

Department of Paediatrics Otolaryngology, Phoniatriy and Audiology  
Medical University of Lublin

GRAŻYNA NIEDZIELSKA, EMILIA KĄTSKA

*TEOAE after treatment of otitis media with effusion*

Otoacoustic emission (OAE) consists in registering generated sounds in the inner ear and their emission outside. A significant aspect of otoacoustic emission is the fact that the information about cochlea mechanics is obtained with objective and non-invasive test. In transient otoacoustic emission (TEOAE) we deal with double signal transmission through the middle ear. This means that the sounds coming into the cochlea and that are retransmitted are highly dependent on the transmission functions of the middle ear.

Otitis media with effusion is a very common childhood disease. Pathological changes result from the Eustachian tube dysfunction, which causes negative pressure and formation of transudate and leads to metaplasia of the cubical epithelium into the ciliary epithelium with beaker cells. The result of these changes is production of thick mucus (glue) in the middle ear cavity causing transmission disorders of the sounds.

The aim of the study was the evaluation of conductive function of the middle ear after the surgical operation of the otitis media with effusion.

MATERIAL AND METHODS

Thirty children with secretory otitis media aged 4-12 were qualified for the study. In 28 children otitis media with effusion was accompanied with adenoid hypertrophy. Otoloscopic tests confirmed pink or amber colour of the tympanic membrane with the level of the fluid. Audiometric tests included pure tone, impedance audiometry and otoacoustic emission before and after operation. TEOAE was carried out in a quiet room with application of ILO 88 DP of "Otodynamic". In TEOAE tests, non-linear click stimulus lasting for 80 $\mu$ s and intensity 84 dB SPL in outer ear canal was used. The intensity was measured from 500-5000 Hz for 20 ms after stimulus. The stimulus was considered to exist when its intensity was at least 3 dB higher than the noise threshold.

The children were qualified for myringotomy or myringotomy and adenoidectomy. Consecutive audiological tests were performed during the first 24 hours after the operation.

## RESULTS

Thirty children aged 4-12 (58 ears) with middle ear effusion and adenoid hypertrophy were studied. In 58 ears abnormal tympanic membrane, hearing loss > 20dB, type B in impedance audiometry and the absence of TEOAE were confirmed.

Twenty-eight adenoidectomy with myringotomy and 2 myringotomy were performed. The character of effusion was assessed by the surgeon's visual inspection as: serous (3), mucous (47) and glue (8).

During the first day after the operation pure tone audiometry and TEOAE were evaluated. In 56 ears normalisation of pure tone audiometry was noticed. However, TEOAE was observed in 46 ears. In 6 ears with thick mucous and in 6 with mucous normalisation of TEOAE was not observed. In 20 ears low frequency responses were confirmed. The absence of TEOAE responses was observed in a proportionally bigger number of ears with glue effusion.

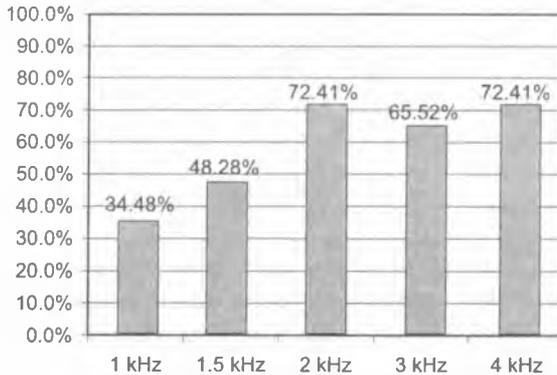


Fig. 1. Percentage of ears with positive responses in TEOAE tests

TEOAE reappeared quicker with frequencies above 2000 Hz. No correlation was confirmed between TEOAE and the kind of operation.

## DISCUSSION

In the studies of Reroń - TEOAE may be observed in 80-90% of the hearing ears. This kind of OAE may be reduced or cancelled if the threshold values are >30 dB HL,

i.e. in the cases of conductive hearing loss, after the acoustic trauma, ischaemia and ototoxicity drugs (2).

Amedee found that the type of effusion present in the middle ear affects the presence or absence of measurable TEOAE. No patient who was found to have mucous fluid at the time of surgery had measurable preoperative TEOAE (1).

Topolska's studies imply that the presence of effusion decreases the amplitude in the whole range of frequencies of DPOAE (4).

Rogowski confirmed the presence of TEOAE in Eustachian tube dysfunction in 28% of cases and in the ears with effusion in the tympanic cavity – only in 10% of cases (3).

Only children without TEOAE were qualified for our studies. After the treatment TEOAE was observed in 79% ears. The results of the study indicate that the applied treatment was effective.

## CONCLUSIONS

1. Myringotomy is the effective method of treatment that was proved by the TEOAE reappearance.
2. TEOAE reappeared quicker with frequencies above 2000 Hz.
3. We did not observe any correlation between TEOAE and the kind of operation.

## REFERENCES

1. Amedee R. G.: The effects of chronic otitis media with effusion on the measurement of transiently evoked otoacoustic emission. *Laryngoscope*, 105, 589, 1995.
2. Reroń E. et al.: Otoakustyczne emisje ślimakowe TEOAE u dzieci z dysfunkcją trąbki słuchowej. *Otolaryng. Pol.*, L, Suppl., 22, 220, 1997.
3. Rogowski M.: Wywołane otoakustyczne emisje (TEOAE) u dzieci z zaburzeniami czynności trąbki słuchowej. *Otolaryng. Pol.*, 49, 3, 238, 1995.
4. Topolska M. M. et al.: The effects of chronic otitis media with effusion on the measurement of distortion products of otoacoustic emissions: presurgical and postsurgical examination. *Clin. Otolaryng.*, 25, 315, 2000.

## SUMMARY

Otoacoustic emission is a noninvasive method of testing inner ear function. OAE is susceptible to the influence of many different factors of which the principal ones are the changes taking place in the middle ear. In transiently evoked otoacoustic emission (TEOAE) we deal with double signal transmission through the middle ear. This means that the sound reaching the cochlea depends on the function of middle ear. In the case of secretion into the tympanic cavity, suppression of the high-frequency otoemission components results from the effect of the mass increasing in the middle ear. The purpose of the study was the evaluation of otoemission in children treated with adenotomy and myringotomy due to MEE. The OAE value was estimated during the first 24 hours post surgery. The results of OAE study were compared with the clinical data, the level of hearing loss and the type of middle ear secretion. The study confirmed the presence of OAE in the majority of the cases. The results of the study indicate the applied treatment was effective.

Otoemisja akustyczna (TEOAE) po leczeniu efuzją wysiękowego zapalenia  
ucha środkowego

Otoemisja akustyczna jest nieinwazyjną metodą badawczą, która pośrednio daje odpowiedź o stanie ucha środkowego. Otoemisja wywołana trzaskiem (TEOAE) jest rejestrowana jako odpowiedź z komórek słuchowych zewnętrznych po dwukrotnym przejściu sygnału przez ucho środkowe. Odpowiedź zależna jest od stanu ucha środkowego. W przypadkach wysiękowego zapalenia uszu przeszkoda płynowa uniemożliwia rejestrację sygnału. Celem pracy była ocena stanu ucha środkowego po paracentezie i adenotomii przy użyciu TEOAE. Badania były przeprowadzane przed i w pierwszej dobie po zabiegach. Wyniki TEOAE były korelowane z danymi klinicznymi, poziomem niedosłuchu i rodzajem wysięku w uchu środkowym. Powrót do wartości prawidłowych zapisu TEOAE po wykonanej paracentezie wskazuje na efektywność przeprowadzonego leczenia.