | 0-18 |
| Median Household Income for Zip ($) | 55,938 | 14,695-129,063 |
| Distance from Hospital (mi) | 24.1 | 0.6-380 |

**Figure 1.** Breakdown of intraoperative middle ear findings

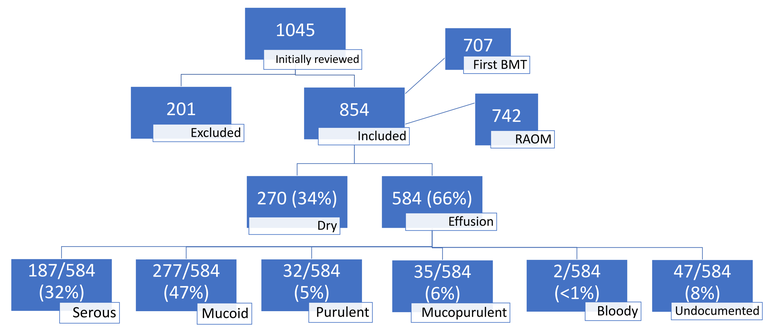



**Table 2.** Impact of fluid type on long term ear outcomes - RAOM

| | Dry | Serous | Mucoid | Purulent | Mucopurulent |
|---|---|---|---|---|---|
| Future Tubes (y/n) [n (%)] | 52/256 (20.3%) | 31/150 (20.7%) | 65/225 **(28.9%)*** | 17/58 (29.3%) | 15/33 **(45.5%)*** |
| Number of Future Tubes [median (range)] | 1 (1-3) | 1 (1-6) | 1 (1-7) | 1 (1-3) | 1 (1-3) |
| Other Future Ear Surgeries [n (%)] | 43/256 (16.8%) | 21/150 (14.0%) | 33/225 (14.7%) | 14/58 (24.1%) | 4/33 (12.1%) |
| Any Adenoidectomy [n (%)] | 94/256 (36.7%) | 42/150 (28.0%) | 87/225 (38.7%) | 14/58 (24.1%) | 14/33 (42.4%) |
| Future Cholesteatoma [n (%)] | 2/256 (0.8%) | 2/150 (1.3%) | 3/225 (1.3%) | 0/58 (0.0%) | 0/33 (0.0%) |
| Otorrhea Suctioning [n (%)] | 56/255 (22.0%) | 27/149 (18.1%) | 46/225 (20.4%) | 17/58 (29.3%) | 13/33 **(39.4%)*** |
| Perforation [n (%)] | 25/256 (9.8%) | **6/150 (4.0%)*** | 14/224 (6.3%) | 6/58 (10.3%) | 2/33 (6.1%) |
| Hearing Loss at Last Visit [n (%)] | 21/255 (8.2%) | 8/150 (5.3%) | 18/222 (8.1%) | 2/57 (3.5%) | 2/33 (6.1%) |

*p<0.05 for comparisons vs dry using logistic regression or Wilcoxon rank-sum tests

## Results (cont.)

**Table 3.** Impact of fluid type on long term ear outcomes in COME

| | Dry | Serous | Mucoid | Purulent | Mucopurulent |
|---|---|---|---|---|---|
| Future Tubes (y/n) [n (%)] | 5/12 (41.7%) | 18/37 (48.7%) | 15/51 (29.4%) | 1/4 (25.0%) | 0/2 (0.0%) |
| Number of Future Tubes [median (range)] | 2 (1-3) | 1.5 (1-4) | **1 (1-2)*** | 1 | n/a |
| Other Future Ear Surgeries [n (%)] | 2/12 (16.7%) | 9/37 (24.3%) | 9/51 (17.7%) | 0/4 (0.0%) | 0/2 (0.0%) |
| Any Adenoidectomy [n (%)] | 5/12 (41.7%) | 16/37 (43.2%) | 25/51 (49.0%) | 1/4 (25.0%) | 2/2 (100.0%) |
| Future Cholesteatoma [n (%)] | 0/12 (0.0%) | 1/37 (2.7%) | 0/51 (0.0%) | 0/4 (0.0%) | 0/2 (0.0%) |
| Otorrhea Suctioning [n (%)] | 6/12 (50.0%) | 10/37 (27.0%) | **8/51 (15.7%)*** | 1/4 (25.0%) | 0/2 (0.0%) |
| Perforation [n (%)] | 3/12 (25.0%) | 5/37 (13.5%) | 5/51 (9.8%) | 0/4 (0.0%) | 0/2 (0.0%) |
| Hearing Loss at Last Visit [n (%)] | 5/12 (41.7%) | 8/37 (21.6%) | **5/51 (9.8%)*** | 0/4 (0.0%) | 0/2 (0.0%) |

*p<0.05 for comparisons vs dry using logistic regression or Wilcoxon rank-sum tests

854 patients were included from a pool of 1045 that were initially reviewed. 270 were found to have a dry middle ear space intraoperatively and 584 (66%) had middle ear effusion (MEE) present. For patients with an indication of RAOM, mucoid and mucopurulent effusion was significantly associated with future BMT compared to no effusion. For patients with an indication of COME, only mucoid effusion showed a similar significance. When comparing long term outcomes between indications, COME was associated with significantly increased need for future BMT, total number of future tubes, previous or future adenoidectomy, and presence of hearing loss as of the last documented clinic visit.

**Table 4.** Impact of indication on long term ear outcomes

| | RAOM | COME | p* |
|---|---|---|---|
| Future Tubes (y/n) [n (%)] | 185/743 (24.9%) | 39/108 (36.1%) | **0.014** |
| Number of Future Tubes [mean (range)] | 1.3 (1-7) | 1.6 (1-4) | **0.006** |
| Other Future Ear Surgeries [n (%)] | 119/743 (16.0%) | 20/108 (18.5%) | 0.511 |
| Any Adenoidectomy [n (%)] | 258/743 (34.7%) | 49/108 (45.4%) | **0.032** |
| Future Cholesteatoma [n (%)] | 8/743 (1.1%) | 1/108 (0.9%) | 1.000 |
| Otorrhea Suctioning [n (%)] | 168/741 (22.7%) | 25/108 (24.6%) | 0.912 |
| Perforation [n (%)] | 57/742 (7.7%) | 14/108 (13.0%) | 0.067 |
| Hearing Loss at Last Visit [n (%)] | 54/738 (7.3%) | 18/108 (16.7%) | **0.002** |

*P-values from logistic regression or Wilcoxon rank-sum tests

## Conclusions

- Intraoperative mucoid and mucopurulent MEE were associated with increased odds of future BMT compared to no effusion.
- COME is associated with worse otologic outcomes than RAOM.
- These indications and operative findings may warrant closer follow-up and increased parental education regarding the likelihood of repeat BMT.

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