

CORRELATION BETWEEN CLINICO – AUDIOLOGICAL DIAGNOSIS AND INTRAOPERATIVE FINDINGS OF CHRONIC OTITIS MEDIA WITH EFFUSION

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Article Received date: 14 February 2024

Article Revised date: 05 March 2024

Article Accepted date: 25 March 2024



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ABSTRACT

Background: Otitis media with effusion is one of the important problems of the middle ear, which leads to impaired hearing and affects speech, learning and the quality of the child's life, early detection of this condition accelerate its treatment and prevents its complications. **Aim of the study:** To assess the accuracy of Otoscopic examination findings and tympanometry results in the diagnosis of chronic otitis media with effusion. **Patients and Method:** The study included (24) patients, meaning a total of (48) ears, (14) male and (10) females, aged between (5-12) years old who had a history of disease and symptoms indicating the presence of middle ear effusion, during the period from the end of December 2019 to the end of December 2020 at *Martyr Ghazi Al-Hariry* Hospital, department of Otolaryngology Head and Neck surgery. **Results:** Depending on the myringotomy findings, fluid was found in the middle ear in (19) right ear and (16) left ear, and the tympanometry was type (B) in (75%) of the right ear and (79.2%) of the left ear. Tympanometry, high sensitivity and less specificity in detecting effusions, and the presence of effusions was also detected by relying on clinical examination and endoscopy of the eardrum. **Conclusion:** Through this study, it was found that both the clinical and endoscopic ear examination have high sensitivity and less specificity in the detection of effusions and can be relied upon in the diagnosis in the early stages, but in the case of non-response to treatment and the continuation of the pathological complaint, myringotomy is the gold standard method for the final diagnosis.

KEYWORDS: otitis media with effusion, tympanometry and myringotomy.

INTRODUCTION

Otitis Media with Effusion (OME), is an inflammatory condition of the middle ear cleft, acute or chronic, with collection of non-purulent fluid behind an intact TM. It is the most frequent cause of hearing loss in childhood. OME is called chronic when the fluid persists for more than three months or when the episodes recur six or more times in twelve months.^[1]

The prevalence of OME in childhood is age-dependent, with two peaks in the distribution, one centred around 1–2 years of age and the other around 3–7 years of age.

In temperate countries, twice as many children have OME in the winter as in the summer. The increased frequency of upper respiratory infections and close contact with other children during the winter months contribute to this association.

Bilateral OME is more likely to persist than unilateral OME. In primary care, children with bilateral OME and a history of upper respiratory infections are more likely to persist.^[2]

In surgical practice, the fluid is usually characterized by its consistency as being either serous or mucoid. This is obviously a gross simplification of the situation.^[3]

Two hypotheses have been postulated for the pathology of OME, The Inflammatory Hypothesis and Gastro-Esophageal Reflux and Allergy Hypothesis.^[4,5]

DIAGNOSIS is by Taking a history, it is important to confirm a normal pregnancy, delivery and neonatal period and that neonatal hearing screening was performed and reported as normal^[6], otoscopy examination^[6] otomicroscopy and pneumatic otoscopy.^[6]

Tympanometry provides an objective assessment of TM mobility, ET function, and middle ear function by measuring the amount of sound energy reflected back when a small probe is placed in the ear canal.^[7]

A combined otoscopy and tympanometry sensitivity and specificity were calculated for those otoscopy and tympanometry determinations in agreement, revealing both sensitivity and specificity above 90%.^[6] by audiometry the air–bone gap was greater than 30 dB that the dry tap rate reduced to 4% (1 of 27). As OME is a conductive hearing loss, it is associated with a Carhart notch in the bone-conduction thresholds around 2 kHz.^[6]

Tympanocentesis can serve as both a therapeutic procedure and a diagnostic procedure. The therapy consists of the removal of a middle ear effusion (MEE).^[8]

Management can be divided into (1) conservative, (2) medical and (3) surgical management. Conservative management includes risk factors modification and use of valsalva maneuvers, surgical management could be Myringotomy, adenoidectomy, tympanostomy tubes, and even tonsillectomy have been advocated.^[9]

Aims of the Study

To assess the accuracy of otoscopic examination findings and tympanometric results in diagnosis of chronic otitis media with effusion.

Patients and Method

The current study was carried on during the period from December 2019 to the end of December 2020, in Medical City - Martyr Ghazi Al-Hariri Hospital for surgical specialties – ENT Department,

Study design

Case series study involved (24) patients with (49) ears, male patients were (14) and female patients were (10) with clinical and audiometric findings of OME underwent myringotomy during this period.

Subjects

The patients were collected from the outpatient clinic with history of hearing impairment, nasal obstruction, snoring, otalgia and learning disabilities or speech and language delay, with otoscopic finding of O.M.E. that include:

- 1) Retracted tympanic membrane.
- 2) T.M. color, more amber yellow, blue or just transparent.
- 3) Absent or shuttered light reflex.
- 4) Presence of air fluid level or bubbles behind T.M.
- 5) Reduced or immobility of T.M. on pneumatic otoscopy.

The inclusion criteria

1. Patients of pediatric age group (5-12) years of boys and girls.

2. Clinical evidence of OME with Persistence effusion for 3 months and above.
3. Type A, B and C tympanometry.
4. Air bone gab in pure tune audiometry.
5. Bilateral OME.

The exclusion criteria

1. Pure sensory neural hearing loss.
2. Acute otitis media.
3. Contraindications to general anesthesia.

Ethical and committee approval

1. **Permission:** Permission to undertake this study was taken from Medical City - Martyr Ghazi Al-Hariri Hospital for surgical specialties Scientific and Ethics Committee. A letter of protocol approval was obtained prior to the commencement of this study.

2. **Confidentiality:** All collected data had been held strictly by the investigator and no information had been released to any unrelated person. Information to the ENT team had been released only after permission of the family.

3. **Informed consent:** was obtained from the parents after explaining to them the surgical intervention and the study.

Assessment of the Patients

Clinical History

history was taken from the parents include demographic data and history about the chief complain which include hearing impairment , nasal obstruction, otalgia, ear discomfort weather unilateral or bilateral, mouth breathing, snoring, recurrent attacks of upper respiratory tract infection, allergy, and its duration, school performance, language and speech development, in addition to history of previous medical treatment and its duration and any surgical intervention, and family history including similar illness, smoking, socioeconomic status and any hereditary or chronic illness runs in family.

Physical examination

This include complete general examination and ENT examination with full examination of head and neck region for any abnormality or LAP.

Otoscope and Tuning fork

A. Otoscope: of the ear using hand held Otoscope device looking for EAC and TM anatomy, position, change in color, retraction, air fluid level, bubbles behind TM, cone of light, and any other abnormalities.

B. Seigal speculum: to assess the mobility of the T.M.

C. Otoendoscope: using 0 degree 2.7mm Hopkins rod scope for better visualization and more detailed examination of T.M.

D. Tuning fork tests: including Weber and Rinne test were done for primary evaluations of hearing

Pure tune audiometry

PTA was done to patients in the study by audiologist, with frequency range (250 Hz – 8000 Hz) and intensity level (-10 dB – 120 dB) for both air and bone conduction, the degree of hearing loss and air-bone gap was estimated.

Tympanometry

Tympanometry was done for all the patients in the study and recorded as type A (normal compliance) type B (OME) and type C (reduced compliance).

Myringotomy

- Myringotomy done to all patients under general anesthesia.
- Using endoscope or microscope (Zeiss surgical microscope with lens 250).

- With ventilation tube insertion and with or without Adenotonsillectomy.

Statistical Analysis

The data of each patient was documented on a preform, then transferred to a master table of these data and the descriptive statistics were analyzed using Statistical Program for Social Science (SPSS) version 15.0.

RESULTS

Demographic data in all studied patients.

As regard age, the mean age of all studied patients was 9.85 ± 8.3 years with minimum age of 5 years and maximum age of 12 years. As regard sex, there were 14 males and 10 females with male to female ratio (1.4:1).

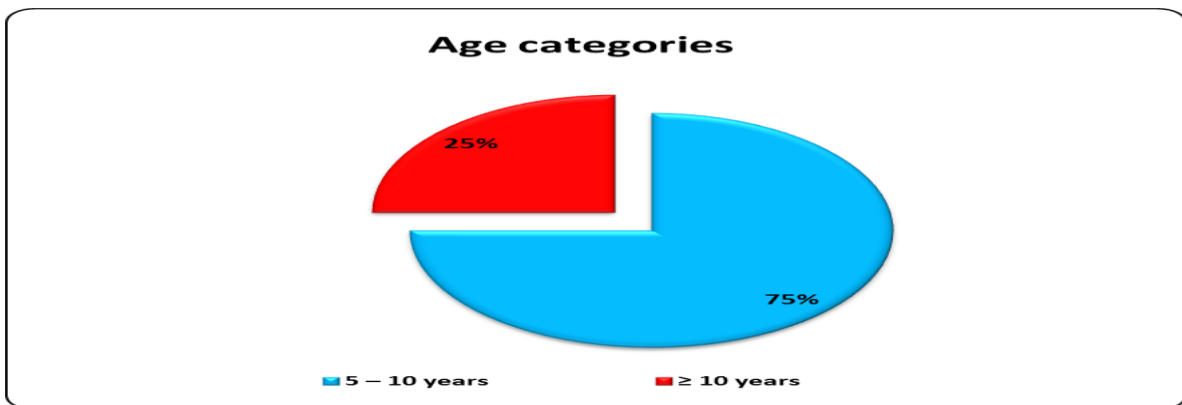


Figure 22: description of age categories in all studied patients.

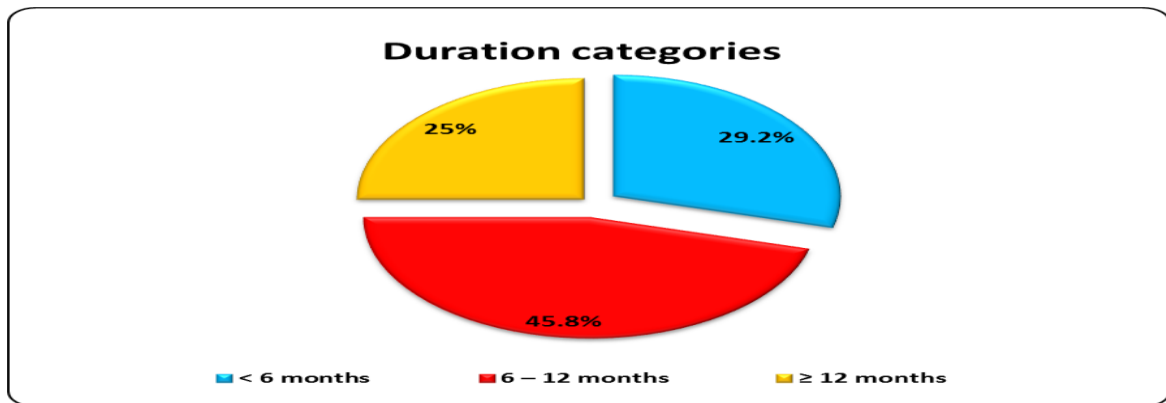


Figure 24: Description of duration categories in all studied patients.

Table 2: Description of complain in all studied patients.

Complain		Studied patients (N = 24)	
Hearing loss	No	9	37.5%
	Yes	15	62.5%
Nasal obstruction	No	12	50%
	Yes	12	50%
Snoring	No	14	58.3%
	Yes	10	41.6%
Otalgia	No	22	91.7%
	Yes	2	8.3%

The most common complaint was hearing loss followed by nasal obstruction and snoring.

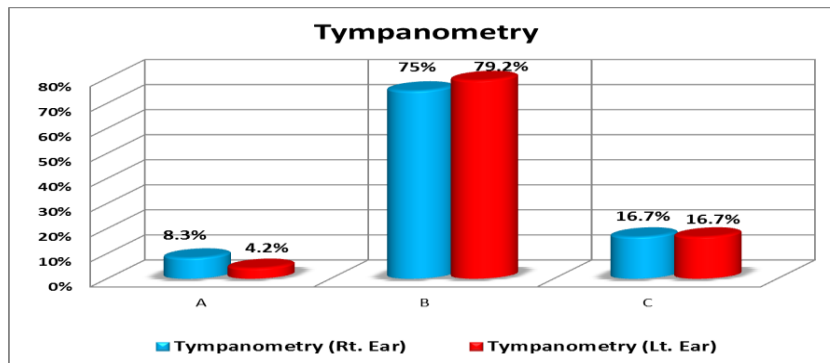


Figure 25: description of tympanometry in all studied patients In Rt. Ear, it was type B in 18 patients (75%) and In Lt. Ear, it was type B in 19 patients (79.2%).

Table 3: Description of intra-operative findings (Myringotomy) in all studied patients.

		Studied patients (N = 24)	
Myringotomy (Rt. Ear)	Dry	5	20.8%
	Fluid	19	79.2%
Myringotomy (Lt. Ear)	Dry	8	33.3%
	Fluid	16	66.7%

This table shows the description of intra-operative findings (Myringotomy) in all studied patients (35) ears out of (48) ears were revealed fluid.

Otoscope examination of right ear in all studied patients. **As regard TM position**, it was retracted in 19 patients. **As regard color**, it was umber in 12 patients. **As regard translucency**, it was dull in 18 patients. **As regard cone of light**, it was shuttered in 18 patients (75%). **As regard mobility**, it was impaired in 16 patients. **As regard air bubbles & fluid level**, it was present in 2 patients and absent in 22 patients.

Otoscope examination of left ear in all studied patients. **TM position**, it was retracted in 12 patients (50%) and pocket in 5 patients (20.8%). **color**, it was umber in 15 patients (33.3%), **As regard translucency**, it was dull in 18 patients (50%). **As regard cone of light**, it was shuttered in 16 patients (66.7%). **As regard mobility**, it was impaired in 13 patients (54.2%). **Air bubbles**, and **fluid level**, presented in only 1 and 2 ear respectively.

DISCUSSION

- O.M.E. is defined as the presence of fluid in the M.E. without signs or symptoms of acute ear infection.^[10]
- If O.M.E. has continued in both ears for 3 months or even longer, resolution is unlikely: only 20% of these resolve within 3 months, 25% after 6 months and 30% after a one year of observation.^[11]

Age and gender

In this study the most frequently reported age group (75%) was 5-10 years old and this agreed with other studies locally prospective study, Khmmas *et al* which reported that most of cases (63%) were 5-8 years of age^[12] and other global study by, Rishi and Praksab^[13] also

reported that 56.8% of patients were with in age group 5-9 years old.

Also in this study male gender (58.3%) was more predominant than female (41.7%) with ratio of (1.4:1) and this agreed with other studies as Khmmas *et al* in which (53%) were male patients^[12]. Dong-Hee L and Sang-Won Y, that shown (33) males and (18) females^[14].

But other studies Ahmad *et al*, study which shown that (54.4%) of children were males and (45.6%) were females^[15]. and show no marked sex predominance. It must be concluded that there is likely to be little difference, if any, in the background risk for boys compared to girls.^[6]

Presenting complains

the most common presenting complains was hearing impairments (62.5%) noticed by the parents or teacher and this agreed with many study as Khmmas *et al* show (90%) hearing impairments^[12]. and Ahmed *et al*, show (47.2%) present with hearing impairments^[15].

While syed *et al* study shows that the most common presentation was fullness in the ear (50.3%).^[16]

Also nasal obstruction, snoring and Otagia are reported presenting complains in less frequency and these agreed with other studies.^{[12] [15]}

Tympanic membrane examination

clinically, retracted TM seen in (79.2%) of Rt ear and (50%) of Lt ear and this agreed with Khmmas *et al*^[12], Ahmad *et al*^[15] and Orji, FT and Mgbor NC study which showed that it was the most specific otologic finding in detection of OME^[17], dull TM present in (75%) in Rt ear and (75%) in Lt ear with shuttered cone of light in(75 %)

in Rt ear and (66.7%) in Lt ear, the color was umber in (50%) RT ear and (62.5 %) of Lt Ear, pale gray in (41.7%) RT ear and (33.3%) of Lt Ear, and blue only in (8.3%) Rt ear and (4.2%) of Lt ear, so in this study the color of the TM has less diagnostic accuracy and this agreed with study^[12] with air fluid level in (8.3%) in Rt ear and same for Lt ear (8.3%) and air bubbles in (8.3%) and (4.2%) Rt and Lt ear respectively, so the most common otoscopic findings were dull, retracted TM, and this agreed with study Karan Sharma *et al*^[18] in which dull and retracted TM account of (74%), the mobility of TM by pneumatic Otolaryngoscope was (66.7%) and (54.2%) RT and Lt Ear respectively and this also agreed with study by Khmmas *et al*^[18] and Hamed MM, Hani MB, Mazin NF, *et al*^[19] and indicate that mobility of TM is affected by many factors like amount of fluid in middle ear.

Type of Tympanometry

Current study reported type B tympanogram in (75%) and (79.2%) in Rt and Lt ear respectively while type C was (16.7%) in both Rt and Lt ear and type A only in (8.3%) and (4.2%) in Rt and Lt ear respectively and this agreed with study locally, the frequency of Type A: 22.9%, Type B: 61.9% and Type C: 15.2% in Mosul^[20] and other study in Asia included 51 children with OME revealed the presence of B Type curve in more than 90% of ears, while Type A (5.8%) and Type C (3.9%).^[21]

Unusual frequencies were reported in a retrospective study in Turkish in which Eyigor *et al.*^[22] investigated 400 children who had been undergone myringotomy. The frequency of Type A, B and C tympanometry traces in those children was found to be 9%, 13.6% and 75.5% respectively, from all these it seems that tympanometry findings in children are variable with age, cooperation, anatomical variations and duration of OME.

Validity of TM examination in the diagnosis of chronic otitis media with effusion depending on myringotomy findings as a gold standard

Estimation of validity depending on Sensitivity, Specificity, PPV, NPP, and Accuracy of the examination in relation to:

Myringotomy (presence of fluid) as a gold standard

TM examination show the following measures range of all ears respectively:

TM position(retracted) showed sensitivity (94.2%), specificity (47.5%), PPV(85%), NPV(67.8%), Accuracy(83.4%) so position of TM is highly sensitive but less specific and this is agreed with study^{[18][19]}.

Translucency(Dull TM) show sensitivity(71.5%), specificity(65.7%), Accuracy(70.8%), so dullness and loss of translucency of TM suggest OME and this agree with study Hamed *et al*^[19] that shown sensitivity(82%), specificity(52%), and Accuracy(71%).

Shuttered cone of light showed result was comparable to Khmmas *et al*^[12] and Hamed *et al*^[19] which reported that

absence or shuttered cone of light is of less important significance because this may be due to change in slope of TM or variations in EAC.^[23]

TM mobility using pneumatic Otolaryngoscope(impaired mobility) showed sensitivity (78.3%), specificity(35%), and Accuracy(45.4%), and this agree with study.^{[12][19]}

Validity of Tympanometry

in current study, sensitivity, specificity, PPV, NPP and accuracy of type B tympanometry was 97.3%,16.2%,75.7%,75%,75% respectively, this study show that type B tympanometry is highly sensitive tool for diagnosis of chronic otitis media with effusion and this agree with Talib DK, Al-Chalabi YI^[24] who found that type B tympanometry is sensitive and reliable tool for diagnosis of OME.

By using X2: Chi-square test P value was 0.115 when comparing type B tympanometry with myringotomy findingsm this mean there is no statistical significant difference between tympanometry and myringotomy results.

CONCLUSION

- ✓ The clinical diagnosis of OME depending on Otolaryngoscopic looking of dull and retracted TM with impaired mobility on pneumatic otoscope have high sensitivity and intermediate accuracy in diagnosis of OME.
- ✓ Myringotomy is the gold standard diagnostic tool.

Recommendations

- ✓ Relay on tympanic membrane findings specially TM position and tympanometry in diagnosis of OME.

Prefer myringotomy as a diagnostic tool even in the presence of normal tympanic membrane.

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