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Serum Leptin Levels in Children with Chronic Glomerulonephritis

Stężenie leptyny u dzieci chorych na przewlekłe kłębuszkowe zapalenie nerek

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Abstract

Background. Adipose tissue is an active metabolic and endocrine organ. It produces several molecules called adipocytokines that may influence the functioning of other tissues. Leptin is produced mainly by adipocytes and plays a role in the regulation of appetite, body mass, and energetic homeostasis. Leptin also influences cytokine production from T lymphocytes, monocyte activation, and phagocytosis.

Objectives. The aim of the study was to evaluate serum leptin in children with chronic glomerulonephritis and nephrotic syndrome (NS) in remission with regard to the dose of steroids.

Material and Methods. Fifty-seven children with chronic glomerulonephritis and nephrotic syndrome in remission were enrolled into the study. The patients were divided into two groups, group I with 35 overweight children with chronic glomerulonephritis (BMI above the 90th percentile) and group II with 22 normal-weight children with chronic glomerulonephritis (BMI below the 90th percentile). Serum leptin concentration was determined by the immunoenzymatic ELISA method using commercially available kits.

Results. Mean leptin concentration was significantly higher in the overweight children with chronic glomerulonephritis compared with the normal-weight children. The dose of steroids during the year before the test (mg) was similar in both group.

Conclusions. This study showed that prednisone therapy had no impact on serum leptin levels. In children with chronic glomerulonephritis, further investigations are necessary to explain the role of leptin and other adipokines in the pathogenesis of overweight and lipid metabolism disturbances (*Adv Clin Exp Med* 2008, 17, 2, 137–140).

Key words: leptin, nephrotic syndrome, children.

Streszczenie

Wprowadzenie. Tkanka tłuszczowa została w ostatnich latach uznana za aktywny metabolicznie i endokrynologicznie narząd. Wydziela wiele różnych substancji nazwanych adipocytokinami, które wpływają na czynność innych narządów i tkanek. Leptyna jest wydzielana głównie przez adipocyty. Odgrywa główną rolę w regulacji apetytu, masy ciała i utrzymaniu homeostazy energetycznej. Leptyna wpływa również na wydzielanie cytokin przez limfocyty T, aktywację monocytów i fagocytozę.

Cel pracy. Określenie stężenia leptyny u dzieci z zespołem nerczycowym w przebiegu przewlekłego kłębuszkowego zapalenia nerek w okresie remisji w odniesieniu do dawki steroidów.

Materiał i metody. Do badania włączono 57 dzieci z zespołem nerczycowym w przebiegu przewlekłego kłębuszkowego zapalenia nerek w okresie remisji. Pacjenci zostali podzieleni na dwie grupy: grupa I – 35 z kłębuszkowym zapaleniem nerek i nadwagą (BMI powyżej 90 percentyla), grupa II – 22 dzieci z kłębuszkowym zapaleniem nerek i prawidłową masą ciała (BMI poniżej 90 percentyla). Stężenie leptyny oznaczono za pomocą metody immunoenzymatycznej z użyciem standardowych zestawów firmy R@D.

Wyniki. Średnie stężenie leptyny było znacząco większe u dzieci z przewlekłym kłębuszkowym zapaleniem nerek i nadwagą w porównaniu z dziećmi z grupy II. Dawka kortykosteroidów rok przed przeprowadzeniem testów była podobna w obu grupach.

Wnioski. W badaniu wykazano, że terapia prednizonem nie wywiera wpływu na stężenie leptyny. U dzieci z przewlekłym kłębuszkowym zapaleniem nerek dalsze badania są niezbędne, aby wyjaśnić rolę leptyny i innych adipokin w patogenezie otyłości i zaburzeń lipidowych (*Adv Clin Exp Med* 2008, 17, 2, 137–140).

Słowa kluczowe: leptyna, zespół nerczycowy, dzieci.

Adipose tissue is recognized as an active metabolic and endocrine organ. It produces several molecules called adipocytokines that may influence the functioning of other tissues. Leptin, the *Ob* gene product and peptide hormone, is produced mainly by adipocytes and plays a role in the regulation of appetite, body mass, and energetic homeostasis. Leptin acts in the central nervous system as a negative feedback signal, decreasing food intake and increasing energy expenditure [1]. Humans with a mutation in the leptin or leptin receptor gene are massively obese. It has been suggested that an elevated level of leptin may promote atherosclerosis.

Leptin is a multifunctional hormone which also influences cytokine production from T lymphocytes, monocyte activation, and phagocytosis [2]. In addition, leptin plays a role in sympathetic nervous system activation, insulin secretion and sensitivity, sodium handling, angiogenesis, and hematopoiesis [3]. The kidneys play a principal role in the elimination of this peptide. High leptin levels have been reported in patients with end-stage renal disease and chronic renal failure [4–6]. Hyperleptinemia is common particularly in patients on continuous ambulatory peritoneal dialysis [7]. As presented by Wolf et al., leptin may directly and indirectly affect the kidney and can take part in the deterioration of renal function [1]. The aim of this study was to evaluate serum leptin levels in children with nephrotic syndrome (NS) in remission due to chronic glomerulonephritis with regard to the dose of steroids.

Material and Methods

Fifty-seven children (24 girls and 33 boys) suffering from chronic glomerulonephritis and nephrotic syndrome in remission were enrolled in the study. The patients were divided into two groups: group I comprised 35 overweight children with chronic glomerulonephritis (BMI above the 90th percentile) and group II 22 normal-weight children with chronic glomerulonephritis (BMI <90th percentile). The mean age in group I was 10.19 ± 3.98 years and in group II 9.25 ± 4.8 years. The characteristics of the patients are presented in Table 1. The mean cumulative doses of steroids during the year before the test were calculated.

Table 1. Clinical characteristic of the examined patients

Tabela 1. Kliniczna charakterystyka badanych pacjentów

Parameter (Wskaźnik)	Group I (Grupa I) n = 35	Group II (Grupa II) n = 22
Age – years (Wiek – lata)	10.19 ± 3.98	9.25 ± 4.8
Sex – M/F (Płeć – M/K)	19/16	13/9
BMI kg/m ²	24.25 ± 4.07	16.81 ± 2.29
Cholesterol mg%	226.9 ± 145.23	239.9 ± 40.76
LDL cholesterol mg%	196.0 ± 92.1	156.9 ± 34.56
HDL cholesterol mg%	35.89 ± 6.57	41.05 ± 4.52
Triglycerides (Trójglicerydy) mg%	274.71 ± 87.24	213.23 ± 104.7

Serum samples were obtained from all the subjects from venous blood after overnight fasting for at least 12 h. Serum leptin concentration was determined by an immunoenzymatic ELISA method using commercially available kits of R&D. Serum levels of total cholesterol, LDL cholesterol, HDL cholesterol, triglyceride, protein, and albumin were determined using standard methods. Body mass index (BMI) was calculated according to the formula $BMI = \text{body-weight (kg)}/\text{height (m)}^2$. Kidney function was normal in all the patients. The blood pressure of all the patients was within the normal range. There were neither urinary tract infections nor acute infectious diseases. The Clinical Research Ethics Committee of Silesian Piasts University of Medicine in Wrocław approved of the above protocol.

Statistical analysis

The results were subjected to statistical analysis using the computer program Statistica PL. The results are expressed as means \pm the standard deviation (*SD*). For comparison of means between the two groups of subjects, the Student's *t*-test was used for normally distributed data and the Mann-Whitney *U* test for nonparametric data.

Table 2. Serum leptin levels in children**Tabela 2.** Stężenie leptyny u dzieci

Parameter (Wskaźnik)	Group I (Grupa I) n = 35	Group II (Grupa II) n = 22
Cumulative steroid dose during the year before the test (Całkowita dawka kortykosteroidów podana w ciągu roku przed badaniem) mg	5184.57 ± 3513.36	4202.36 ± 4141.98
Leptin (Leptyna) pg/ml	*226.92 ± 145.23	159.79 ± 72.87

* Significantly higher in group I.

* Istotnie statystycznie większe niż w grupie I.

Differences were considered significant when p was less than 0.05.

Results

The mean leptin concentration was significantly higher in the overweight children with chronic glomerulonephritis and than in the normal-weight patients. The dose of steroids during the year before the test (mg) was similar in both groups (Table 2). No significant correlation was observed between serum leptin level and the cumulative dose of corticosteroids in these patients. Positive correlation between BMI and serum leptin level was found in the children. No statistically significant differences in serum leptin levels between boys and girls were found. No significant relationships were found between serum leptin level and cholesterol, HDL cholesterol, LDL cholesterol, or triglyceride.

Discussion

Many factors contribute to the pathogenesis of obesity in children with chronic glomerulonephritis. Overweight may be associated with different functional or structural lesions of the kidney. Leptin has been shown to play a very important role in the regulation of appetite in health and disease [8]. Among other mechanisms, steroid therapy seems to play a crucial role in the development of obesity. The present authors observed that some children developed massive obesity quickly and others did not in spite of similar doses of steroids.

This study showed that prednisone therapy had no impact on serum leptin levels. This is in accordance with the findings of Buyan et al. [9]. Tan et al. showed that short-term administration of steroids upregulates the expression of leptin, but longer glucocorticoid treatment (over three weeks) does not seem to increase it [10].

Like other studies [11–13], the present study demonstrated a positive correlation between serum leptin level and BMI. Leptin is involved in the regulation of lipid metabolism both in health and in pathological conditions. The data showed that the relationship between leptin and lipid levels in patients with chronic glomerulonephritis is limited. Wu et al. demonstrated a positive correlation between serum leptin and triglyceride and LDL levels in healthy children. They also showed a negative correlation with HDL [14].

During relapse, characteristic disturbances are observed in children with nephritic syndrome. In remission, partial normalization of these perturbations occurs. No significant difference between lipid parameters were found in the two groups of children. The present study found no correlation of leptin with total cholesterol, HDL fraction, LDL fraction, or triglycerides as reported in the study of Özata et al. [13]. Wasilewska et al. showed a positive correlation of leptin with cholesterol level and LDL and a negative correlation with HDL fraction [11]. They did not find any relationship between leptin and triglycerides.

In children with chronic glomerulonephritis, further investigations are necessary to explain the role of leptin and other adipokines in lipid metabolism disturbances.

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