Dietary Management for Tinnitus Control in Patients with Hyperinsulinemia—A Retrospective Study

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ABSTRACT

A retrospective study in 205 patients with a chief complaint of tinnitus and associated hyperinsulinemia/euglycemia is presented. Dietary control if umpaired insulin metabolism has resulted in a significant degree of tinnitus control. The methods and research are reported.

INTRODUCTION

Tinnitus is one of the leading complaints of the patients with cochleovestibular disorders and may result from many different etiologies. The importance of metabolic imbalances as etiologic agents of tinnitus, hearing loss, and dizziness has been recognized for a long time. Among the metabolic imbalances, hyperinsulinemia is a highly prevalent etiology for cochleovestibular disorders.[1-10]

The goal of this retrospective is to present the results of dietary control and modifications of eating habits in the management of tinnitus and associated symptoms in cases exclusively related to hyperinsulinism/euglycemia status. Clinical studies have independently identified and indicated that hyperinsulinemia is the major diagnostic factor in most of the cases of "idiopathic" vertigo, tinnitus, and hearing loss.[1,3,7,8] The correlation of hyperinsulinemia and migraine, with or without, cochleovestibular symptoms was also reported. Medical nutritional therapy resulted in significant improvement (or even a cure) in patients with dizziness, sensorineural hearing loss, tinnitus, headache, and nausea.[1-5,8,9]

Many of these patients have clinical histories and/or clinical findings

(1) sensation of floating, or of walking on a floor of rubber foam
(2) long periods of unsteadiness, with or without episodes of recurring true vertigo
(3) flat hearing loss, or inverted-U shaped audiograms
(4) abnormal electrocochleographic patterns suggesting endolymphatic hydrops
(5) hyper-reflexia of vestibular responses in per-rotatory and/or caloric tests in absence of signs of central vestibular involvement
(6) patients with cochlear and/or vestibular symptoms and with a familiar history of diabetes mellitus
(7) migraine with attendent cochleovestibular symptoms [4,8,9]

METHOD: PATIENT SELECTION

Material Study

This material consists of nonanalyzed data from our previous study which included 1,128 neuro-otologic patients with impaired carbo-hydrate/insulin metabolism. Patients who experienced exposure to noise as well as those displaying another underlying organic pathology were not included.

This retrospective study comprises 205 out-patients with a chief complaint of tinnitus and a hyperinsulinemia/euglycemia status confirmed by means of a 5-hour glucose/insulin tolerance test. The blood samples were collected during fasting, and 30, 60, 90, 120, 180, 240, and 300 minutes following intake of 75 g of glucose dissolved in water.

The tinnitus patients presented curves of Kraft types II (56.1%), IIIA (39.0%), IIIB (4.4%), or IV (0.5%). Hypoglycemia (glucose blood levels below 55 mm/dL) and insulinopenia (Kraft type V insulin curve) were not seen in these patients.

No other abnormalities were found in a battery of tests which included serum cholesterol, serum triglycerides, and electrophoretic evaluation of the lipoprotein fractions with quantification by densitometry.

All patients also presented dizziness as a secondary complaint. Hypoacusia (23.9%), fullness in the ear (5.4%), and nausea (3.9%)

were the other symptoms found in the clinical history. The average age of these patients was 51.2 years; 109 were men and 96 women. In 153 patients (74.6%), the tinnitus was bilateral and in 52 patients (25.4%) it was unilateral. The average duration of tinnitus was 1.4 years before the initial visit. All patients reported the ear as the location of the tinnitus. The duration of tinnitus was constant (72.7%) or intermittent (32.3%); it was considered to be steady (59.5%) or fluctuant (50.5%). The patients reputed the tinnitus intensity as mild (39.5%), moderate (39.0%), or severe (21.5%).

These tinnitus patients were subject to a neuro-otologic evaluation including pure tone audiogram, speech discrimination, impedance audiometry, evoked response audiometry (auditory brain stem response testing), and computerized nystagmography before therapy. Inverted-U shaped audiograms (10.7%), flat hearing loss (6.8%), or high-frequency hearing loss (6.8%) were found in the cochlear evaluation. Sensorineural hearing loss (24.3%), averaging 45 dB at the frequencies affected, and the peripheral changes shown by the auditory brain stem response testing were suggestive of a peripheral site of lesion for the tinnitus patients with hypoacusia. Normal hearing was found in the cochlear evaluation of 75.7% of the tinnitus patients with hyperinsulinemia.

Electronystagmography revealed hyperreflexia of vestibular responses in per-rotatory and/or caloric tests in absence of signs of central vestibular involvement (19.5%), directional preponderance in the caloric tests (19.5%), or reduced vestibular responses (15.6%). No vestibular abnormalities were found in 45.4% of tinnitus patients. The diagnosis of a peripheral vestibular disorder was established for all patients with abnormal vestibular findings (54.6%) in the neuro-otologic examination.

All tinnitus patients with sensorineural hearing loss displayed abnormal vestibular findings. Normal cochleovestibular evaluation was observed in 45.4% of the tinnitus patients.

According to the clinical history and the cochleovestibular evaluation,[16] our patients displayed a presumed peripheral type auditory (cochlear and/or vestibular) tinnitus. Of special significance in this study of 205 tinnitus patients with hyperinsulinemia was the noteworthy prevalence of a familiar history of diabetes mellitus (39.0%), migraine (31.7%), or both diseases (19.0%).

The dietary therapy consisted of a high-protein low-sugar diet, and restricted cholesterol intake. The instructions shown in Table I were prescribed for the patient's entire life. Tinnitus patients were closely followed for 6 months. The use of medications for this condition was prohibited.

Table I.

Have a nourishing breakfast, light lunch, and an even lighter dinner.
Do not go longer than 3 hours without a snack during the day.
Do not use refined sugar. Use sweeteners if necessary.
Pasta, pastry, and fatty foods should be limited to small amounts.
Drink 4 to 6 glasses of water a day.
Quit smoking; if impossible, do not smoke more than 10 cigarettes a day.
Eat slowly and chew food well.
Do not drink more than 2 cups of coffee a day.
Diminish intake of alcoholic beverages.
Avoid excess rest. Practice sports and/or aerobic exercises on a regular basis.

The main evaluation criteria were the patient's judgment and the physician's opinion on treatment efficacy. For the majority of patients, the subjective symptoms were more important in the analysis of the results than the audiologic or vestibular objective changes.

The clinical symptoms were recorded using the same protocol for all the cases. The symptoms were graded as: (1) not present, (2) slight, (3) medium, and (4) severe.

At the end of the therapy, audiologic and vestibular tests were repeated and a record was made of the patient's symptoms.

RESULTS OF DIET TREATMENT

Table II shows the intensity of subjective tinnitus before, and after 6 months of dietary control. The results demonstrate the positive effect of the diet treatment on the intensity of tinnitus, causing an alleviation or disappearance of this symptoms.

Table II.
Subjective self-rating of 205 neurootologic patients concerning tinnitus intensity before, and after 6 months of dietary management

Tinnitus	Before diet n	Before diet %	After diet n	After diet %
Not present	0	0.0	44	21.5
Slight	16	7.8	110	53.6
Medium	165	80.5	36	17.6
Severe	24	11.7	15	7.3
Total	205	100.0	205	100.0

Table III presents the subjective self-rating scores after 6 months of diet treatment. The favourable effect of the dietary control was observed in 79.6% of the sample, indicating that dietary management is an effective treatment for tinnitus control in patients with hyperinsulinemia/euglycemia status.

Table III.
Subjective self-rating of 205 neurootologic patients concerning the results of the 6 months' dietary management of tinnitus

Subjective self-rating of follow-up	n	%
Total remission	44	21.5
Much improved	101	49.3
Slightly improved	18	8.8
Unchanged	40	19.5
Slightly worse	2	0.9
Total	205	100.0

True vertigo or other kinds of dizziness were present in all cases before the use of the nutritional therapy. After the treatment, it was verified that dizziness improved or disappeared in 83.4% of the cases.

The subjective improvement of hypoacusia occurred in 24.5% of the tinnitus patients. After diet treatment, 18.0% had their audiogram normalized, 42.0% improved in some frequencies, and 40.0% had their audiogram unchanged.

DISCUSSION

Hyperinsulinemia as a cause of cochleovestibular disorders is very frequent and can be easily diagnosed and treated. Careful neurotologic evaluation is necessary for an adequate diagnosis. The confirmation in the laboratory is made by the standard 5-hour glucose/insulin tolerance test, which provides a definitive determination of the glucose and insulin status. It was stated that the blood glucose levels alone had little value for the early detection of carbohydrate metabolism disturbances.[2-6,9,10]

Hyperinsulinemia was identified as one of the major metabolic etiologies of inner ear disorders[2,3,9] In these hyperinsulinemic patients hypoglycemia is a mere consequence of the excessive liberation of insulin.[9]

For laboratory confirmation of hyperinsulinemia, it is necessary to analyze both the glucose and the insulin concentrations in the blood samples obtained from the standard 100g glucose/insulin tolerance test according to Kraft's criteria.[2,3] Insulin curves are more sensitive than glucose curves to detect abnormalities in carbohydrate metabolism. In addition to dizziness, tinnitus, and sensorineural hearing loss, hyperinsulinism with or without hyperglycemia has been etiologically associated with essential hypertension, primordial follicle dysfunction, and atherosclerosis.[3,9,10] Clinical attention is now being directed to the hyperinsulinemia euglycemia status.[3]

The labyrinth is strongly influenced by insulin according to some experimental studies. The great concentration of Na^+K^+ATPase in the *stria vascularis* maintains a high concentration of potassium in the endolymph through continuous movement of this liquid's sodium ions. A decrease in the endolymph K^+ level with subsequent increase in the endolymph Na^+ level occurs when there is a decrease in the Na^+K^+ATPase function. The decrease of this enzyme's action could be determined by hypoglycemia-induced hyperinsulinemia, because the movement of the Na^+ is performed against electrochemical gradient with great expenditure of energy.[11,12]

A close relationship between Ménière's disease and hyperinsulinemia was also noted.[7,8] Ménière's disease is pathologically

characterized by excessive volumes of endolymph. In hyperinsulinemic patients, a decrease of endolymph K^+ with an increase of Na^+ leads to an increase in the volume of endolymph, which characterizes Ménière's disease.[7]

In an earlier study,[2] presented at the XXI Neurotological and Equilibriometric Society Meeting, Bad Kissingen, Germany, March 17 to 20, 1994, it was stated that dietary management is useful for the treatment of tinnitus and associated symptoms resulting from different dysfunctions of the glucose/insulin metabolism.

Compliance with medical nutritional therapy yields dramatic relief and sustained therapeutic response in patients with dizziness (with or without headache, nausea, tinnitus, and/or hearing loss) and hyperinsulinemia.[3] Medical nutritional therapy requires counseling expertise as well as an understanding of hyperinsulinemia to be shared with the patient.[3,15] Changing lifetime nutritional habits is also required. [2,3,4,13-15]

In order to obtain the best therapeutic results related to tinnitus and dizziness control as well as the improvement and/or stabilization of the sensorineural hearing loss, the earliest possible identification of hyperinsulinemia becomes mandatory.[2,3]

Adequate diets are essential to render these patients asymptomatic from the cochleo-vestibular disorders related to hyperinsulinism. [1-6,8-10,13-15]

Our results for 1128 neurotologic cases suffering from impaired carbohydrate and insulin metabolism were presented at the XXI Neuro-otological and Equilibriometric Society, Bad Kissingen, Germany, March 17-20, 1994.[2] Different kinds (types I, II, IIIA, IIIB, IV, or V) of hyperinsulinism with or without hypo- or hyperglycemia were found in these patients complaining of tinnitus, hearing loss, dizziness, and other associated symptoms.

In this paper, we have directed our attention to the patients included in that clinical study which exclusively presented hyperinsulinism, without any abnormalities of the glucose status. Among those cases, 205 patients (18.2%) with a hyperinsulinism/euglycemia status were found. The overall results are practically identical.

The prescription of an identical 6-months' dietary management also promoted very impressive improvement or even cure for most of the patients suffering from tinnitus, dizziness, and hearing loss. Results suggest that the use of adequate nutritional therapy is a very efficient procedure in the treatment of cochleo-vestibular disorders related to impaired insulin metabolism.

CONCLUSION

The findings of the present study show that a long-term high-protein low-sugar diet, including restriction of cholesterol and modification of some habits is suitable for the treatment of tinnitus and associated symptoms in patients with hyperinsulinemia/euglycemia status.

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