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Original research

EVALUATION OF THE EFFECTIVENESS OF MEDICAL THERAPY VERSUS SURGICAL INTERVENTION IN PEDIATRIC RECURRENT ACUTE OTITIS MEDIA

Nguyen Thi Dieu Trinh[1], Dang Ngoc Hung[2], Ho Minh Tri[1]

[1]Department of Otorhinolaryngology, Hue University of Medicine and Pharmacy, Vietnam

[2]Department of Gastrointestinal Surgery, Hue Central Hospital, Vietnam

ABSTRACT

Objective: *To evaluate the clinical and subclinical characteristics and the effectiveness of different treatment methods in children with recurrent acute otitis media (RAOM).*

Methods: *This was a descriptive interventional study conducted on 61 children diagnosed with RAOM and treated at Hue University of Medicine and Pharmacy Hospital and Hue Central Hospital from March 2023 to May 2025. Treatment methods included medical therapy during acute episodes, adenoidectomy, and adenoidectomy combined with tympanostomy tube insertion (TTI). Treatment effectiveness was assessed based on the number of recurrent episodes, recurrence rate, and time to next recurrence within 6 months after treatment.*

Results: *The mean age was 34.48 ± 28.42 months, with a male predominance (65.6%). Most children presented with fever and ear pain. Children who developed the disease before 6 months of age and those attending daycare before the age of 1 had significantly more recurrent episodes ($p < 0.05$). The degree of adenoid hypertrophy was significantly associated with abnormal tympanometry type. After 6 months of treatment, the surgical group had a significantly higher rate of non-recurrence compared to the medical treatment group ($p < 0.05$). The average number of recurrences after 6 months was significantly higher in the medical treatment group ($p < 0.05$). The time to the next recurrence was significantly longer in the surgical intervention group compared to the medical group ($p < 0.05$).*

Conclusion: *Adenoidectomy with or without tympanostomy tube insertion is associated with more favorable short-term outcomes, including a lower number of recurrent episodes and a prolonged time to recurrence, compared to medical therapy in children with RAOM. However, due to the non-randomized design, these findings should be interpreted with caution.*

Keywords: *Recurrent acute otitis media, adenoidectomy, tympanostomy tube.*

I. INTRODUCTION

Recurrent acute otitis media (RAOM) refers to AOM episodes occurring repeatedly over a short duration. Per the AAP (2013), RAOM is diagnosed as ≥ 3 episodes in 6 months or ≥ 4 in 12 months, with at least one occurring in the last 6 months [1]. While official RAOM data is lacking in Vietnam, AOM remains one of the most common pediatric infectious diseases.

Key risk factors for RAOM include daycare attendance, passive smoking, allergies, pacifier use, low socioeconomic status, and conditions like respiratory infections, adenoiditis, or reflux [2, 3]. The disease significantly impacts a child's quality of life, causing pain, sleep disturbance, and school absence [4]. Improper treatment can lead to severe complications, including eardrum perforation, chronic otitis media, mastoiditis, and meningitis [5].

Modern antibiotics effectively control otitis media, but misuse risks drug resistance. Consequently, guidelines now prioritize medical or surgical interventions-such as adenoidectomy or

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Corresponding author: Ho Minh Tri. Email: drhominhtri@gmail.com. Phone: +84 935531866

tympanostomy tube insertion (TTI)-over long-term prophylaxis. While TTI reduces episode frequency and duration, it may not fully prevent long-term RAOM [4]. Accordingly, this study describes clinical characteristics and evaluates treatment effectiveness to propose optimal management strategies for pediatric RAOM.

II. MATERIAL AND METHODS

2.1. Material

This study included 61 children diagnosed with RAOM who were treated at the Department of Otorhinolaryngology - Ophthalmology - Maxillofacial Surgery, Hue University of Medicine and Pharmacy Hospital, and the Department of Otorhinolaryngology, Hue Central Hospital, from March 2023 to May 2025.

Selection criteria:

- Patients under 15 years old; Diagnosed with RAOM according to the criteria of AAP 2013, specifically: ≥ 3 separate episodes of acute otitis media within 6 months, or ≥ 4 episodes within 12 months, with at least 1 episode occurring in the last 6 months.

- Each episode of acute otitis media is determined when there is: Acute onset with specific symptoms such as fever, ear pain, ear discharge, irritability, or sleep disturbance; Physical signs: bulging or red tympanic membrane, presence of fluid behind the tympanic membrane, poor tympanic membrane mobility or ear discharge; A new recurrent episode was strictly defined as the onset of clinical signs and symptoms of AOM occurring at least 30 days after the onset of the previous episode, or after complete clinical resolution of the previous episode. This criterion was applied to clearly distinguish a true recurrence from an unresolved, persistent infection.

- Patients were followed up at 6 months after treatment.

Exclusion criteria: The patient does not meet the diagnostic criteria mentioned above. The patient has a comorbidity that may interfere with follow-up or affect recurrence outcomes.

2.2. Methods

Study design: A prospective, descriptive study with clinical intervention and follow-up.

Study procedures:

Step 1: Initial examination and assessment. Record basic information: age, gender, address, admission date, discharge date. Perform endoscopy of the ear, nose, and throat and necessary paraclinical tests. Confirm the diagnosis of RAOM based on AAP 2013 criteria.

Step 2: Treatment of RAOM according to intervention groups

Patients were treated according to the indications of ENT specialists, based on disease severity, recurrence frequency and the clinical features:

- Medical therapy (oral/systemic antibiotics): indicated for mild recurrences, without complications, responding well to previous antibiotic treatment. Standard empirical regimens typically included Amoxicillin-Clavulanate or second/third - generation cephalosporins for 7 to 10 days, adjusted based on clinical response.

- Adenoidectomy: indicated for patients with significant enlarged adenoids and frequent recurrence of RAOM episodes, especially those with signs of nasopharyngeal obstruction, loud snoring, mouth breathing or open - mouth sleeping. Surgery was primarily performed under general anesthesia using endoscopic techniques.

- Adenoidectomy combined with TTI: indicated for patients of severe or prolonged recurrences, persistent middle ear effusion (lasting > 3 months), poor tympanic membrane mobility or a failure of previous medical treatment.

Step 3: Follow - up and evaluation of treatment outcomes

Follow - up examination were performed at 6 months after treatment to record the number of recurrence episodes, the proportion of patients without recurrence, and the time to the next recurrence.

2.3. Data collection and analysis

Data were entered, processed, and statistically analyzed using SPSS version 22.0. Categorical

variables were compared using the Chi-Square test. For continuous variables that were not normally distributed, the Mann-Whitney U test (for two groups) and the Kruskal-Wallis test (for three groups) followed by Bonferroni correction were utilized. The Kaplan-Meier method was used to estimate the time to next recurrence, and the log-rank test was applied to compare the survival curves between treatment groups. A p-value < 0.05 was considered statistically significant.

III. RESULTS

3.1. Clinical and paraclinical features of recurrent acute otitis media.

Regarding age: the age distribution ranged from 6 to 126 months, with a mean age of 34.48 ± 28.42 months. The age group with the highest proportion was 12 - 23 months. The mean age of onset was 18.46 ± 16.7 months, the youngest patient was 1 month old and the oldest was 96 months old. Regarding gender: the incidence was higher in male (65.6%) compared to female (34.4%).

Most patients have symptoms of fever and ear pain during the acute phase before treatment, accounting for 86.9% and 88.5%, respectively. Symptoms of ear discharge were recorded in 21.3% of cases. Meanwhile, peripheral facial paralysis - a serious complication - was only found in 1 patient.

Most patients presented with fever and ear pain during the acute episode before treatment, accounting for 86.9% and 88.5%, respectively. Ear discharge was observed in 21.3% of the cases. Meanwhile, peripheral facial paralysis - a severe complication - was recorded in only one patient.

Before treatment, the number of RAOM episodes during the previous 12 months ranged from 4 to 8, with an average of 4.97 ± 1.15 episodes. Meanwhile, the number of recurrences during the 6 months before treatment ranged from 2 to 5 episodes, with an average of 3.2 ± 0.54 episodes (Table 1).

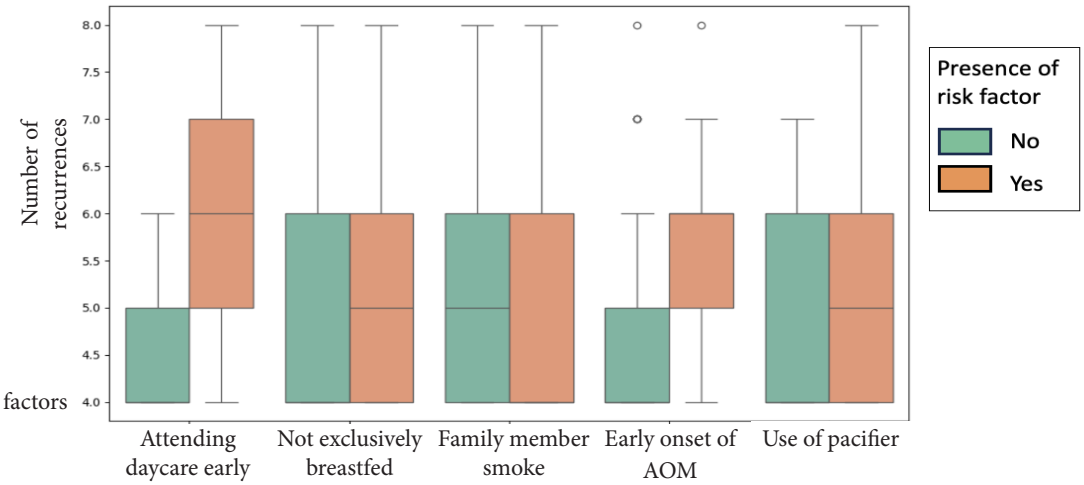
Table 1: Number of RAOM episodes before treatment

Recurrence period	Mean ± SD	Min	Max
Within 6 months before treatment	3.2 ± 0.54	2	5
Within 12 months before treatment	4.97 ± 1.15	4	8

All patients in the study had a history of rhinitis or adenoiditis. Among the remaining of five risk factors, two showed a statistically significant difference in the number of recurrence episodes during 12 months before treatment between groups with and without risk factors ($p < 0.05$, Mann-Whitney test). Children who attended daycare before one year of age had a significantly higher average number of recurrences (5.88 ± 1.41) than those who did not (4.61 ± 0.81) ($p < 0.05$). Similarly, patients who had their first episode of acute otitis media before 6 months of age had more frequent recurrences (5.73 ± 1.19 vs 4.80 ± 1.09; $p < 0.05$). The other three risk factors showed no statistically significant difference ($p > 0.05$) (Figure 1).

Among the 61 patients, only 54 cases were included in the cross-tabulation analysis between adenoid grading and tympanogram type. The remaining 7 patients were excluded from this specific analysis because they either could not cooperate during the tympanometry procedure due to extreme irritability at their young age, or presented with a perforated tympanic membrane with active discharge, which precluded accurate tympanometric measurement (Figure 1).

Figure 1: Comparison of the number of recurrences within 12 months by individual risk



Among 54 patients who were evaluated for both adenoid grade and tympanogram type, the group with grade III-IV had a significantly higher proportion of Type B/C tympanogram compared to the group with grade I-II (50,0% vs 29,6%). In contrast, the proportion of type A tympanogram was notably lower in the grade III-IV group (1,9% vs 18,5%). The Chi-Square test showed a statistically significant relation between the degree of adenoid hypertrophy and tympanogram type ($p < 0.05$) (Table 2).

Table 2: Relationship between adenoid hypertrophy grade and tympanogram type

Adenoid grade	Tympanogram type				Total (n= 54)		P
	Type A		Type B/C				
	n	%	n	%	n	%	
Grade I - II	10	18.5%	16	29.6%	26	48.1%	p < 0.05
Grade III - IV	1	1.9%	27	50.0%	28	51.9%	
Total	11	20.4%	43	79.6%	54	100%	

The results showed no statistically significant differences ($p > 0.05$) in age, gender, pre-treatment recurrence frequency, and the degree of adenoid hypertrophy among the three groups, indicating baseline comparability prior to intervention (Table 3).

Table 3: Baseline characteristics among treatment groups

Characteristics	Medical therapy (n=20)	Adenoidectomy (n=21)	Adenoidectomy + TTI (n=20)	Total (n=61)	p-value*
Male gender, n (%)	13 (65.0%)	14 (66.7%)	13 (65.0%)	40 (65.6%)	> 0.05
Age, Mean ± SD (months)	33.50 ± 27.15	35.12 ± 29.50	34.78 ± 28.91	34.48 ± 28.42	> 0.05
Age of onset, Mean ± SD (months)	18.25 ± 15.80	19.10 ± 17.50	18.00 ± 16.90	18.46 ± 16.70	> 0.05
Episodes in past 12 months, Mean ± SD	4.85 ± 1.20	5.00 ± 1.10	5.05 ± 1.15	4.97 ± 1.15	> 0.05

Characteristics	Medical therapy (n=20)	Adenoidectomy (n=21)	Adenoidectomy + TTI (n=20)	Total (n=61)	p-value*
Episodes in past 6 months, Mean ± SD	3.10 ± 0.50	3.20 ± 0.60	3.30 ± 0.50	3.20 ± 0.54	> 0.05
Adenoid Grade III - IV, n (%)	9/18 (50.0%)	10/18 (55.6%)	9/18 (50.0%)	28/54 (51.9%)	> 0.05

3.2. Evaluation of recurrence status after treatment

The three treatment methods were applied in relatively equal proportions. The group treated with adenoidectomy alone had the highest proportion at 34.4%, followed by the medical treatment group and the group receiving adenoidectomy combined with TTI, each accounting for 32.8% (Table 4).

Table 4: Treatment methods

Methods	Number of patients	Proportion
Medical therapy	20	32.8
Adenoidectomy	21	34.4
Adenoiddectomy + TTI	20	32.8
Total	61	100%

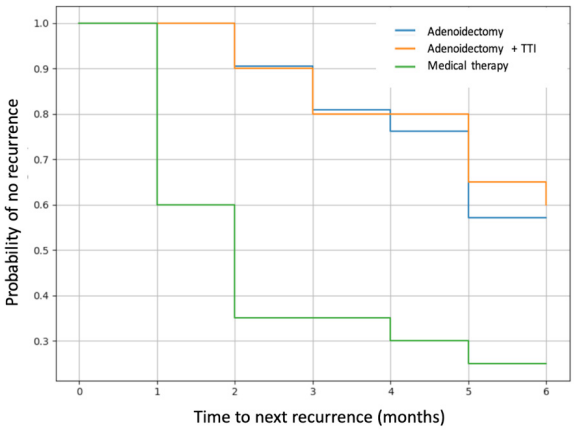
The proportion of patients without recurrence after 6 months was significantly different among treatment methods ($p < 0.05$). The surgical group (adenoidectomy or adenoidectomy + TTI) had a noticeably higher rate of non - recurrence (57.14%) compared to the medical treatment group (25%) (Table 5).

Table 5: Number of patients without recurrence after 6 months according to treatment methods

Methods	Number of patients	Number of patients without recurrence	Proportion	p
Medical therapy	20	5	25%	p < 0.05
Adenoidectomy	21	12	57.14%	
Adenoidectomy + TTI	20	12	57.14%	

The Kaplan - Meier chart shows that the non-recurrence time was longer in the adenoidectomy alone group and the adenoidectomy + TTI group compared to the medical treatment group. The Log-rank test showed a statistically significant difference between the medical group and the two surgical groups ($p < 0.05$), while there was no difference between the two surgical groups. This suggests that both surgical methods were more effective than medical therapy in prolonging the time without recurrence (Figure 2).

Figure 2: Time to next recurrence after treatment



The number of recurrences after 6 months was significantly different among treatment groups ($p < 0.05$, Kruskal - Wallis test). The medical group had the highest mean number of recurrences (2.3 ± 1.75), while both surgical groups (adenoidectomy and adenoidectomy + TTI) had clearly lower numbers (0.52 ± 0.75 and 0.65 ± 1.04, respectively). The Mann - Whitney U test with Bonferroni correction showed: No significant difference between adenoidectomy and adenoidectomy + TTI ($p > 0.05$). Significant difference between medical therapy and adenoidectomy ($p < 0.05$). Significant difference between medical therapy and adenoidectomy + TTI ($p < 0.05$) (Table 6).

Table 6: Comparison of number of recurrences after 6 months between treatment methods

Methods	Number of patients	Mean number of recurrences	p
Medical therapy	20	2.3 ± 1.75	p < 0.05
Adenoidectomy	21	0.52 ± 0.75	
Adenoidectomy + TTI	20	0.65 ± 1.04	

IV. DISCUSSION

4.1. Clinical and paraclinical features of recurrent acute otitis media:

- Demographics and Clinical Presentation

The study's mean patient age was 34.48 ± 28.42 months, reinforcing that RAOM primarily affects young children, particularly those under 4 years [6]. Males showed a significantly higher incidence (65.5%) than females (34.4%), a trend supported by Salah (2013), Ameli (2021), and Farghaly (2024) [3, 7, 8]. This susceptibility may stem from sex hormone influences on B cells and cytokines [9].

Common symptoms include fever, ear pain, and discharge. Fever is the most frequent reason for clinical visits; however, its non-specific nature means ENT specialists must rule out middle ear infection in any child with fever of unknown origin. Notably, one rare case of peripheral facial paralysis was recorded, a serious complication requiring urgent detection [5].

- Recurrence Trends and Pathogenesis

Patients averaged 4.97 ± 1.15 episodes annually. The frequency increased closer to treatment (3.2 episodes in the last 6 months), representing 64% of the yearly total. This escalation aligns with RAOM's natural progression and may be linked to bacterial biofilms in adenoid tissue-present in 80% of adenoiditis cases-which facilitate persistent infection [10]. This often necessitates surgical interventions like adenoidectomy or Tympanostomy Tube Insertion (TTI).

- Risk Factor Analysis

All participants had a history of rhinitis and adenoiditis. Statistically significant risk factors included:

Daycare attendance: Aligns with findings that daycare children face 1.5 times higher risk due to increased pathogen exposure and stress-induced immune suppression [2, 11].

Early onset: Children with a first episode before 6 months had significantly higher recurrence rates (5.73 ± 1.19 vs 4.80 ± 1.09). Early onset (before 9 months) is known to quadruple RAOM risk [12].

Conversely, non-exclusive breastfeeding, passive smoking, and pacifier use were not statistically significant in this study, differing from larger meta-analyses and studies by Salah, Zhang, and Ameli [2, 3, 7].

- Adenoid Hypertrophy and Middle Ear Function

Table 2 shows a significant correlation between adenoid hypertrophy and tympanogram results ($p < 0.05$). Patients with Grade III-IV hypertrophy had higher rates of abnormal (Type B/C) tympanograms (50.0%) compared to Grade I-II (29.6%). This confirms the impact of adenoid size on middle ear dysfunction [13, 14] and highlights tympanometry as a vital tool for determining the need for surgical intervention.

4.2. Evaluation of recurrence status after treatment

- Treatment Distribution and Efficacy

Treatment for RAOM was distributed evenly across three methods, reflecting an individualized strategy based on recurrence frequency, adenoid hypertrophy, and clinical assessment. Surgical intervention (adenoidectomy alone or with TTI) proved significantly more effective than medical treatment, with a 57.14% non-recurrence rate compared to 25% at 6 months ($p < 0.05$). Furthermore, surgical groups experienced longer durations before recurrence and fewer overall episodes ($p < 0.05$). Notably, adenoidectomy alone provided sufficient short-term protection for patients with concurrent hypertrophy, potentially avoiding tube-related complications like otorrhea.

- Comparative Evidence

Kaplan-Meier analysis confirmed that surgery offers superior recurrence prevention and longer protective durations than medical management. These results align with:

- Paradise (1999): Reported fewer RAOM episodes with adenoidectomy in the first year [15].

- Kujala (2014): Noted surgery's effectiveness in reducing episodes over medical treatment [16].

- Suresh (2024): Found that increased adenoid hypertrophy significantly impairs middle ear pressure and membrane mobility, explaining why adenoidectomy is effective [17].

- Gattinara (2025): Advised against routine antibiotic prophylaxis due to adverse events and resistance risks [18].

- Long-term Outlook and Limitations

While surgical benefits are clear in the short term, some studies indicate efficacy may diminish over time [15, 19]. Current AAO-HNS (2022) guidelines recommend against first-line adenoidectomy in children under 4 unless specifically indicated [20].

This study's findings must be interpreted with caution due to several limitations:

- Small sample size (n=61): Approximately 20 patients per arm limits statistical power.

- Selection bias: The non-randomized, observational design assigned treatment based on clinical severity.

- Short follow-up: A 6-month period is insufficient to assess late recurrences or long-term sustainability.

- Recommendations

Future research should employ randomized controlled trials with larger cohorts and follow-up periods ≥12 months. An individualized approach remains essential-stratifying risk by recurrence history, adenoid hypertrophy, and environmental factors-to optimize outcomes while minimizing unnecessary interventions.

V. CONCLUSION

In this observational study, adenoidectomy with or without tympanostomy tube insertion was associated with more favorable short-term outcomes, demonstrating a reduced number of recurrent episodes and a prolonged time to recurrence compared to medical therapy in children with RAOM. However, due to the small sample size and non-randomized allocation, further large-scale, randomized controlled trials are required to establish definitive causal advantages between these treatment modalities.

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