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Impedance Audiometry in Newborns of Abnormal Deliveries

Audiometria impedancyjna u noworodków z porodów nieprawidłowych

Various methods have been used to evaluate hearing of neonats like behavioural responses (2), impedance audiometry (1, 5, 6) and electric response audiometry (5). Impedance audiometry measurements we had performed earlier in newborns of normal deliveries showed that about 95% of the ears in the first week of life had normal tympanograms (3). However, stapedia reflex was elicited in 5% of the ears only, when a low frequency tone probe was used (4).

The aim of the studies was the assessment of the middle ear system in full-term newborns of abnormal deliveries.

MATERIAL AND METHODS

The studies were carried out on 28 ears of 18 infants of complicated deliveries (amniotitis, cloudy amniotic fluid) and on 18 ears of 13 newborns delivered of cesarean sections. The measurements were performed on the first, the third and the fifth day of life, without sedation, about an hour after a meal, using Madson ZO70 electroacoustic bridge with a low frequency tone probe. Before the measurement otoscopy was carried out and the external ear canal was cleaned of amniotic fluid and debris when necessary.

Tympanograms were plotted manually by recording compliance values in cubic centimeters across the pressure range from +200 to -200 mm of water including the point of maximum compliance. Stapedial reflex was elicited with contralateral stimulation for pure tones of 95 dB at 0.5, 1, 2 and 4 kHz. In some ears the impedance measurements could not be obtained.

RESULTS

The incidence of various shapes of tympanograms in the newborns of complicated deliveries is shown in Table 1. On the first day of life 2 double peak, 2 flat and 12 (75%) normal tympanograms were found in 16 ears examined. On the third day 1 double peak, 4 flat and 23 normal tympanograms were encountered and on the fifth day of life all 14 tympanograms were normal. In the newborns delivered of cesarean sections all tympanograms were normal except for 2 of 18 ears that had a flat tympanogram on the third day of life.

Table 1. Types of tympanogram in the newborns of complicated deliveries

Day of life	Tympanogram			Total
	normal	double peak	flat	
1	12	2	2	16
3	23	1	4	28
5	14	0	0	14

The middle ear pressure in the newborns of cesarean sections ranged from +80 to -80 mm of water. The percentage distribution of the ears with positive, equal and negative pressure is shown in Figure 1. There was no ear with negative pressure on the first day of life. Within 5 days the pressure turned from positive to negative values and the difference between the first and the fifth day was significant ($p < 0.05$).

The middle ear pressure in the newborns with labour complications ranged from +60 to -100 mm of water. The percentage distribution of the ears with positive, equal and negative pressure is shown in Figure 2. There was a tendency to turn from positive to negative pressure like in newborns of normal deliveries, but it was not significant.

In Table 2 the average compliance values in the newborns of various types of deliveries are presented. In the newborns of normal and complicated deliveries

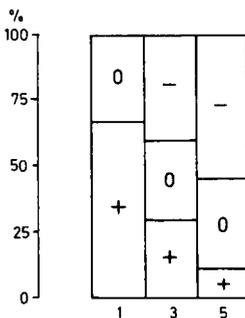


Figure 1

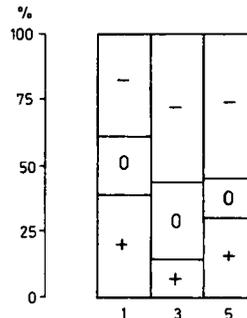


Figure 2

the average compliance gradually increased from the first to the fifth day of life and the difference was significant. The compliance values in the newborns of cesarean section on the first, the third and the fifth day did not differ significantly.

Stapedial reflex measurements in the infants of complicated deliveries are shown in Table 3. None of 18 ears had stapedial reflex on the first day of life. On the third day the reflex was elicited in 3 (10.7%) of 28 ears and on the fifth day — in 4 of 22 ears. In the newborns of cesarean section the reflex was found in one of 18 ears. When we look at the reflex incidence in the whole group, we can see that the reflex was easier to elicit on the fifth than on the first day of life and easier at low than at high frequency.

Table 2. Middle ear compliance (cm)

Type of delivery \ Day of life	1	3	5
Normal (3)	0.74	0.82	0.89
Complicated	0.58	0.81	0.95
Cesarean section	0.71	0.69	0.60

Brackets show a significant difference.

Table 3. Stapedial reflex in the newborns of complicated deliveries

Day of life	Number of ears	Frequency (kHz)			
		0.5	1	2	4
1	18	0	0	0	0
3	28	3	3	0	0
5	22	4	4	1	0

DISCUSSION

The average middle ear pressure, compliance and stapedial reflex incidence in the newborns of complicated deliveries did not differ significantly from those of normal deliveries reported elsewhere (3).

In the newborns of cesarean sections the impedance measurements in the first week of life showed some differences when comparing to other infants. The average compliance values on the first, the third and the fifth day of life were nearly the same, whereas in the newborns of normal and complicated deliveries the compliance significantly increased from the first to the fifth day of life. The middle ear pressure in the newborns of cesarean sections was getting more

negative within the first week of life like in other infants, however, there were no negative values on the first day in this group.

In the infants of complicated deliveries and those of cesarean sections the number of ears with present stapedial reflex was small despite the fact that majority of the ears had normal tympanograms. Similar situation was found in the newborns of normal labours (3). The reason for this was thought to be incomplete maturity of the reflex arch in the central nervous system. However, some investigations showed that one can elicit the stapedial reflex in newborns using a probe with higher tone frequencies, i.e. 800—1200 Hz (1).

The studies showed that in the first week of life the middle ear system of newborns of complicated deliveries did not differ significantly from those of normal labours. However, in the infants of cesarean sections there were some alterations related to the middle ear pressure and compliance.

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STRESZCZENIE

Audiometrię impedancyjną wykonano u 18 noworodków z porodów powikłanych i u 13 noworodków urodzonych drogą cięcia cesarskiego. Badania wykazały, że system ucha środkowego w pierwszym tygodniu życia noworodków z porodów powikłanych nie różnił się istotnie od systemu ucha środkowego noworodków z porodów prawidłowych. U noworodków urodzonych drogą cięcia cesarskiego stwierdzono zmiany ciśnienia ucha środkowego i podatności błony bębenkowej.