

Comparative Study between Adenoidectomy with Myringotomy and Adenoidectomy with Ventilation Tube Insertion in Management of Secretory Otitis Media

Wael Hassan Aboulwafa, Hatem Salah Eldin El Habashy, Marwan Ahmed Ibrahim, Mohamed Sobhy Ali

Otorhinolaryngology Department, Faculty of Medicine, AL-Azhar University, Egypt

Corresponding author: Mohamed Sobhy Ali, Mobile: 01092149427; Email: isia992018@yahoo.com

ABSTRACT

Background: Otitis media with effusion is one of the most common chronic otological conditions and the most common cause of conductive hearing loss in the pediatric population. Ventilation tubes insertion with or without adenoidectomy is considered as a standard surgical procedure. **Objective:** this study aimed to compare the efficacy and the complications of adenoidectomy with myringotomy in comparison with adenoidectomy and ventilation tube insertion in management of otitis media with effusion. **Patients and Methods:** this was a prospective study carried out between October 2017 to October 2018 (One year). The study included 60 cases diagnosed with persistent otitis media with effusion due to adenoid enlargement and they were categorized randomly into two groups (30 cases per each). **Group I** underwent myringotomy alone with adenoidectomy and **group II** underwent myringotomy with ventilation tube insertion with adenoidectomy. All patients were subjected to full ENT examination, tympanometry and hearing evaluation. Patients were followed up (After myringotomy healing, at one month and 3 months after healing) for 3 months after tube extrusion or myringotomy closure. Postoperative evaluation was done for all patients and complications were assessed. **Results:** the mean healing time was significantly longer in children who underwent adenoidectomy with ventilation tube (**Group II**) compared to patients of **group I**, ($p < 0.001$) (28.5 vs. 2.2 weeks). The number of cases with OME recurrence after 3 months of healed myringotomy were significantly higher in **group I** (18 ears, 30.0%) compared to **group II** (6 ears, 10.0%), ($p < 0.006$). Postoperative tympanogram was improved in both groups but, it was significantly improved in the group who underwent adenoidectomy with ventilation tube (**Group II**) compared to the group who underwent adenoidectomy with myringotomy only at all follow up intervals ($p = 0.015, 0.002, 0.022$), respectively. The incidence of some postoperative complications such as otorrhea and tympanic sclerosis was significantly higher in **group II** ($p = 0.024$ for otorrhea and $p < 0.001$ for tympanic sclerosis). **Conclusion:** both used procedures were effective in the treatment of OME in children, but adenoidectomy with ventilation tube insertion was significantly better in improving tympanogram and reducing OME recurrence, while, it may increase incidence of some complications. Further studies are warranted with larger number of cases and longer follow-up period to confirm these results.

Keywords: Adenoidectomy, myringotomy, ventilation tube, otitis media

INTRODUCTION

Otitis Media with Effusion (OME) is defined as the presence of a middle ear effusion in absence of infection; its synonyms include 'glue ear' and serous otitis media⁽¹⁾. Fluid in the middle ear is associated most commonly with a conductive hearing loss and an increased risk of acute middle ear infection⁽²⁾. Management of OME consisted of many choices, auto inflation and medical treatment included antibiotic, mucolytics and corticosteroids⁽³⁾. Surgery was indicated in cases where the effusion does not resolve spontaneously or failed medical treatment for 3 months and the main purpose of surgery was to restore middle ear ventilation by eliminating negative intratympanic pressure thus, the mucosa was normalized, hair cells increased and the secretion potential was reduced⁽⁴⁾. The adenoids may play an important role in the pathogenesis of OME, adenoid hypertrophy can cause mechanical obstruction of the Eustachian tube⁽⁵⁾. The adenoids may be the source of bacteria infection which can induce inflammation of the middle ear and may provide a microenvironment for the generation of T lymphocytes (A lymphocyte phenotype found in the

middle ear effusion)⁽⁶⁾. When chronic adenoid infection is suspected, adenoidectomy is being increasingly used for the treatment of OME; a recent study had confirmed its effectiveness⁽⁷⁾. Also, adenoidectomy was beneficial in treating otitis media in children who were older than 4 years of age and had previously undergone ventilation tube insertion⁽⁸⁾. Ventilation tubes of the ear were tiny cylinders placed through the ear drum to allow air into the middle ear⁽³⁾. Myringotomy with ventilation tube placement remains the most common surgical procedure in treatment of OME, common indication for tube insertion include recurrent acute otitis media, chronic Eustachian tube dysfunction and OME⁽⁹⁾. There were some complications associated with tube insertion which were more frequent than anticipated, reaching 80% of operated ears under specific circumstances and in certain subgroups of children⁽¹⁰⁾. The main associated complications were purulent otorrhea (10–26%), myringosclerosis (39–65%), segmental atrophy (16–75%), atrophic scars and pars flaccida retraction pockets (21–28%), tympanic membrane perforation (3%, but as high as 24% with T-tubes), cholesteatoma

(1%) and granulation tissue (5–40%)⁽¹¹⁾. So, we conducted this study to compare the efficacy and the complications of adenoidectomy with myringotomy in comparison with adenoidectomy and ventilation tube insertion in management of OME.

PATIENTS AND METHODS

This was a prospective study conducted in E.N.T Outpatient Clinic at Bab El Shereya (Sayed Galal) Hospital, Cairo, Egypt through one year between October 2017 to October 2018. This study included a total of 60 cases that were suffered from persistent otitis media with effusion due to adenoid enlargement and were planned for adenoidectomy, myringotomy and/or ventilation tube insertion. The aim and nature of the study was explained for parents of children before inclusion. An informed written consent was obtained before enrollment. The included patients were divided randomly to two groups as follow: **Group I:** included 30 patients underwent myringotomy alone with adenoidectomy or adenotonsillectomy. **Group II:** included 30 patients underwent myringotomy with ventilation tube insertion classically, together with adenoidectomy or adenotonsillectomy. Patients were excluded if their age was under 3 or above 12 years to limit our work with patients in childhood period as this age group represented the majority of our target cases, also we excluded patients with recurrent adenoidectomy due to possible affection of Eustachian tube from previous surgery, children with congenital disease such as cystic fibrosis or cleft palate, also, patients with previous ventilation tube insertion to avoid possible tympanosclerotic patch that can affect the hearing loss and to avoid the effect of the cause of recurrence. All patients were subjected to full history taking in terms of full ENT examination, complaint also, history of present illness (All patients had received course of medical treatment composed of antibiotics, steroids and nasal decongestants For a period of 4-12 weeks prior being candidates for the study). The pre-operative evaluation was done. Also, preoperative X-ray nasopharynx lateral view was done. In addition, tympanometry and hearing evaluation were done (patients were examined by tympanometry one day before the surgery with a probe tone of 226Hz and testing of acoustic reflexes threshold using 500,1000,2000,4000Hz, for postoperative comparison.

Surgical procedures: all patients were operated under general anesthesia via a cuffed

endotracheal tube. The outer ear canal was prepared with povidone-iodine solution. The patients were operated microscopically under sterile condition. Cerumen was cleared by suction. In **group I** a simple myringotomy incision was placed in the antero-superior quadrant of pars tensa of both tympanic membranes. Middle ear fluids were aspirated. Adenoidectomy with or without tonsillectomy when indicated was also performed. In **group II** the same steps were followed as **group I** in addition to ventilation tube insertion

Postoperative care and follow-up: Patients received antibiotics for one week postoperatively. Parents of patients were instructed to avoid water entering to the ears. Patients were followed up after one week from operation, then after one month, then monthly to check for tube extrusion, myringotomies closure and early postoperative complications. Three months after each tube extrusion or myringotomy closure, patients were examined to look for recurrence of the effusion based on clinical and tympanometric findings, tympanosclerosis, persistent perforation, cholesteatoma, atelectasis, and retraction pockets.

Statistical analysis: Statistical analysis of the data was performed by using SPSS_22 software package (Illinois, Chicago, USA). Categorical data were presented in the form of frequency and percent. Quantitative data were expressed in the form of mean \pm SD. Comparison between groups were performed by chi-square (χ^2) test for categorical data and by independent sample T-test for continuous data. Probability level (P-value) was assumed significant if less than 0.05 and highly significant if P-value was less than 0.001. P-value was considered non-significant if greater than or equal to 0.05.

RESULTS

The present study included a total of 60 cases (34 males and 26 females) with persistent otitis media with effusion, these patients were categorized randomly into two groups. The results showed that there were no significant differences between groups regarding age and sex distribution. Ten cases in **group I** was 33.3% and 14 cases in **group II** (46.7%) underwent tonsillectomy and this difference between groups was not significant (Table, 1). The results showed that patients in **group II** had significantly higher healing time of myringotomy compared to patients of group (I),

($p < 0.001$) (28.5 vs. 2.2 weeks). However, number of cases with OME recurrence after 3 months of healed myringotomy were significantly higher in **group I** (18 ears, 30.0%) in comparison with **group II** (6 ears, 10.0%), ($p < 0.006$) (**Table 2**). This means that the recurrence rate was significantly higher in group of patients who underwent adenoidectomy with myringotomy only compared to the other group.

Regarding the results of tympanogram, generally, tympanogram was significantly improved in **group II** compared to **group I** at all follow up times, this was evidenced by that ears with type A tympanogram were 55 ear (91.7%) in **group II** vs. 43 ear (71.7%) in **group I** just after myringotomy healing, however, ears with type A tympanogram were 54 ears (90.0%) in **group II** vs. 38 ears (63.4%) in **group I** at one month after

healing, while at 3 months after healing, ears with type A tympanogram were 54 ears (90.0%) in **group II** vs. 42 ears (70.0%) in **group I**, this difference between groups was significant at all follow up times ($p = 0.015, 0.002, 0.022$), respectively (**Table 3 & fig. 1**).

Regarding postoperative complications, the results showed that the incidence of some complications such as otorrhea and tympanic sclerosis was significantly higher in **group II** compared to **group I** ($p = 0.024$ for otorrhea and $p < 0.001$ for tympanic sclerosis). However, no significant differences were found between groups as regard the incidence of some complications such as persistent perforation ($p = 0.154$), tympanic membrane atrophy ($p = 0.747$), cholesteatoma, atelectasis and retraction pockets (**Table 4**).

Table 1: Demographic characteristics and Tonsillectomy between groups

Variable		Group (I) Adenoidectomy with myringotomy (n=30)	Group (II) Adenoidectomy with ventilation tube (n=30)	P. value (Sig.)
Age (year)		7.1 ± 2.3 (3.0-8.0)	7.3 ± 2.6 (3.0-10.0)	0.753 ^{NS}
Sex	Male	18 (60.0%)	16 (53.3%)	0.601 ^{NS}
	Female	12 (40.0%)	14 (46.7%)	
Tonsillectomy		10 (33.3%)	14 (46.7%)	0.291 ^{NS}

NS - Not significant

Table 2: Healing time of myringotomy and recurrence of OME between groups

Variable		Group I Adenoidectomy with myringotomy	Group II Adenoidectomy with ventilation tube	P. value (Sig.)
Healing time (wks.) Mean ± SD (range)		2.2 ± 0.9 (1.0-3.0)	28.5 ± 10.4 (8.0-52.0)	<0.001**
Recurrence of OME (ear)	No	42 (70.0%)	54 (90.0%)	0.006**
	Yes	18 (30.0%)	6 (10.0%)	

** Significant ($p < 0.01$)

Table 3: Tympanogram just after myringotomy healing, at 1 month and 3 months after myringotomy healing between groups

Tympanogram		Group I	Group II	P. value (Sig.)
		Adenoidectomy with myringotomy (n=60 ear)	Adenoidectomy with ventilation tube (n=60 ear)	
just after Myringotomy healing	Type A	43 (71.7%)	55 (91.7%)	0.015*
	Type B	10 (16.7%)	2 (3.3%)	
	Type C	7 (11.6%)	3 (5.0%)	
1 month	Type A	38 (63.4%)	54 (90.0%)	0.002**
	Type B	14 (23.3%)	4 (6.7%)	
	Type C	8 (13.3%)	2 (3.3%)	
3 months	Type A	42 (70.0%)	54 (90.0%)	0.022*
	Type B	16 (26.7%)	5 (8.3%)	
	Type C	2 (3.3%)	1 (1.7%)	

* Significant (p<0.05). highly significant (p<0.01).

Table 4: Post operative complications between groups

Complication	Group (I) Adenoidectomy with myringotomy (n=60 ear)	Group (II) Adenoidectomy with ventilation tube (n=60 ear)	P. value (Sig.)
Otorrhea	5 (8.3%)	14 (23.3%)	0.024*
Persistent perforation	0	2 (3.3%)	0.154 ^{NS}
Tympanic sclerosis	0	10 (16.6%)	<0.001**
Tympanic membrane atrophy	1 (1.7%)	3 (5.0%)	0.747 ^{NS}
Cholesteatoma	0	0	-
Atelectasis	0	0	-
Retraction pockets	0	0	-

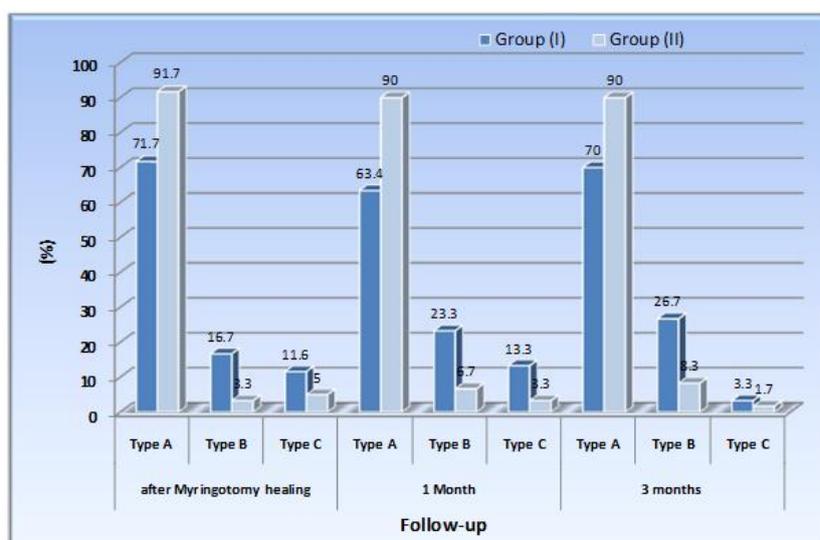


Figure 1: Bar chart showing result of tympanogram just after myringotomy healing, at 1 month and 3 months after myringotomy healing between groups

DISCUSSION

Otitis media with effusion is one of the commonest chronic otological conditions seen in children; it leads to conductive hearing loss, “fullness” in the ear, and occasional pain from the pressure changes and also leads to negative impact on speech development and behavior⁽¹²⁾. The prevalence of OME was reported as 10% to 30% and a cumulative incidence of 80% at different age of children was also reported⁽¹³⁾. The results of the present study showed that there were no significant differences between the studied groups in age ($P=0.753$) and sex distribution ($P=0.601$) of children. This result is important to insure the complete homogenization of the studied groups to get accurate results from the comparison between the two procedures. These results agree with those of **Khan *et al.***⁽¹⁴⁾ and **Smith and Greinwald**⁽¹⁵⁾ who reported that there were no significant differences between their studied groups as regards age and sex and that could lead to accurate results from the comparison between procedures in post operative variables. Our present results showed that there was male predominance in the studied sample (34 males vs. 26 females). These results are in agreement with those of **James *et al.***⁽¹⁶⁾ who reported that male gender had consistently been identified as one of the risk factors for OME. Also, it had been reported that male children had more incidence of childhood infection as they are more exposed to allergic and infectious agents compared to female children⁽¹⁷⁾. While, **Erdivanli *et al.***⁽¹⁸⁾ reported that there was no difference in OME incidence between both sexes. The present results showed that children who underwent adenoidectomy with ventilation tube (**Group II**) had significantly higher healing time mean of myringotomy compared to patients of **group I** ($p<0.001$) (28.5 vs. 2.2 weeks). These results are in agreement with results of **Khan *et al.***⁽¹⁴⁾ who reported that myringotomy and ventilation tube insertion had higher healing time compared to adenoidectomy with myringotomy alone. It has been reported that complete healing without complications should occur within four weeks, if ear tubes were inserted, they should fall out within 6-12 months and in some cases, surgery to remove the ear tubes may be necessary **Popova *et al.***⁽¹⁹⁾ and **Awad**⁽²⁰⁾ reported similar results.

The present results revealed that number of cases with OME recurrence after 3 months of healed myringotomy were significantly higher in **group I** (18 ears, 30.0%) in comparison with **group II** (6 ears, 10.0%), ($p<0.006$). This means that the recurrence rate was significantly higher in group of patients who underwent adenoidectomy with myringotomy only compared to ventilation tube group. Our findings are similar to those of **Popova *et al.***⁽¹⁹⁾ who compared between myringotomy and tympanostomy tubes in combination with adenoidectomy in 3–7 years old children with otitis media with effusion. They found that the recurrence of OME was higher in adenoidectomy with myringotomy group compared to adenoidectomy with ventilation tube group. Also, **Farhadi *et al.***⁽²¹⁾ studied the effectiveness of adenoidectomy on tympanostomy tubes retention duration. They found that ventilation tubes placement in conjunction with adenoidectomy showed better improvement in tympanogram and prolonged ventilation and they suggested that adenoidectomy is an effective surgical intervention in the management of otitis media especially when it is performed in conjunction with insertion of tympanostomy tubes, this significantly decreases tube extrusion rate, which might be due to improving Eustachian tube function that consequently reduced repeated otitis media. In addition, in a recent systemic review and meta analysis also concluded that adenoidectomy with primary tube insertion appears to provide a protective effect against repeated surgery in children older than 4 years⁽²³⁾. **Casselbrant *et al.***⁽²²⁾ compared the efficacy of three surgical treatment combinations: myringotomy and tympanostomy tube insertion (M&T), adenoidectomy with M&T (A-M&T), and adenoidectomy with myringotomy (A-M) - in reducing middle ear disease in young children with chronic OME. They found that during the 36 months after entry, subjects had middle-ear effusion for the following percentages of time: 18.6% in the M&T group, 20.6% in A-M&T group and 31.1% in the A-M group (M&T vs A-M&T, $p=.87$; M&T vs A-M, $p=.01$). By 36 months, there were no differences in the number of further surgical procedures for ear disease needed among the groups.

The results of the present study showed that postoperative tympanogram was improved in both groups but, it was significantly improved in the group who underwent adenoidectomy with ventilation tube (**Group, II**) compared to the group who underwent adenoidectomy with myringotomy only at all follow

up intervals (after myringotomy healing, at one month after healing, at 3 months after healing) ($p=0.015, 0.002, 0.022$), respectively. As similar to our findings, **Farhadi et al.** ⁽²¹⁾ found that adenoideotomy with ventilation tubes showed better improvement in tympanogram. Also, **Van den et al.** ⁽²⁴⁾ reported that the insertion of grommets (Ventilation or tympanostomy tubes) into the ear drum was a surgical treatment option commonly used to improve hearing in children with otitis media with effusion results in minimal, if any, hearing disability. In addition, our results are in accordance with those of **Shishegar and Hobhoghi** ⁽²⁵⁾ and **Vlastos et al.** ⁽²⁶⁾ who reported that adenoideotomy with ventilation tube insertion had better outcome on tympanogram and PTA in children with otitis media with effusion. On the other hand, **Casselbrant et al.** ⁽²²⁾ found that adenoideotomy with or without tube insertion provided no advantage to young children with chronic OME in regard to time with effusion compared to tube insertion alone. They added that fewer tympanostomy tubes were placed in children undergoing A-M as their initial procedure, but this should be balanced by the performance of the more invasive surgical procedure and their increased time with effusion. Many surgeons performed adenoideotomy in conjunction with tympanostomy tubes insertion as the initial treatment for chronic OME or recurrent AOM in recent years after the release of AAO-HNS practice guidelines ⁽²⁷⁾. However, **Popova et al.** ⁽¹⁹⁾ studied comparison between myringotomy and tympanostomy tubes in combination with adenoideotomy in 3–7-year-old children with otitis media with effusion. They found that the insertion of tympanostomy tubes in association with adenoideotomy provided no additional benefit to adenoideotomy in association with myringotomy alone in terms of hearing loss in patients with bilateral otitis media with effusion. Furthermore, they found no relationship between the choice of operative intervention and the recurrence rate of OME. On the other hand, **Boston et al.** ⁽²⁸⁾ reported that for children with tympanostomy tubes, 20–50% may require repeated tympanostomy tubes after their initial tubes extruded. Adenoideotomy has been proved to be effective in preventing recurrence of OME, recurrent AOM, or the need for repeated tympanostomy tubes in many studies in the past 30 years ⁽²⁹⁾. Regarding postoperative complications, the present results showed that the incidence of some complications such as otorrhea and tympanic

sclerosis was significantly higher in adenoideotomy with ventilation tube group of patients compared to adenoideotomy with myringotomy only group ($p=0.024$ for otorrhea and $p<0.001$ for tympanic sclerosis). However, no significant differences were found between groups as regard the incidence of some complications such as persistent perforation ($p=0.154$), tympanic membrane atrophy ($p=0.747$), cholesteatoma, atelectasis and retraction pockets. These results are in agreement with those of **Popova et al.** ⁽¹⁹⁾ who found that none of the patients with adenoideotomy and myringotomy had episodes with otorrhea which contrasted with the 40% occurrence rate in the adenoideotomy with ventilation tube group: 24% with one otorrhea episode, 12% with two, 2% with three and 2% with four or more episodes. Additionally, **Flynn et al.** ⁽¹⁰⁾ reported that complications associated with tube insertion were more frequent than anticipated, reaching 80% of operated ears under specific circumstances and in certain subgroups of children. The main complications were purulent otorrhea (10–26%), myringosclerosis (39–65%), segmental atrophy (16–75%), atrophic scars and pars flaccida retraction pockets (21–28%), tympanic membrane perforation (3%, but as high as 24% with T-tubes), cholesteatoma (1%) and granulation tissue (5–40%) ⁽¹¹⁾. Also, similar to our findings **Rosenfeld** ⁽³⁰⁾ reported that potentially adverse effects on the tympanic membrane are common after grommet insertion. **Awad** ⁽²⁰⁾ reported that the ventilation tube insertion relieved the symptoms of the effusion such as the conducting hearing loss and episodes of acute otitis media, the procedure was not without risk; formation of granulation tissue, tube extrusion into the middle ear space, cholesteatoma formation, external otitis media and suppurative otitis media are some of the recognized complications. **Khan et al.** ⁽¹⁴⁾ demonstrated that myringotomy with insertion of ear tubes is an extremely common and safe procedure with minimal complications and when complications do occur, they may include Perforation, scarring, infection and ear tubes come out too early or stay in too long.

CONCLUSION

On the basis of our findings, both used procedures (Adenoideotomy with myringotomy or Adenoideotomy with ventilation tube) are effective in treatment of OME in 3:10 years children, but Adenoideotomy with ventilation tube insertion is significantly better in improving tympanogram and

reducing OME recurrence, while, it may increase incidence of some complications. Further studies are warranted with larger number of cases and longer follow-up period to confirm these results.

Ethical considerations- Ethical permission was sought from a Local Research Ethics Committee (REC) of Faculty of Medicine, Al-Azhar University and an informed consent was taken from all patients before enrolment in this study.

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