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The Protective Effect of Niamid on Hearing in Patients Treated with Large Doses of Streptomycin

Ochronny wpływ niamidu na stan słuchu u chorych
leczonych dużymi dawkami streptomycyny

Предохранительное влияние ниамида на слух больных, леченных большими дозами
стрептомицина

The purpose of these studies was to evaluate the effect of Niamid (produced by Pfizer) on hearing in patients treated with streptomycin for scleroma of the respiratory tract. For this disease, streptomycin is still used in treatment of choice, which has been checked in large groups of patients. The studies were carried out in a group of 12 subjects, between the ages of 20 and 56, the average age was 42. They were treated with streptomycin sulphate (STM), because of scleroma, according to the method of Durska-Zakrzewska (1). While being treated with STM, they were simultaneously given Niamid at the dosage of 50—75 mg daily, over an average period of 4 months. The therapeutic dose of STM with these patients was 120—140 g for a single cure and was on the average, 125 g over the period of 17—18 weeks of treatment. The control group, which did not receive Niamid, consisted of 25 persons over the age of 19—61; the average age was 44 years. They were also treated with STM, because of scleroma, by the Poznań method. The therapeutic STM dose was 110—150 g and was on the average, 130 g over the treatment period of 17—19 weeks. For the studies carried out in both groups, only those patients were qualified, before starting the STM treatment, in which no deviations from the norm in the cochlear and vestibular function were

found. Patients with scleromatc lesions in the nasopharynx were also excluded from the studies.

In both groups, detailed audiological examinations of the hearing and vestibular organs were carried out before, during and after the STM treatment (every 7 days). The general condition of the patients was also controlled. In all patients examined, the anamnesis of tinnitus-intensity was estimated (in those who reported it), as well as the appearance and intensity of such symptoms as vertigo, headache, abnormal sensations and vision impairment. On evaluating the air conduction hearing for pure tones, the authors calculated average hearing losses for both ears (in dB) for the frequencies of 500, 1000, 2000, 4000, 6000 and 8000 Hz. Upon analysis of audiometric investigation results in both groups studied, physiological losses of hearing at frequencies calculated according to the standards given by Portmann were taken into consideration. The results obtained were analyzed statistically. The mean values for the hearing loss expressed in dB in both groups are shown in Fig. 1. The results of numerical comparison and basic statistical characteristics are shown in Table 1.

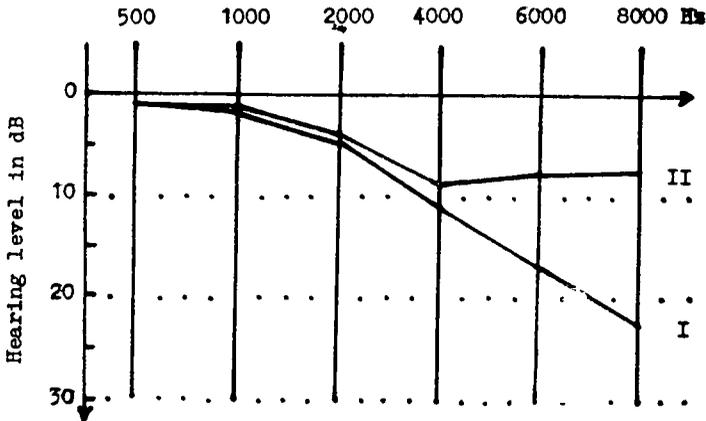


Fig. 1. The average hearing loss for both ears in the group of patients treated with streptomycin only (I) and in the group receiving streptomycin and niamid (II)

In the group of patients treated exclusively with STM, statistically significant hearing loss at the frequencies of 2000, 4000, 6000 and 8000 Hz were found, whereby the loss of hearing increased with the rise of the frequency. On immediate evaluation after treatment with STM, no negative effect of this antibiotic at the frequencies of 500 and 1000 Hz was found in the doses used in this group of patients. In the group of patients treated with STM and simultaneous administration of Niamid, statistically significant loss was found only at the frequency of 6000 Hz.

Table 1. Average hearing loss at given frequencies in the group of patients treated with streptomycin only and in the group receiving streptomycin and niamid

Frequency (Hz)	Control group — receiving STM only (25 patients)			Experimental group — receiving STM and niamid (12 patients)			Effect of niamid	
	Hearing loss (dB)	Standard error	Probability P	Hearing loss (dB)	Standard error	Probability P	Function t	Probability P
500	1,0	0,64	< 0,2	1,0	1,05	< 0,4	0	—
1000	1,5	0,95	< 0,2	1,0	1,20	< 0,5	0,32	< 0,8
2000	4,5	1,95	< 0,05	4,0	2,00	< 0,1	< 0,9	0,17
4000	11,0	3,68	< 0,01	9,0	4,22	< 0,1	0,31	< 0,8
6000	17,0	4,86	< 0,01	8,0	3,40	< 0,05	0,50	< 0,2
8000	22,5	5,03	< 0,001	7,5	4,50	< 0,2	2,22	< 0,05

The hearing loss at frequencies 2000, 4000, and 8000 Hz was not significant. As in the former group no changes were found at the frequencies of 500 and 1000 Hz.

Though in both groups examined hearing losses in the higher tone-range appeared almost equally frequent, both during treatment with STM and Niamid (in 5 patients — 41,6%), and in the control group (in 9 patients — 37,5%), differences in the values of losses were found. In the group of patients receiving streptomycin and Niamid, a significant decrease in the hearing loss at the frequency of 8000 Hz was observed, in comparison with control group. However, the more than twofold decrease in the loss of hearing at the frequency of 6000 Hz, found in the group treated with Niamid, was not significant in relation to the control group. At other frequencies examined, the differences between both groups in losses found were slight.

Although a detailed analysis of the hearing of the patients treated for scleroma with large STM doses is not the subject of this paper — as both groups studied were properly selected in order to carry out a clinical experiment — it should be noticed that the degree of poststreptomycinal hearing-damage was low in our patients, and it most frequently spared the so called „life area”; only in a few cases did the patients report difficulties in communicating. It should also be indicated, as have other authors, that the improved hearing often observed in subjects treated for scleroma with STM is connected with the improvement of conduction. This was originally handicapped by a specific process, or by accompanying changes located in the nasopharyngeal cavity and pharyngotympanic tube. The authors also observed that after some time the caloric excitability returned in patients in whom it decreased, or even expired, during treatment with STM.

The mechanism and site of the ototoxic action of streptomycin was, and still is, the object of many studies. Some authors think that STM brings about lesions of the centres of cochlear and vestibular system at the stem of the brain and cerebellum (4, 9). A majority of the data, however — particularly from recent years — support the opinion that the the original site of the toxic effect of this antibiotic is in a peripheral organ, and that the changes in cerebral centres occur secondarily and require a larger dose of STM (3, 6, 8). STM was also found to bring about some metabolic disorders in the cochlea, such as changes in enzyme activity and decrease in coenzyme A content (2, 5).

Niamid is a potent monoamineoxidase inhibitor (7). One of the active amines which accumulates in the organism as a consequence of the blocking of monoamineoxidase with Niamid is adrenaline. It has a manysi-

ded metabolic action. This action, particularly the activation of anaerobic glycolysis, can provide a sufficient amount of energy in sensory cells damaged by streptomycin to prevent their degeneration and the loss of their functions. In the clinical experiment carried out, Niamid was found to have a positive effect on the peripheral organ of hearing in patients treated for scleroma by the use of large doses of streptomycin:

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STRESZCZENIE

Przeprowadzono badania kliniczne nad wpływem niamidu na stan słuchu u chorych poddanych kuracji streptomycynowej z powodu twardzieli. W obu badanych grupach, leczonych streptomycyną (STM) w zakresie dawek 110—150 g, u około 40% obserwowanych chorych stwierdzono cechy poststreptomycynowego uszkodzenia słuchu. W grupie chorych otrzymujących niamid w czasie kuracji STM, obserwowany ubytek słuchu w częstotliwościach 6000 i 8000 Hz był wyraźnie mniejszy niż w grupie kontrolnej nie otrzymującej niamidu.

OPIS RYCINY

Ryc. 1. Średnie wartości ubytków słuchu obliczone dla obu uszu łącznie w obu grupach badanych. I — grupa leczona tylko streptomycyną, II — grupa leczona streptomycyną i przyjmująca niamid.

OPIS TABELI

Tab. 1. Średnie ubytki słuchu w poszczególnych częstotliwościach w grupie chorych leczonych tylko streptomycyną oraz w grupie otrzymującej streptomycynę i niamid.

РЕЗЮМЕ

Авторы провели клинические исследования над влиянием ниамида на слух больных склерозом, леченных большими дозами стрептомицина. В обеих исследованных группах, получавших по 110—150 граммов стрептомицина, почти у 40% больных констатировались признаки постстрептомицинового повреждения слуха. В группе больных, получавших во время лечения стрептомицином ниамид, дефект слуха в частотах 6000 и 8000 гц был отчетливо меньшим по сравнению с контрольной группой, не получавшей ниамида.