

Research Article

Comparative Study between Endoscopic and Microscopic Myringotomy and Ventilation Tube Insertion in Treatment of Otitis Media with Effusion in Beni-Suef University Hospital

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Abstract

The goal of this study to compare between endoscopic and microscopic myringotomy and ventilation tube insertion in the management of otitis media with effusion regarding operative time and intra operative complications. This study was carried out in the Otorhinolaryngology department of Beni-Suef University's Hospital. The study was carried out on 100 patients divided into two groups (group A and B) each group included 50 patients who suffering from otitis media with effusion not respond to medical treatment for 3 months. The medical treatment used in this study was in form of anti-inflammatory, mucolytic, nasal decongested drops, oral corticosteroids and antihistaminic in cases associated with allergy. In group A the operation was done by the endoscope and in group B the operation was done by the microscope.

Keywords: Myringotomy and Ventilation tube.

Introduction

Otitis media with effusion (OME) is a condition characterized by presence of fluid within the middle ear without signs or symptoms of acute infection. It is more common in young children. It is common among children with craniofacial anomalies including cleft palate and Down's syndrome^[1]. OME may occur spontaneously because of dysfunction of the Eustachian tube or as an inflammatory response following acute otitis media (AOM). Many episodes resolve spontaneously within 3 months, but 30% to 40% of children have recurrent OME and 5% to 10% of episodes last 1 year or longer^[2]. Risk factors of OME can be divided into non-medical and medical risk factors. Significant non-medical risk factors includes age (two to five years old), large family size, sibling's history of OME, short duration of breast feeding and passive smoking. While significant medical risk factors are previous history of AOM, acute tonsillitis, nasal obstruction and craniofacial anomalies^[1]. The diagnosis of OME is done by audiometry (tympanogram) in combination with otoscopy or otomicroscopy^[3]. OME has both short and long term affection on audition, language and quality of life. The condition may lead to severe complication like

retraction of the tympanic membrane, ossicular defects, tympanosclerosis and cholesteatoma in the middle ear^[4]. For the child who is not at a high risk, three months period of watchful waiting from the diagnosis is recommended, in order to avoid any unnecessary surgery and its complications^[5]. There are different treatment options medical and surgical. The medical treatment options include the use of decongestants, mucolytics, steroids, antihistamines, antibiotics and autoinflation. Surgical treatment options include adenoidectomy, myringotomy only and myringotomy with ventilation tube insertion. The myringotomy (tympanocentesis) is surgical incision of the ear drum this done with or without aspiration of fluid from the middle ear cavity^[3].

Surgical intervention should be considered after three months of persistent OME in children with hearing loss or\and structural changes to tympanic membrane^[1]. Myringotomy and ventilation tube positioning (M&T) is a common operation, this surgery has been performed using the operating microscope, as well as other otologic procedures. In 1990, operative endoscopy was introduced in otologic surgery and significantly changed surgical

concepts. Nowadays, for many otolaryngologists endoscopes have joined and sometimes replaced the microscope^[6]. The magnified view of the surgical field represents the greatest advantage of endoscopic myringotomy and ventilation tube insertion. The endoscopic procedure enables both the junior surgeon and the tutor to see the same magnified images during surgery, thus facilitating the tutoring. Using a common surgical microscope instead, the surgeon benefits by 3-dimensional images, but the observers have a 2-dimensional view^[6]. Comparison with otomicroscopic guidance, Videotelescopic guidance for insertion of myringotomy tubes is a safe and effective technique in some selected patients. This technique allows demonstration of the entire tympanic membrane during surgery enabling better teaching for medical students and nurses^[7]. However, there are few conditions where endoscopic myringotomy is practically challenging-for example, a narrow or very tortuous ear canal, excessive bleeding that obstructing the endoscopic view or the presence of a mass such as asymptomatic osteoma, We advise caution in such cases. Major disadvantages of the endoscope are that we have only one hand to operate and insert the ventilation tube^[8]. The microscope offers to the surgeon an immediate depth perception that the endoscope lacks. However, movements of the endoscope allow perception of a relative positional anatomy, which can minimize this limitation^[6].

Patients and Methods

This study was carried out in the Otorhinolaryngology department of Beni-Suef University's Hospital from September 2018 to May 2019. This study was conducted on 100 cases (195 ears) were suffering from otitis media with effusion not responding to medical treatment for more than three months.

So surgical interventional was required in form of myringotomy and ventilation tube insertion. They were randomly divided into two groups:

- Group A contain 50 case (48 bilateral, 2 unilateral {98 ears}) the operation was done by the endoscope.
- Group B contain 50 case (47 bilateral, 3 unilateral {97 ears}) the operation was done by the microscope.

Inclusion criteria:

- Patients with otitis media with effusion not respond to medical treatment more than 3 months.
- Sex both gender.
- Age: any age.

Exclusion criteria:

- Recurrent cases. Previous myringotomy and ventilation tube insertion.
- Poor general condition.
- Atelectatic and adhesive cases.

Full assessment was done for all patients who included in this study in form of:

A. History

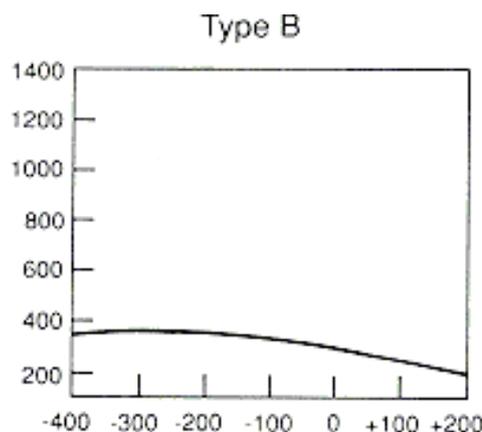
- Decrease hearing or sensation of hearing fullness or \and delayed speech.
- Nasal obstruction, nasal discharge or snoring.
- Risk factors; craniofacial anomalies, cigarette smoking and recurrent upper respiratory tract infection.
- Medical treatment for more than three months.

B. Examination

- Complete otorhinolaryngeal examination.
- Otoscopy examination revealed disturbed cone of light, air-fluid levels, air bubbles or signs of T.M retraction (medial displacement and foreshortened handle of malleus, prominence of the lateral process of the malleus, exaggerated anterior and posterior malleal folds).
- Oral examination to see enlarged tonsil.
- Nasal examination to see any signs of allergy.

C. Investigation

- Tympanometry; type B (flat curve).



- Pure tone audiometry in cases with hearing loss more than expected from OME.
- X rays nasopharynx to see any enlarged adenoid.
- Routine investigations including coagulation profile, complete blood count, liver functions tests and kidney functions tests.

Surgical technique:

- Both groups were done under general anesthesia.
- Adenoidectomy was performed first if needed.
- The patient was positioned with rubber ring place under the head to stabilize it and the head tilted to the opposite side.
- Sterilization of the ears was done by an antiseptic solution and covering around the auricle with sterile drapes.
- M&T was done to both groups.

In group A,

The endoscope was used for the surgical intervention (2.7endoscope with light source and video monitor). The endoscope was carefully used to avoid injury to the external ear canal to decrease the bleeding.

The steps of the operation were:

- Myringotomy in the anteroinferior quadrant of the ear drum with a myringotomy knife.
 - Suction of fluid (glue) in the middle ear.
 - The ventilation (grommet) tube was inserted.
- When oozing of the blood occurred from external auditory canal skin or from the ear drum it obstructed the view of the endoscope so frequent cleaning of the lens was done.

The intraoperative recorded information was;

1. Time of the operation recorded from the surgeon take the instrument from the nurse till insertion of the tube in each side separately in all patients in both groups.
2. Complications, if occurred, which may be in form of; tearing of the tympanic membrane, laceration of the external auditory canal, bleeding and dropping of the tube in the middle ear cavity.

Statistical analysis

Analysis of data was performed using SPSS v.23 (Statistical Package for Social science) for Windows.

Description of variables was presented as follows:

- Description of quantitative variables was in the form of mean, standard deviation (SD), minimum and maximum.

- Description of qualitative variables was in the form of numbers (No.) and percent's (%).

Data was explored for normality using Shapiro/Kolomogrov tests of normality. Comparison between the scale variables of the two groups was assessed by the independent t-test.

Comparison between the categorical variables of the two groups was assessed by the chi square test. The significance of the results was assessed in the form of P-value that was differentiated into:

Non-significant when P-value > 0.05

Significant when P-value ≤ 0.05

Highly significant when P-value ≤ 0.001

Results

Our study was done on 100 cases (195 ears) the patients were 65 males and 35 females. The age of the patients was ranging from (2-55) years.

In our study there was no statistically significant difference between both groups regarding the age of the patients ($P>0.05$), age ranges from 2 to 42 years with mean 9.6 ± 8 in group A and ranges from 2 to 55 with mean 9.7 ± 8.5 in group B.

Table (1): Demographic data of the patients in the studied groups:

Characteristics	Endoscopic group N=50 (100%)	Microscopic group N=50 (100%)	P-value
Age (years)			0.999
Mean \pm SD	9.6 \pm 8	9.7 \pm 8.5	
Range	(2-42)	(2-55)	
Sex no.(%)			0.843
Males	32(64%)	33(66%)	
Females	18(36%)	17(34%)	

Table (1): show that there was no statistical significant difference between both groups regarding the patients age and sex.

The mean time taken by endoscopic procedure was 5.1 ± 2.1 which was shorter than that taken by microscopic procedure which was 6.1 ± 2.5 .

There was statistical significant different between two groups regarding the intra-operative time. P-Value=0.026.

Table (2) Comparison between both procedures regarding the operative time:

Length of operation (min)	Endoscopic group N=50 (100%)	Microscopic group N=50 (100%)	P-value
Mean \pm SD	5.1 \pm 2.1	6.1 \pm 2.5	
Range	(2-12)	(2-14)	0.026*

Table (2): Show There was statistical significant different between two groups regarding the intraoperative time. P-Value=0.026.

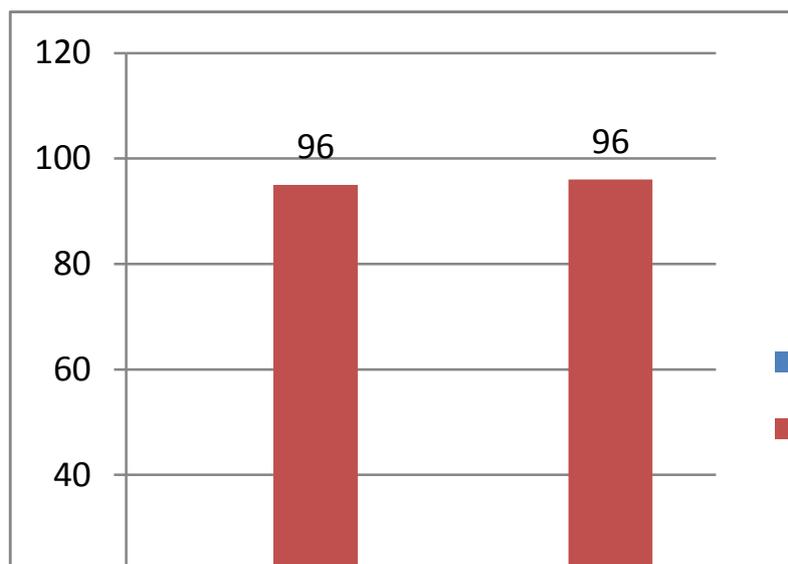


Figure (1): Comparison between both groups regarding the intraoperative complications.

The complications occurred were in the form of minimal bleeding which was controlled by application a 0.5mg/ml. epinephrine soaked cotton wad.

Bleeding occurred in two ears (1.1%) in endoscopic group and in 1 ear (1%) in the microscopic group. There was no statistical significance difference between both groups regarding the intraoperative bleeding. p-value 0.763

No complications, like tearing in tympanic membrane, dropping of the tube into the middle ear or injury to external auditory canal were occurred in both groups. So no statistical significance difference between the two groups regarding the complication.

In cases with a hump in the external auditory canal the procedure was more difficult with the microscope than with the endoscope and take prolonged time.

In endoscopic procedure one hand was used this made some limitation in this procedure, but with training the procedure was easier and rapid.

Bleeding during the surgery obscure the view of the endoscope so frequent cleaning of the lens was required that prolonged the time of the operation.

Discussion

Otitis media with effusion is a common disease in children characterized by presence of ear fluid behind an intact drum^[2]. There are many causes for OME like malfunction of the Eustachian tube, allergy, viral infection, bacterial infection, or unresolved acute otitis media^[9]. OME lead to conductive hearing loss because of many causes: (Decreasing sound signal reaching the inner ear due to presence of fluid inside the middle ear, scarring of tympanic membrane and adhesive retraction of the ear drum to the ossicles). OME usually results in conductive hearing loss of 20–30 dB and the degree of loss can vary depending on character and quantity of effusion^[10]. The technique for diagnosis of OME is impedance audiometry (tympanogram) in combination with pneumatic otoscopy or otomicroscopy. In OME the tympanometry is a flat curve (type B-relative gradient less than 0.1) and the mobility of the

drum may be decreased or absent this indicate presence of fluid or air bubbles behind the tympanic membrane^[11]. There are many treatment options for otitis media with effusion include preventing the risk factors, watchful waiting without treatment then medical treatments. The medical treatment in form of decongestant, mucolytic, antibiotic, maneuvers to open ET. If medical treatment failed, surgical treatment is required. The surgical treatments are in form of adenoidectomy, myringotomy with or without tympanostomy tube placement^[12]. Myringotomy and ventilation tube insertion is done if middle ear effusion is persistent and chronic lasting more than 3 months despite of medical treatment. The ventilation tubes helping in equalizing the pressure of the middle ear and drainage of the fluid. Although ventilation tubes insertion are associated with a number of complications like purulent otorrhea in (10%-26%) of cases, myringosclerosis (39%-65%), retraction pockets (21%) and persistent tympanic membrane perforations (3% although with longer stay T-tubes up to 24%)^[13]. Ventilation tube insertion is a common childhood operation which has been performed in the past by the microscope. Endoscopes have been used in many otologic surgeries since the 1990.^[14] The advantages of the endoscope are that; 1) it enables the surgeon to see the whole tympanic membrane and the ear canal without having to manipulate the head of the patient as in the microscope, 2) it increases the operative field to show the structures usually not seen during the use of the microscope also, 3) it enables visualization of the structures from multiple angles as opposed to the microscope's single axis along the auditory canal^[15]. The main disadvantages of the endoscope are one handed surgical technique, loss of depth perception and need for training^[6].

In our study we compared between myringotomy and ventilation tube insertion by the use of the endoscope and the microscope regarding the operative time and intraoperative complications of the surgery.

Our study was done on 100 cases (195 ears) the patients were 65 males and 35 females. The age of the patients was ranging from (2-55) years.

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From the 100 cases 95 cases with bilateral OME and 5 cases with unilateral OME not So myringotomy and ventilation tube insertion was done for them.

In our study the patients were divided into two groups:

- Group A included 50 cases. In this group the operation was done by the endoscope.

- Group B included 50 cases. In this group the operation was done by the microscope.

There was no statistically significant difference between both groups regarding the sex and the age of subjects ($P > 0.05$).

In our study the mean operative time in group A is 5.1 ± 2.1 ranging from 2-12 min and in group B is 6.1 ± 2.5 min ranging from 2-14 min. There was a statistical significance difference between

both groups regarding the time consumed for both procedures, as the endoscopic procedure was significantly faster than the microscopic procedure. (P -value=0.026).

A study was done on 150 ear were underwent myringotomy and tube placement, 102 ears with endoscopic technique and 48 ear with microscopic technique, the average time taken by the endoscopic technique was 5.71 ± 2.27 min ranging from 3.0 to 14.0 min and 7.10 ± 2.36 min in microscopic technique ranging from 4.0 to 15.0 min there was statistically significant difference noted in the average operative time between the endoscopic and traditionally microscopic technique for myringotomy and ventilation tube placement^[16]. Current study agreed with the results of^[16].

Another study was done on 26 patients (37 ears) suffering from chronic otitis media with effusion were treated with myringotomy and tube insertion under endoscopic guidance. The operation time for each ear ranged from 4 to 13 minutes, with an average of seven minutes^{[17], [18]} did a study on one hundred cases (163 ears). The study was focused on sixty-six patients (66%) where 106 ventilation tubes (65%) were placed by otoendoscopy. The mean time for the endoscopic technique was 18 min and the microscopic technique was 11 min. In this study the mean operative time of the endoscopic technique is longer than that of the

responding to medical treatment for more the three months.

microscopic technique which was differ from our study. It may be due to presence of some patients with difficult anatomical situations where external auditory canal (EAC) was stenotic or bending.^[14] did a study on 39 patients divide them into two groups. In Group A, ventilation tube insertion was performed by using the endoscope in 15 patients (29 ears) with a mean age of 5.7 ± 2.5 years (range, 2-10 years), But in Group B, ventilation tube insertion was done with surgical microscope in 24 patients (44 ears) with a mean age of 5 ± 1.7 years (range, 3-9 years). They reported that the mean operative time for the microscopic technique was shorter than that of the endoscopic technique at the level of statistical significance. The mean time taken by the endoscope was 266.90 seconds (4.44 min), however the mean time taken by the microscope was 231.23 seconds (3.85 min) ($p < 0.034$).^[6] did a study on 24 patients with OME underwent M&T insertion and divided them into two groups of 12 subjects each were formed by assigning the patients alternately. In group A, patients underwent M&T under endoscopic view, whereas in group B, the same procedure was performed using a surgical microscope. They reported that mean operative time was 10.14 ± 3.13 minutes in group A and 10.92 ± 3.99 minutes in group B ($P > 0.05$). No statistical difference was observed in operative time ($P > 0.05$).

In our study the rate of complications occurred in group A (endoscopic) was 1.1% and in group B was 1%. There was no statistical significance difference between both groups regarding the intraoperative complications, as the complications were absent in 98.9% in endoscopic group and in 99% in the microscopic group. The complications occurred was in the form of minimal bleeding which was controlled by application a 0.5mg/ml. epinephrine soaked cotton wad. No complications, like tearing in tympanic membrane, dropping of the tube into the middle ear or injury to external auditory canal were occurred.^[14] reported that moderate bleeding during the procedure occurred in a single patient, who had a prominent anterior wall of the external auditory canal. The bleeding was controlled by the application of a

0.5mg/ml. epinephrine-soaked cotton wad. No complications, such as tearing of the tympanic membrane or the surgeon dropping the tube in to the middle ear, occurred in either Group A and Group B. All of the ventilation tubes were successfully placed in both groups without recourse to changing surgical method.^[6] reported that there was No statistical significant difference was observed between endoscopic and microscopic myringotomy and ventilation tube insertion. (P-Vale > 0.05).

In current study in cases with anterior overhung, the procedure more difficult during the use of the microscope and prolonged the time of the operation. So in our experiences we advise the use of the endoscope in cases with anterior overhung.

In the endoscopic group there were some difficulties when use one hand but with training the procedure became easier. And when bleeding occurred it was difficult to control and take more time due to one hand technique and fogging the lens of the endoscope this needs frequent cleaning.

Conclusion and Recommendations

The use of the endoscope in myringotomy and ventilation tube insertion is a safe and effective technique. Compared with microscopic guidance and video-telescopic there were no significant different between both technique regarding the complication. The time taken by the endoscope was shorter than that taken by the microscope. In our study we found that the endoscope gave better view of the all parts of the tympanic membrane and the surgeon and the students share the same view which was better in teaching. So from our experience we found that the use of the endoscope in ventilation tube insertion is very benefit but it needs some training to avoid the disadvantages of the technique.

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