

# *Correlation Between Tympanogram and Myringotomy Fluid in Pediatric Patients with Otitis Media with Effusion*

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## SUMMARY

- Introduction:** Otitis Media with Effusion is a common cause of hearing disability that can be treated simply with myringotomy with or without ventilation tube insertion.
- Objective:** The aims of this study are 1) to assess different types of fluid after myringotomy in Otitis Media with Effusion, 2) to assess the Pre Operative Tympanogram in Patients undergoing myringotomy 3) to correlate between myringotomy fluid and pre operative tympanogram in pediatric patients with Otitis Media with Effusion
- Method:** A retrospective study in children ( $\leq 12$  years) with Otitis media with effusion was carried out in ENT Department, T.U. Teaching Hospital, Kathmandu between October 2005 to September 2007. All patients undergoing myringotomy were assessed by tympanometry and compared with the types of fluid during surgery. Result was analyzed statistically using Chi -Square Test.
- Results:** Most of the patients were in age group 5-8 years. Around 56.8 % of children had thick myringotomy fluid with dry tap in 27.5 %. Tympanogram showed B type curve in 90.2 % children. In patients with B type curve, thick fluid was found in 63.0%, while 21.0 % children had dry tap. But all patients with thick fluid had B type curve in Tympanogram. Sensitivity of B curve to predict fluid was 97.3% while Specificity was 28.6%.
- Conclusion:** Common type of tympanogram curve in patients with Otitis Media with Effusion is B type, but it doesn't always indicate to have fluid in middle ear. Tympanogram is useful in predicting the nature of the myringotomy fluid.
- Key words:** Otitis media with effusion, tympanogram and myringotomy.

## INTRODUCTION

Accumulation of non purulent fluid in middle ear cleft is one of the commonest causes of hearing disability in children. Though it is described with various synonyms like catarrhal, exudative, seromucous, secretory, non-suppurative otitis media but the most widely accepted terminology is otitis media with effusion (OME) (1).

The cause is basically eustachian tube dysfunction and nasopharyngeal disproportion. Nasopharyngeal disproportion is due to craniofacial abnormality and adenoid hypertrophy. Disease peak at age of 2 years and 5 years (1,2). OME can be De novo or following an episode of acute otitis media. 20-50% of children between ages 3 - 10 years will have at least one episode of OME. By age of 2 years 40% of children will have OME while at 11 years of age only 1% has it (1,3). 90% OME has spontaneous resolution and most of them by 3 months while rest 10% persist with multiple squeale (1). The incidence of OME in Nepal is not studied much but according to one study it is 1.65% in general Nepalese population (4).

There is growing evidence of correlation between OME and speech, language and cognitive development. Clinically diagnosed cases of Otitis Media with Effusion are investigated with tympanometry and pure tone audiometry. Patients with type B curve planned to have ventilation tube insertion after 3 months if it does not resolve by that time. It is because 50% of cases will resolve in 3 months by its own. Myringotomy with or without Ventilation tube insertion is best modality of management in such persisting OME (5). Fluid or glue if obtained in myringotomy is the gold standard method of diagnosing the condition as well. But in clinically diagnosed cases of OME can have thick or thin fluid on myringotomy or even can have dry tap.

The aim of study is to assess different types of fluid after myringotomy in OME and also to assess the Pre Operative Tympanogram in Patients undergoing Myringotomy. By comparing them this study focuses on accuracy of predicting type of myringotomy fluid by tympanogram.

## METHOD

It is a retrospective longitudinal Study conducted in the department of ENT-Head Neck Surgery, TU Teaching Hospital, Kathmandu, Nepal from 1<sup>st</sup> October 2005 - 30<sup>th</sup> September 2007. All Pediatric patients ( $\leq 12$  years) of either sex who underwent myringotomy with or without VTI during that period in TUTH were included in this study. Patients with inadequate recordings were not included.

Tympanometry (Interacoustic AS, Assens, DIC-5610, and Denmark) and pure tone audiometry (Hughson's and West lake method) was done 1 week prior to surgery planned. Myringotomy was done under General Anaesthesia. Data analyzed using Chi Square test.

## RESULTS

Total no. of ears that underwent myringotomy was 51. Out of which 26 were of male children. Fluid was found during myringotomy in 37 ears while rest had dry tap. Most of the children (56.8%) were in 5-8 years of age (Figure 1, Table 1).

Tympanogram analysis showed B type curve in more than 90 % of ears (Figure 2). Curve on tympanometry were Type A - 3 (5.8%); Type B - 46 (90.2%); Type C - 2 (3.9%). Dry tap rate was 27.6%

Out of 37 ears with fluid on myringotomy 78.37% had thick fluid and all thick fluid cases had B type of curve (Table 2). The result is found to be significant at 5% level of significance using Chi Square test for correlation of B type curve with thick myringotomy fluid.

Average volume and compliance was tabulated in different types of myringotomy fluid. Though low volume and compliance was found in thick fluid it was not statistically significant using Chi Square test (Table 3).

If OME is defined according to presence of Fluid on myringotomy then according to Table 4 we can interpret

**Table 1. Showing age and sex distribution in different tympanogram curves and myringotomy fluid.**

Age group	Total	Male child	Female child	Tympanogram curve			Myringotomy fluid		
				A	B	C	Dry	Thin	Thick
$\leq 4$ years	12	8	4	0	11	1	2	1	9
5-8years	29	16	13	3	26	0	7	6	16
$\geq 9$ years	10	2	8	0	9	1	5	1	4
Total	51	26	25	3	46	2	14	8	29

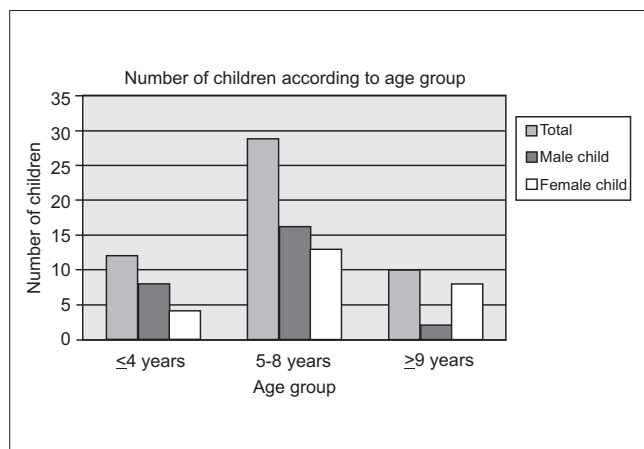


Figure 1. Showing age distribution of study group.

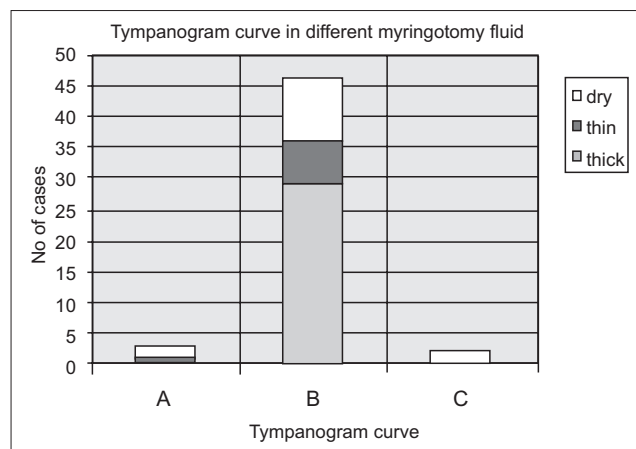


Figure 2. Showing different types of tympanogram curves and correlating with different Myringotomy fluid.

Table 2. Showing different types of tympanogram curves and correlating with different Myringotomy fluid.

Curve	Myringotomy Fluid			Total
	Thick	Thin	Dry	
A	0	1	2	3
B	29	7	10	46
C	0	0	2	2
Total	29	8	14	51

Table 3. Showing average volume and compliance in different myringotomy cases.

Myringotomy fluid	Average Volume (ml)	Average Compliance (ml)
Thick	0.473	0.1006
Thin	0.511	0.0825
Dry	0.577	0.25

Sensitivity of B curve to predict OME: 97.3%. Specificity of B curve to predict Fluid: 28.6%, Positive predictive value: 78.3%, Negative predictive value: 20%.

## DISCUSSION

Though OME is a common clinical entity; extensive study in our setup has not been done regarding its investigation with tympanogram. Our centre is a tertiary care centre and it represents whole population. Study do not represent true prevalence of the disease as study was performed in only hospital attending patients - most of OME are asymptomatic.

Among the dated patients - only 35% turned up for surgical treatment - may be resolved or treated outside.

Tympanogram being an objective test and as it can be done in small children it is a good, reliable and reproducible investigation than pure tone audiogram. OME is diagnosed clinically most of the time and confirmed with tests like tympanogram, and myringotomy. Dry tap rate of 27.6% is similar to other studies (1). (34%) Though sensitivity is high but specificity is low (28.6%) which may be due to dry tap despite having fluid in middle ear cavity (very thick fluid,

Table 4. Comparing B curve with fluid during myringotomy.

Myringotomy result	Tympanogram curve		Total
	B Curve	Non B Curve	
Fluid on Myringotomy	36	1	37
Dry tap	10	4	14
Total	46	5	51

located in dependent areas, Nitrous Oxide action). Various studies have been conducted to correlate different diagnostic modalities.

According to PALMU AND SYRJÄNEN study (6), Sensitivity of the type B tympanogram was 61% and specificity 99% at the sick visit when Pneumatic Otoscopy was used as the reference method for the diagnosis of Otitis media. In SAEED K et al study (7), with tap findings as the standard, sensitivity and positive predictive value of type B tympanogram were 97 and 87%, respectively. This study is similar to our study with good specificity result. HARRIS PK et al study (8) used myringotomy to diagnose and found that the diagnoses provided with pneumatic Otoscopy and tympanometry were both similar, agreeing in diagnosis 80%-100% of the time. In study of OKITSU et al (9) it was demonstrated that the tympanogram pattern depends on

the fluid volume and location, air volume of mastoid cavity, intratympanic pressure and eardrum condition. ORJI AND MGBOR study (10) showed that Simple Otoscopy produced 84.4% agreement with tympanometry in detecting OME. The agreement was better in older children than the younger ones ( $P < 0.05$ ).

Compliance and volume has also been tried to be correlated in SMITH et al study (11). For tympanograms generally, the lower their height and the greater their width, the greater was the probability of associated middle-ear effusion. Among children  $> \text{ or } = 6$  months of age, effusion was diagnosed in only 2.7% of ears with tympanometric height  $> \text{ or } = 0.6$  mL, but in 80.2% of ears with flat tympanograms. But in our study regarding volume and compliance it was not statistically significant.

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## CONCLUSION

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Common type of tympanogram curve in patients with OME is B type, but it doesn't always indicate to have fluid in middle ear. Tympanogram is useful in predicting the nature of the myringotomy fluid.

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