SHORT REPORT

Relation between serum β-endorpin, neuropeptide Y and thyroid hormone in children with anorexia

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Abstract

The purpose of this study was to investigate whether serum β-endorpin and neuropeptide Y were associated with changes in levels of thyroid hormones in children suffering from anorexia. One hundred and five anorexic children admitted to Xianning City Central Hospital, China, from August 2019 to July 2021, were selected as case group, while 105 normal children were selected as normal control group. Serum β-endorpin and neuropeptide Y levels in the case group were lower than those in the normal control group (both $p<0.001$), and serum triiodothyronine and thyroxine levels were also lower (both $p<0.001$). Serum β-endorpin and neuropeptide Y levels in the case group were positively correlated with triiodothyronine and thyroxine. There is a reduced level of serum β-endorpin, neuropeptide Y, and thyroid hormones in anorexic children, and it is possible that they are connected and work together in regulating ingestion.

Keywords: Serum; β-endorpin; Neuropeptide Y; Thyroid hormones, Children, Anorexia

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Introduction

Paediatric anorexia is characterised by a lack of appetite, no taste for food, and nutritional intake insufficient to maintain normal body function.[1] Anorexia may lead to anaemia, immune deficiency, malnutrition, rickets, and being prone to recurrent respiratory infections, which exert varying degrees of impact on the growth and intellectual development of children.

The causes of paediatric anorexia can range from digestive disorders to improper feeding to deficiencies in trace elements and some endocrine hormones (such as thyroid hormones).[2,3] Decreased levels of thyroid hormones can bring down the body's metabolism, resulting in decreased appetite and affecting the growth and development of the children.[4] It has been shown that thyroid hormones such as triiodothyronine (T3) and thyroxine (T4) are involved in material and energy metabolism as well as growth and development of the body.[5]

β-endorpin (β-EP), a brain-gut peptide secreted and released by the hypothalamus, has an integral role in the pathogenesis of anorexia.[6] Neuropeptide Y (NPY) is an appetite regulator associated with the homeostasis of energy metabolism.[7,8] Closely related to eating behaviour, NPY may be a contributing factor in the low appetite of anorexic children, or its lower blood level may result from the fact that the low appetite and lack of hunger in anorexia cannot feedback to the hypothalamus, where the synthesis and release of NPY occur.[9] The relationship between thyroid hormones (such as T3 and T4) and β-EP, NPY is not well understood at present.

The aim of this study was to investigate whether serum β-EP and NPY were associated with changes in levels of thyroid hormones (T3 and T4) in children suffering from anorexia, in order to provide reference for the judgment of the condition and the evaluation of the prognosis in children with anorexia.

Patients, Methods and Results

This prospective clinical study was approved by the medical ethics committee of the Xianning City Central Hospital, China, in July 2019. Sample size was calculated by using the G power software.[10] A total of 105 anorexic children, admitted to Xianning City Central Hospital, China, from August 2019 to July 2021, were selected as the case group. Children who met the diagnostic criteria of paediatric anorexia in whom the duration of the disease was not less than one month, and first diagnosis without having taken any dyspepsia relieving and digestion improving medication or receiving other appetite improvement-related treatments recently were included in the study. The guardians of the children agreed to participate in the study and voluntarily signed the informed consent form.

Children younger than one year age or older than 6 years; those with severe rickets, anaemia, heart, brain, liver, kidney or other system diseases; those with other acute or chronic

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digestive system diseases; anorexia or anorexia nervosa caused by various diseases and medications; and those with hypothyroidism were excluded from the study.

In addition, 105 normal children of the same age who were examined in our hospital during the same period were selected as the normal control group. The subjects in this group had normal appetite and development without heart, brain, kidney and other endocrine diseases, or any development of sexual characteristics.

Fasting venous blood was collected from all subjects on empty stomach, and the serum was stored in a refrigerator at -20℃ for testing. Serum β-EP, NPY, and thyroid hormones T3 and T4 were measured by radioimmunoassay.

SPSS 25 was used to analyse the data. Measurement data were expressed by mean ±SD, using independent sample *t*-test, and the correlation was analysed by Pearson correlation. Counting data were expressed by n (%) and chi square test was used. P＜0. 05 was considered statistically significant.

Among the 105 subjects in the case group, 54 (51.4%) were males and 51 (48.6%) were females, with the mean age of 4.36±1.25 years, and the duration of disease was 6.81±1.90 months.

Among the 105 subjects in the normal control group, 53 (50.5%) were males and 52 (49.5%) were females, with the mean age of 4.30±1.74 years.

The serum β-EP and NPY levels in the case group were lower than those in the normal control group (both $p<0.001$), and the serum T3 and T4 levels were also lower (both $p<0.001$) (Table-1).

Table-1: Comparison of parameters between the two groups.

Parameter	Case group **Mean±SD** (n=105)	Normal control group **Mean±SD** (n=105)	*p*-value
Serum β-EP (n/L)	7.68 ±0.63	13.92 ±1.04	<0.001
Serum NPY (pg/mL)	33.30 ±3.18	72.06 ±5.67	<0.001
Serum T3 (μg/L)	1.46 ±0.22	2.27 ±0.30	<0.001
Serum T4 (μg/L)	49.70 ±7.44	67.05 ±8.78	<0.001

β-EP: β-endorpin. NPY: Neuropeptide Y. T3, Triiodothyronine. T4, Thyroxine.
SD: Standard deviation.

Table-2: Comparison of serum marker-related indexes in case group.

Index	Serum T3		Serum T4	
	r	*p* value	*r*	*p* value
Serum β-EP	0.283	0.003	0.240	0.014
Serum NPY	0.403	<0.001	0.401	<0.001

β-EP: β-endorpin. NPY: Neuropeptide Y.

The serum β-EP and NPY levels in the case group were positively correlated with T3 ($r=0.283$, $p=0.003$; $r=0.403$, $p<0.001$) and T4 ($r=0.240$, $p=0.014$; $r=0.401$, $p<0.001$) (Table-2).

Conclusion

The study concluded that anorexic children have a reduced level of serum NPY, β-EP, and thyroid hormones, and it is possible that they are connected and work together in regulating ingestion. The limitation of this study is that their mode of interaction and how they regulate each other was not studied. This needs to be further studied in the future.

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Conflict of Interest: None.

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References

1. Bo-wen Z, Ming-ming C. Nie-pinching the spine, puncturing Sifeng (EX-UE 10) plus Chinese herbs for pediatric anorexia due to dysfunction of spleen in transportation: a randomized controlled trial. J Acupunct Tuina Sci 2021；19： 104–9.
2. Lieberman M, Houser ME, Voyer AP, Grady S, Katzman DK. Children with avoidant/restrictive food intake disorder and anorexia nervosa in a tertiary care pediatric eating disorder programme: A comparative study. Int J Eat Disord 2019; 52: 239-45.
3. Iordan Z, Poinsot P, Iceta S, Morfin D, Berthiller J, Fourneret P, et al. Micronutrient status in children with anorexia nervosa: high frequency of early copper and selenium deficiencies. Clin Nutr ESPEN 2020; 40: 417-8.
4. Giovinazzo S, Sukkar SG, Rosa GM, Zappi A, Bezante GP, Balbi M, et al. Anorexia nervosa and heart disease: a systematic review. Eat Weight Disord 2019; 24: 199-207.
5. Jafari J. The relationship between thyroid hormones (thyroxin, triiodothyronine) and metabolic activities of body: Reviewed. J Health Med Sci 2020; 3: 84-9.
6. Daimon CM, Hentges ST. β-endorphin differentially contributes to food anticipatory activity in male and female mice undergoing activity-based anorexia. Physiol Rep 2021; 9: e14788.
7. Jeong I, Kim E, Kim S, Kim HK, Lee DW, Seong JY, et al. mRNA expression and metabolic regulation of npy and agrp1/2 in the zebrafish brain. Neurosci Lett 2018; 668: 73-9.
8. Greene ES, Abdelli N, Dridi JS, Dridi S. Avian Neuropeptide Y: beyond feed intake regulation. Vet Sci 2022; 9: 171-88.
9. Wang L, Han W, Iwasaki Y, Yermek R, Sharp GW, Seino Y, et al. Onion component, isoalliin, stimulates feeding and activates the arcuate nucleus neuropeptide Y, ghrelin-and Ninjin'yoeito-responsive neurons. Neuropeptides. 2021; 89: 102180.
10 Faul F, Erdfelder E, Lang AG, Buchner A. G*Power 3: A flexible statistical power analysis programme for the social, behavioural, and biomedical sciences. Behav Res Methods 2007; 39: 175-91.