

Olga A. Zhdanova

Voronezh State Medical University named after N.N. Burdenko, Voronezh, Russian Federation

Glucocorticosteroid Therapy and Physical Development of Children with Steroid-Sensitive Nephrotic Syndrome: a Retrospective Study

Corresponding author:

Olga A. Zhdanova, MD, PhD, associate professor of the Department of Clinical Pharmacology, VSMU n.a. N.N. Burdenko

Address: 10, Studencheskaya Str., Voronezh 394030, **phone:** +7 (473) 265-64-42, **e-mail:** olga.vr9@yandex.ru

Article received: June 6, 2017, **submitted to publication:** Aug 28, 2017

BACKGROUND. Body weight gain and growth retardation are common side effects of prolonged glucocorticosteroid therapy in children. Time for the appearance and elimination of glucocorticosteroid obesity as well as growth disorders require further investigations.

OBJECTIVE. Our aim was to study the relationship between glucocorticosteroid therapy and changes in physical development indices of children with steroid-sensitive nephrotic syndrome (SSNS). **METHODS.** We carried out a retrospective study of case records of patients with SSNS hospitalized in 2011-2014. Treatment of children was carried out in accordance with the Federal Clinical Guidelines. The Z-score (ANTHRO Plus) was determined for body length (height), body weight, body mass index and correlation of physical development indices with a cumulative dose and duration of glucocorticosteroid therapy.

RESULTS. We analyzed data on the treatment of 31 children, 18 of them received glucocorticosteroids for 6 months (Group 1), 13 of them did not receive glucocorticosteroids ≥ 6 months (Group 2). The Z-score of body weight in children in these groups was 1.64 ± 1.54 and 0.05 ± 1.19 ($p = 0.004$), Z-score of body mass index was 1.85 ± 1.64 and -0.54 ± 1.14 , respectively ($p < 0.001$). Excess body weight and obesity were only observed in children of Group 1 (in 6 and 9, respectively). The Z-score of the body length of patients in groups 1 and 2 were comparable and did not differ from normal values (0.34 ± 1.08 and 0.52 ± 1.12 , respectively, $p = 0.655$). Correlation of Z-score values of the body length and cumulative doses of glucocorticosteroids was noted ($r = -0.87$, $p < 0.001$). **CONCLUSION.** Long-term (at least 6 months) glucocorticosteroid intake is associated with the development of overweight and obesity in most children with SSNS. In patients who did not use hormonal drugs for ≥ 6 months, normal body weight values were recorded. The height of children with SSNS was within the range of normal values.

KEY WORDS: children, nephrotic syndrome, glucocorticosteroids, body length, body weight, obesity.

(For citation: Zhdanova Olga A. Glucocorticosteroid Therapy and Physical Development of Children with Steroid-Sensitive Nephrotic Syndrome: a Retrospective Study. *Voprosy sovremennoi pediatrii — Current Pediatrics*. 2017; 16 (4): 298–303. doi: 10.15690/vsp.v16i4.1775)

RESULTS

Table 1. Comparative analysis of children with steroid-sensitive nephrotic syndrome who received and did not receive glucocorticosteroids for 6 months before admission

Indices	Group 1 (n =18)	Group 2 (n =13)	p
Age, years min–max	5.6 (5.0; 8.0) 4–14	9.1 (7.0; 12.9) 3–18	0.032
Girls, abs. (%)	10 (56)	5 (39)	0.348
Place of residence, abs. (%): • city	7 (39)	6 (46)	0.686

• village	11 (61)	7 (54)	
Duration of disease, months min–max	22 (11; 38) 4 months –11 years	63 (27; 122) 11 months –16 years	0.009
Age of the disease onset, months min–max	45 (33; 61) 1.8–8.4 years	36 (29; 66) 9 months – 8 years	0.346
Admissions, abs. • Exacerbation, abs. (%) • Onset, abs. (%)	71 35 (49) 9 (13)	16 2 (13) –	0.001
Duration of remission, months min–max	2 (2; 4) 1–10 months	38 (20; 108) 11 months – 13 years	0.001

Note. Group 1 — while taking the maximum dose of GCS, Group 2 — in the period of the longest remission of the disease.

Table 2. Mean values of Z-score indices of physical development of children with nephrotic syndrome

Indices	Group 1 (n =18)	Group 2 (n =13)	<i>p</i>
Z-score of body length (height)	0.34±1.08	0.52±1.12	0.655
Z-score of body weight	1.64±1.54	0.05±1.19	0.004
Z-score of BMI	1.85±1.64	-0.54±1.14	0.000

Note. BMI — body mass index.

Table 3. Incidence of Z-score indices of physical development of children with steroid-sensitive nephrotic syndrome

Indices*	Group 1, abs. (%)	Group 2, abs. (%)	<i>p</i> **
Z-score of body length (height)	n =18	n =13	–
Low	0	0	–
Below the average	3 (17)	2 (15)	0.690
Average	10 (55)	7 (54)	0.786
Above the average	5 (28)	3 (23)	0.904
High	0	1 (8)	0.898
Z-score of body weight***	n =13	n =7	–
Low	0	1 (14)	0.747
Below the average	0	0	–
Average	5 (38.5)	6 (86)	0.120
Above the average	3 (23)	0	0.470
High	5 (38.5)	0	0.176
Z-score of BMI	n =14	n =13	–
Low	0	2 (15)	0.430
Below the average	0	2 (15)	0.430
Average	4 (28.5)	9 (70)	0.084
Above the average (overweight)	4 (28.5)	0	0.122
High (obesity)	6 (43)	0	0.027

Note. Group 1 — while taking the maximum dose of GCS, Group 2 — in the period of the longest remission of the disease. * Ranges for Z-score values: low — < -2, below the average — from -2 to -1, average — from -1 to +1, above the average — from 1 to 2, high — >2. ** Calculated by χ^2 criterion with Yates' correction for contingency tables 2×2; the value of *p* for the entire table 5×2 (df =4) was 0.833 for the body length, 0.091 for the body weight, 0.004 for the BMI. *** Body weight values in the ANTHRO Plus program are given only for children under 10 years; in children with edema, body weight and BMI values in the ANTHRO Plus program are not considered.

Table 4. Glucocorticosteroid therapy of children with steroid-sensitive nephrotic syndrome

Indices	Group 1 (n =18)	Group 2 (n =13)	<i>p</i>
Cumulative dose of GCS (for the entire period of the disease), mg/kg	240 (199; 315)	145 (102; 181)	0.001
Duration of GCS intake, days	485 (221; 660)	300 (180; 365)	0.051

Note. GCS — glucocorticosteroids.

Table 5. Values of the Spearman's rank correlation coefficient of Z-score of physical development indices and the received dose of glucocorticosteroids in children with nephrotic syndrome

Indices	Cumulative dose (mg)	Cumulative dose (mg/kg)	Dose for 6 months (mg)	Dose for 6 months (mg/kg)	Dose for 6 months (mg/kg per day)	Duration of GCS intake
Group 1 (n =18)						
Body weight	0.70*	0.51	0.37	-0.14	-0.38	0.54
Height	0.45	0.10	-0.04	-0.38	-0.42	0.40
BMI	0.22	0.09	0.33	0.06	0.13	0.04
Group 1, children with rare relapses of nephrotic syndrome (n =11)						
Body weight	0.57	0.22	0.43	-0.28	-0.50	0.48
Height	0.64*	0.21	-0.05	-0.68*	-0.87**	0.71*
BMI	0.29	0.06	0.38	0.00	-0.22	0.70
Group 2 (n =13)						
Body weight	-0.18	-0.64	—	—	—	-0.24
Height	-0.02	-0.42	—	—	—	-0.07
BMI	-0.36	-0.57	—	—	—	-0.08

Note. GCS — glucocorticosteroids, BMI — body mass index. * $p < 0.05$, ** $p < 0.001$

FINANCING SOURCE

Not specified.

CONFLICT OF INTERESTS

Not declared.

ORCID

Olga A. Zhdanova <http://orcid.org/0000-0002-3917-0395>