



Hashimoto's thyroiditis and carbohydrate metabolism disorders in patients hospitalised in the Department of Endocrinology and Diabetology of Ludwik Rydygier Collegium Medicum in Bydgoszcz between 2001 and 2010

Choroba Hashimoto a zaburzenia gospodarki węglowodanowej u pacjentów hospitalizowanych w Klinice Endokrynologii i Diabetologii Collegium Medicum w Bydgoszczy w latach 2001–2010

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Abstract

Introduction: Chronic lymphocytic thyroiditis, also known as Hashimoto's thyroiditis, is the most frequent type of thyroiditis. An average of 2% of the population have the disease. It occurs in all age groups, also in children. The main cause of the disease are autoimmune disorders, which results in increased risk of suffering from type 1 diabetes. Furthermore, during the course of Hashimoto's thyroiditis, hypothyroidism may cause carbohydrate metabolism disorders. Aim of our study was estimate disturbances of glycaemia in patients with recognized Hashimoto's thyroiditis, hospitalized in Endocrinology and Diabetology Department of Collegium Medicum University of Nicolaus Copernicus in Bydgoszcz in years 2001–2010.

Material and methods: We examined 54 patients with the diagnosis of Hashimoto thyroiditis based on clinical picture and examination (autoantibodies anti-TPO and anti-Tg).

Results: In the tested group with Hashimoto's thyroiditis, diabetes has been confirmed in 27.8% of the patients; impaired fasting glycaemia (IFG) or impaired glucose tolerance (IGT) occurred in 16.6%, whereas a normoglycaemia has been confirmed in 55.6% of the patients. An average age of the patients with Hashimoto's thyroiditis and diabetes at the same time, was 53 years. The patients in which we confirmed the impaired fasting glycaemia or impaired glucose tolerance were on average 49.9 years old. An average age of the patients without any carbohydrate metabolism disorders was on average 43.1 years.

Conclusions: Carbohydrate metabolism disorders in the form of type 1 diabetes connected with an autoimmune process, as well as type 2 diabetes connected with the increase of the insulin resistance, occur in average of half of the patients with Hashimoto's thyroiditis. (Pol J Endocrinol 2012; 63 (1): 14–17)

Key words: Hashimoto's thyroiditis, diabetes, IFG, IGT

Streszczenie

Wstęp: Przewlekłe limfocytowe zapalenie tarczycy zwane chorobą Hashimoto jest najczęstszym typem zapalenia tarczycy. Dotyczy około 2% populacji. Występuje we wszystkich grupach wiekowych, także u dzieci. Głównym podłożem choroby są zaburzenia autoimmunologiczne, co powoduje, że występuje zwiększone ryzyko zachorowania na cukrzycę typu 1. Dodatkowo w przebiegu choroby Hashimoto mogą wystąpić zaburzenia gospodarki węglowodanowej spowodowane hipotyreozą. Celem naszej pracy była ocena zaburzeń gospodarki węglowodanowej u pacjentów z rozpoznaną chorobą Hashimoto, hospitalizowanych w Klinice Endokrynologii i Diabetologii Collegium Medicum Uniwersytetu Mikołaja Kopernika w Bydgoszczy w latach 2001–2010.

Materiał i metody: Przebadano 54 pacjentów z rozpoznaną na podstawie obrazu klinicznego oraz badań dodatkowych (przeciwciała anti-TPO oraz anti-Tg) chorobą Hashimoto.

Wyniki: W badanej grupie osób z chorobą Hashimoto cukrzycę rozpoznano u 27,8% pacjentów. Nieprawidłowa glikemia na czczo (IGT) lub nieprawidłowa tolerancja glukozy (IFG) wystąpiły u 16,6% osób, natomiast normoglikemii stwierdzono u 55,6%. Średni wiek pacjentów z chorobą Hashimoto i jednocześnie cukrzycą wynosił 53,1 roku. Osoby, u których stwierdzono stan przedcukrzycowy pod postacią nieprawidłowej glikemii na czczo (IFG), bądź nieprawidłowej tolerancji glukozy (IGT) miały średnio 49,9 roku, natomiast wiek osób bez zaburzeń gospodarki węglowodanowej wynosił średnio 43,1 roku.

Wnioski: Zaburzenia gospodarki węglowodanowej pod postacią zarówno cukrzycy typu 1 związane z procesem autoimmunologicznym, jak i cukrzycy typu 2 związane ze wzrostem insulinooporności występują u około połowy pacjentów z chorobą Hashimoto. (Endokrynol Pol 2012; 63 (1): 14–17)

Słowa kluczowe: choroba Hashimoto, cukrzyca, IFG, IGT



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Introduction

Chronic lymphocytic thyroiditis, also known as Hashimoto's thyroiditis, is the most frequent type of thyroiditis. On average, 2% of the population will suffer from the disease at some time in their lives. The incidence of the disease is estimated at 0.3–1.5/1,000 people a year. It occurs in all age groups, and women suffer from it far more often than men.

The main causes of the disease are autoimmune disorders that result in increased risk of diabetes type 1. Furthermore, during the course of Hashimoto's thyroiditis, hypothyroidism may originate carbohydrate metabolism disorders, which lead to an increase of insulin resistance.

Material and methods

We examined 54 patients (45 females and nine males, aged 17–87) with the diagnosis of Hashimoto's thyroiditis based on clinical picture and examination (autoantibodies anti-TPO and anti-Tg). The patients had been hospitalised in the Department of Endocrinology and Diabetology at Nicolaus Copernicus University in Toruń, *Collegium Medicum* in Bydgoszcz, Poland between 2001 and 2010. They had all undergone glycaemia examination and an oral glucose tolerance test. In the group of patients with impaired fasting glycaemia (> 100 mg/dl), we determined peptide-C concentration to differentiate diabetes.

Results

In the tested group with Hashimoto's thyroiditis, diabetes was confirmed in 27.8% of the patients; impaired fasting glycaemia (IFG) or impaired glucose tolerance

(IGT) occurred in 16.6%, whereas normoglycaemia was confirmed in 55.6% of the patients (Table I).

The average age of those patients with simultaneous Hashimoto's thyroiditis and diabetes was estimated to be 53 years. The patients with confirmed impaired fasting glycaemia or impaired glucose tolerance were, on average, 49.9 years old. The average age of the patients without any carbohydrate metabolism disorders was, on average, 43.1 years (Table II).

In patients with Hashimoto's thyroiditis and diabetes, fasting plasma glucose was on average 132 mg/dl, average postprandial glycaemia was 164 mg/dl, and average daily blood glucose was 152 mg/dl (Table III).

In terms of the age of the investigated people, we distinguished four groups (0–35 years; 36–50 years; 51–60 years; and > 60 years old) (Table IV).

Discussion

It has been proved that there is a connection between the incidence of either hypothyroidism or hyperthyroidism and carbohydrate metabolism disorders. The abnormalities of glycaemia levels are directly proportional to the hormone disorders of the thyroid gland [1–2].

Patients with Hashimoto's thyroiditis have a predisposition to suffer from diabetes mellitus type 1. This is due to autoimmune etiology of both diseases. Antibodies against thyroid peroxidases: anti-TPO, antibodies against thyroglobulin (the protein storing T₃ and T₄ hormones in vesicles), anti-Tg and also autoantibodies blocking TSH receptors (TBII), are developed in the organism. A cytotoxic effect dependent on the reaction of cellular type and cytokines acting locally, results in inflammation located in the organism [3]. Cytotoxic

Table I. Carbohydrate metabolism disorders in tested group with Hashimoto thyroiditis

Tabela I. Zaburzenia gospodarki węglowodanowej u pacjentów z zapaleniem tarczycy typu Hashimoto

Hashimoto's thyroiditis	Normoglycaemia	IFG-IGT	Diabetes
Total (n = 54)	n = 30 (55.6%)	n = 9 (16.6%)	n = 15 (27.8%)
Females (n = 45)	n = 28 (62.2%)	n = 9 (20.0%)	n = 8 (18.9%)
Males (n = 9)	n = 2 (22.2%)	n = 0	n = 7 (77.8%)

Table II. An average age of the patients with Hashimoto thyroiditis

Tabela II. Średni wiek pacjentów z zapaleniem tarczycy typu Hashimoto

Hashimoto's thyroiditis	Normoglycaemia	IFG-IGT	Diabetes
Total (n = 54)	43.1 years	49.9 years	53.1 years
Females (n = 45)	43.9 years	49.9 years	55.2 years
Males (n = 9)	28 years	–	48.2 years

Table III. *An average parameters of glycaemia in patients with diabetes and Hashimoto thyroiditis***Tabela III.** *Średnie parametry glikemii u pacjentów z cukrzycą i zapaleniem tarczycy typu Hashimoto*

Patients with diabetes	Average fasting glycaemia [mg/dl]	Average postprandial glycaemia [mg/dl]	Average daily blood glucose [mg/dl]
Total (n = 15)	132	164	152
Females (n = 8)	124	166	148
Males (n = 7)	141	158	156
Diabetes type 1 (n = 8)	148	158	146
Diabetes type 2 (n = 5)	148	167	159
Another diabetes (n = 2)	110	176	163

Table IV. *Carbohydrate metabolism disorders in studied group according to the age***Tabela IV.** *Zaburzenia gospodarki węglowodanowej w grupie badanej w zależności od wieku*

Age groups	Number of patients	Normoglycaemia	IFG-IGT	Diabetes
0–35	19	14 (73.7%)	1 (5.3%)	4 (11.0%)
36–50	16	7 (43.7%)	4 (25%)	5 (31.3%)
51–60	9	5 (55.5%)	3 (33.3%)	1 (11.2%)
> 60	10	4 (40.0%)	1 (10.0%)	5 (50.0%)

lymphocytes T and macrophages colonise and destroy thyroid follicular cells. They are also responsible for disease development. Cytotoxic lymphocytes T activate lymphocytes B to produce antibodies anti-TPO together with anti-Tg indirectly by plasmocytes. Another mechanism responsible for the development of type 1 diabetes is an activation of lymphocytes and macrophages, which injure beta cells.

At present, it is believed that the comorbidity of autoimmune diseases dependent on the abnormal function of the lymphocytes T is conditioned by a genetic mutation, which probably appeared in the CTLA-4 gene [4]. Lymphocytes T and macrophages infiltrate the pancreatic islands cells and this leads to the presentation of pancreatic islands antigens, tyrosine phosphates IA-2, glutamine dicarboximide acid-65 (GADA), insulin, zinc transporter and a production of antibodies. A connection between the existence of anti-thyroid antibodies in patients with type 1 diabetes without thyroid disease has been described. It has been proven that its existence increases the risk of the development of an autoimmune thyroid disease in the future [5, 6].

In our study, in the investigated group, diabetes was confirmed in 27.8% of the patients. Either impaired fasting glycaemia or impaired glucose tolerance was found in another 16.6% of the patients. The main mechanisms of the development of carbohydrate metabolism disturbances in type 2 diabetes are insulin resistance (tissue resistance to insulin), and disturbance in insulin secretion.

Insulin resistance in patients with chronic lymphocytic thyroiditis is due to the inflammation process connected with the autoimmune etiology of Hashimoto's thyroiditis. Pro-inflammatory cytokines affect insulin receptors, destroying its physiological activity by inhibition of the 'downregulation' mechanism of these receptors, and through that they inactivate IRS-1 (Insulin receptor substrate 1). They also affect TNF- α , JNK kinases (c-Jun N-terminal Kinase) and NF κ B (nuclear factor kappa-light-chain-enhancer of activated B cells) [7, 8].

In patients with chronic lymphocytic thyroiditis, the insulin resistance in hypothyroidism may depend on the increased level of free fatty acids, which leads to reduced glucose uptake and its oxidation. When there is a decreased amount of tyrosine in the body, the phenomenon occurs of a postprandial increase of insulin hormone with existing peripheral insulin resistance [9]. There has been a description of a patient with Hashimoto's disease and type 2 diabetes, in whom the thyroid hormone supplementation had decreased the insulin resistance (the need for insulin had decreased from 96 units to around 30 units, a change from insulin therapy to oral hypoglycaemic) and stabilised the total cholesterol level.

Also in our study, there were three patients with Hashimoto's thyroiditis coexisting with type 2 diabetes. Hyperglycaemia may also result from a mechanism dependent on triiodothyronine, glucagon, adrenal cortex hormones and a growth hormone.

Carbohydrate metabolism disorders in the form of type 1 diabetes connected with an autoimmune process, as well as type 2 diabetes connected with increased insulin resistance, occur in an average of half of the patients with Hashimoto's thyroiditis.

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