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Regulation of Somatotropic Hormone in Children, Dwarfism and Gigantism, Early Diagnosis and Treatment

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Annotation: The somatotropic hormone (STH), also known as growth hormone (GH), is secreted by the anterior lobe of the pituitary gland and plays a crucial role in normal growth and development. This hormone regulates cell proliferation, protein synthesis, bone and muscle growth, as well as metabolic processes. In children, deficiency or excess secretion of GH leads to severe endocrine disorders — dwarfism and gigantism. Timely diagnosis and proper treatment are essential for ensuring a child's healthy development and quality of life.

Keywords: Somatotropic hormone, pituitary gland, dwarfism, gigantism, growth retardation, accelerated growth, early diagnosis, treatment.

Statistics (in Uzbekistan)

- According to WHO data, 3–5% of children worldwide suffer from various growth disorders.
- Observations at the Endocrinology Research Center of Uzbekistan indicate that dwarfism occurs in 18–20 cases per 100,000 children, while gigantism occurs in 3–4 cases per 100,000 children.
- In recent years, due to advances in GH synthesis and diagnostics, these disorders are being detected earlier; however, preventive monitoring remains insufficient.

Causes

1. Dwarfism:

- Genetic mutations (pituitary malformations);
- Pituitary hormone deficiency;
- Intrauterine infections or toxic exposure during pregnancy;
- Birth trauma and hypoxia.

2. Gigantism:

- Pituitary adenomas (hormone-secreting tumors);
- Genetic and hereditary factors;
- Central nervous system damage;
- Endocrine disorders (e.g., insulinoma, thyroid dysfunction).

Mechanism

- GH stimulates the production of IGF-1 (insulin-like growth factor-1) in peripheral tissues. IGF-1 enhances bone plate activity, muscle development, and visceral growth.
- In dwarfism, GH secretion is reduced, resulting in IGF-1 deficiency → insufficient bone plate activity → short stature, fragile bones, and delayed puberty.
- In gigantism, GH secretion is excessive → IGF-1 levels rise → overstimulation of bone plates → accelerated growth, disproportional body features, and visceral organ hypertrophy.

Types

1. Dwarfism:

- Pituitary dwarfism (GH deficiency as the main cause);
- Idiopathic dwarfism (etiology unknown);
- Syndromic dwarfism (Turner syndrome, Russell-Silver syndrome).

2. Gigantism:

- Pituitary gigantism (due to excessive GH secretion);
- Ectopic gigantism (other tumors producing GH-like substances);
- Pseudogigantism (accelerated bone growth without proportional organ development).

Early Diagnosis

- Anthropometry: measurement of height and weight compared with age-related standards;
- Laboratory tests: assessment of GH and IGF-1 levels in serum;
- Dynamic tests: oral glucose tolerance test to evaluate GH suppression (remains high in gigantism);
- Imaging: MRI or CT for detection of pituitary tumors;
- Genetic testing: identification of hereditary syndromes.

Treatment

1. For Dwarfism:

- Hormone replacement therapy: long-term administration of recombinant GH (somatropin);
- Nutritional support with protein-, vitamin-, and mineral-rich diet;
- Physical rehabilitation and regular monitoring of growth parameters.

2. For Gigantism:

- Surgical treatment: removal of pituitary adenomas;
- Pharmacotherapy: somatostatin analogs (octreotide, lanreotide), dopamine agonists, GH receptor antagonists;
- Radiotherapy: used in patients unsuitable for surgery.

Conclusion

Abnormal secretion of somatotropic hormone during childhood leaves profound effects on growth and development. Dwarfism and gigantism, if diagnosed early, can be effectively managed with modern therapeutic approaches. In Uzbekistan, strengthening pediatric-endocrinological services and implementing routine anthropometric monitoring in schools and clinics would improve early detection and treatment outcomes.

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