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Original Research Article

Evaluation of the Safety and Effectiveness of Endoscopic Myringotomy and Ventilation Tube Placement

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Abstract	Keywords
<p>The objective of the study was to analyze the safety and effectiveness of endoscopic myringotomy and ventilation tube placement in comparison with traditional otomicroscope procedure. The primary outcomes of interest in this study were perioperative complications, operative time and correct placement of ventilation tube. This is a prospective study conducted on 75 patients, based on clinical history, otoscopic and audiological evaluation; the patients were scheduled for bilateral myringotomy with tube placement, 51 patients under endoscopic view (group A) and 24 patients using traditional otomicroscope technique (group B). Of the 75 patients in this study, 42 were males (56%) and 33 were females (44%), and the mean age of the patients were 11.94 years with a range of 2 to 60 years. A total of 150 ear were underwent myringotomy with tube placement, the rate of complication was 7.84% in the endoscopic technique group (8/102), and 6.25% in the otomicroscopic technique group (3/48). The 95% confidence interval for endoscopic technique is ± 5.22, so we are 95% certain that the true complication proportion falls within the range of 2.62% to 13.06%. We found that the average operative time was 5.71 ± 2.27 min in endoscopic technique (3.0-14.0) min and 7.10 ± 2.36 min in microscopic technique (4.0-15.0) min. The endoscopic myringotomy and ventilation tube placement seem to be safe procedure in all gender, affording less costly than performing the procedure with otomicroscope, The efficacy of the technique was observed in term of less operative time than needed in microscopic technique and no need for conversion to traditional procedure in all case of the endoscopic technique.</p>	<p>Endoscopic myringotomy Otomicroscope Otitis media Ventilation tube</p>

Introduction

Otitis media with effusion (OME) is characterized by the collection of serous or mucous fluid behind an intact tympanic membrane cavity during an inflammatory

process and the lack of acute signs and symptoms of infection (Martines et al., 2011).

For the child who is not at a high risk, 3 month period of watchful waiting from the date of effusion onset (if

known) or diagnosis (if onset is unknown) is recommended, in order to avoid any unnecessary surgery, and its complications (Fotini et al., 2005). The most common surgical treatment for OME is still the insertion of ventilation tubes, introduced by Armstrong in 1954 (Armstrong, 1954).

Otoendoscopy is a new technique in otological surgery. The traditional surgery for otitis media with effusion (OME) is myringotomy and tube insertion using an operating otomicroscope (Abou-Elhamd, 2000).

The use of an otoendoscope for myringotomy and grommet insertion was first reported by Thomassin in 1998, but did not become popular because the operating microscope had the major advantage of providing binaural vision (Thomassin, 1998).

Compared with otomicroscopic guidance, video-telescopic guidance for insertion of myringotomy tubes is a safe and effective technique in properly selected patients. This technique allows demonstration of the entire tympanic membrane during surgery enabling better teaching for medical students and nurses (Bhattarai, 2012).

The objective of this study was to determine the safety and effectiveness of endoscopic myringotomy and ventilation tube placement as compared with traditional otomicroscope procedure.

Patients and method

The study was conducted on 75 patients underwent bilateral myringotomy with tube placement for chronic otitis media with effusion. The patients divided into 2 groups:-

Group A: 51 patients underwent endoscopic bilateral myringotomy with tube placement.

Group B: 24 patients underwent bilateral myringotomy with tube placement using traditional otomicroscope technique.

The patients were scheduled for bilateral myringotomy with tube placement based on clinical history, otoscopic and audiological evaluation; patients with history of chronic otitis media with effusion which lasted for 3 months or more in spite of medical treatment and had Type B tympanogram were candidate for this study.

The operative procedure

The patient was positioned with rubber ring place under the head to stabilize it, and the head tilted to the opposite side with the aid of anesthesiologist to avoid endotracheal tube displacement, the sterilization of the ears was done by an antiseptic solution and covering around the auricle with surgical drapes.

Visualization of the external ear canal and the tympanic membrane was done by endoscope in Group A and microscope in Group B, and then the external ear canal was cleaned with normal saline and suction.

Group A

The 2.7 mm 0-degree rigid endoscope was connected to the camera and display screen (Fig. 1), the endoscope was carefully introduced into the external ear canal without contact with the external ear canal skin to avoid bleeding, show (Fig. 2).

Fig. 1: The 2.7 mm 0-degree rigid endoscope connected to the camera.



Myringotomy incision was made in the antero-inferior or antero-superior quadrant of the ear drum with a myringotomy knife, the incision was enlarged enough to accommodate a ventilation tube, the middle ear effusion was then sucked out.

Finally, the ventilation tube was inserted and adjusted to the correct position with the aid of a needle or crocodile forceps shown in Fig. 3. However, if oozing from external ear canal skin or tympanic membrane occurred, the operative field may be obscured, so the cleaning of the lens is mandatory to obtain clear view of all tympanic membrane parts.

Fig. 2: The endoscopic view of all tympanic membrane parts.



Group B

The traditional otomicroscope was used, an ear speculum was carefully introduced into the ear canal and held in place to avoid bleeding from external ear canal skin, the microscope was moved slide around, so that the tympanic membrane is in the center of the field of view, and the fine adjustment was used to obtain the clearest magnified image of the tympanic membrane.

If there is anterior or inferior canal hump, the head of the patient must be tilted more to the opposite side or the incision made at inferior or postero-inferior part of the tympanic membrane. After insertion of the ventilation tube, the procedure was usually finished in that side and the steps will be the same in the other side shown in Fig. 4.

Fig. 3: Positioning of the ventilation tubes in endoscopic technique.



The operation time for each ear and the technique related complication if happened were documented, the data were analyzed to look for safety and effectiveness of endoscopic myringotomy with ventilation tube placement as compared with traditional microscopic procedure, using Mann-Whitney test and Chi-squared test. P value ≤ 0.05 was considered a statistically significant difference and P value ≤ 0.001 was considered highly statistically significant difference.

Fig. 4: The microscopic view of ventilation tube positioning.



Results

Patients were categorized into 2 groups according to the type of the surgical procedure that subjected to it; endoscopic myringotomy (Group A) and traditional otomicroscopic myringotomy (Group B)

Of the 75 patients in this study, 42 were males (56%) and 33 were females (44%). The mean ages of the patients were 11.94 years with a range of 2 to 60 years (Fig. 5).

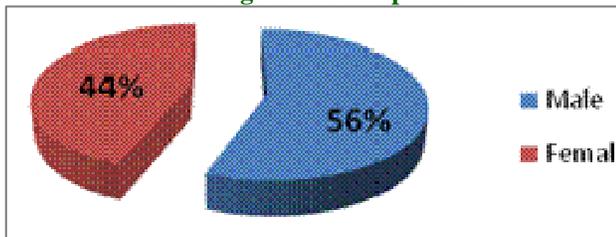
A total of 150 ear were underwent myringotomy with tube placement, 102 ears with endoscopic technique and 48 ear with microscopic technique, The average operative time was 5.71 ± 2.27 min in endoscopic technique (3.0-14.0) min and 7.10 ± 2.36 min in microscopic technique (4.0-15.0) min (Table 1), there was statistically significant difference noted in the average operative time between the endoscopic and traditionally microscopic technique for myringotomy and ventilation tube placement.

Table 1. Comparison between endoscopic and microscopic technique according to the operative time.

Operative time	Endoscopic technique	Microscopic technique
Min. – Max	3.0-14.0	4.0-15.0
Mean ± SD	5.71 ± 2.27	7.10 ± 2.36
Median	5.0	7.0

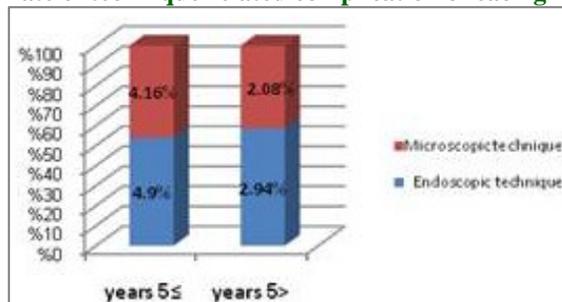
The rate of complication was 7.84% in the endoscopic technique group (8/102), and 6.25% in the microscopic technique group (3/48). The 95% confidence interval for endoscopic technique is ±5.22, so we are 95% certain that the true complication proportion falls within the range of 2.62% to 13.06%, there was statistically no significant difference noted in the ratios of complication between the endoscopic and traditionally otomicroscopic technique for myringotomy and ventilation tube placement.

Fig. 5: Pie Chart illustrating the sex distribution among the studied patients.



The 75 patients were stratified into two groups by age: ≤5 year and > 5 years, the rate of technique related complication in the younger group (≤5years) was 4.90% (5/38) with the endoscopic technique, and 4.16% (2/22) with the microscopic technique, the rate of technique related complication in the older group (>5 years) was 2.94% (3/64) with the endoscopic technique, and 2.08% (1/26) with the microscopic technique, there was statistically no significant difference between the age of studied patients and the rate of technique related complication (Fig. 6).

Fig. 6: Chart showing correlation between age groups and the rate of technique related complication of each group.



Discussion

OME is defined by the presence of middle ear effusion (MEE) behind an intact tympanic membrane (TM) without signs or symptoms of acute infection (Bluestone and Klein 1995).

Of the 75 patients in this study, 42 were males (56%) and 33 were females (44%), and the mean age of the patients were 11.94 years with a range of 2 to 60 years.

Insertion of a myringotomy tube is a common ENT procedure, traditionally this procedure is performed under microscopic view, based on clinical history, otoscopic and audiological evaluation; the patients were scheduled for bilateral myringotomy with tube placement, 51 patients under endoscopic view (group A) and 24 patients using traditional otomicroscope technique (group B).

The primary outcomes of interest in this study were perioperative complications, operative time and correct placement of ventilation tube. The effectiveness and efficacy of the new technique was assessed by compare the mean operative time and the rate of correct placement of ventilation tube between the two techniques.

In our study, the average operative time are consisted with results of Lee et al. (2006) and Nassif et al. (2014). There was statistically significant difference noted in the average operative time between the endoscopic and traditionally otomicroscopic technique for myringotomy and ventilation tube placement.

The average operative time in Nassif et al. (2014) study in the endoscopic 10 min and traditionally otomicroscopic technique 15 min is slightly more higher than our results, because Nassif et al. (2014) calculated the duration of surgery from the moment the surgeon started receiving instruments from nurse till the procedure is concluded when the nurse receives the tool from the surgeon, while in our study the operative time beginning with the starting of ear sterilization and ending when the ventilation tube has been placed.

The conversion rate to traditional otomicroscopic technique was zero, where in all cases, we have been successfully inserted the ventilation tube into the correct place under endoscopic view, and these results consisted with the results of Nassif et al. (2014) who reported that

no endoscopic managements were abandoned or converted to the use of a microscope.

In the present study, the safety of the new technique was assessed by compare the rate of procedure-related complications between the two techniques, and the rate of complications during the operation for all ages.

There was statistically no significant difference noted in the ratios of complication between the endoscopic and traditionally otomicroscopic technique for myringotomy and ventilation tube placement, these results are consistence with the results of Nassif et al. (2014) and Martellucci et al. (2015), and there was no statistically significant difference between the rate of technique related complication between all age groups.

Conclusion

- The endoscopic myringotomy and ventilation tube placement seem to be safe procedure in all ages.
- The efficacy of the technique was observed in term of less operative time than needed in microscopic technique.
- Endoscopic myringotomy affording less cost than performing the procedure with microscope.
- In endoscopic technique the surgeon and the assistants can visualize the whole tympanic membrane and the ear canal.

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