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TABLE OF CONTENTS

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EDITORIAL

GROWTH HORMONE: ITS PHYSIOLOGY, PLETHORA OF USES AND MISUSE

Globally diabetes mellitus is the commonest endocrine-metabolic disorder followed by thyroid disorders. However, others like growth hormone deficiency disorders are not uncommon in our resource constraint setting and do require high index of suspicion, history and physical examination to detect before expensive hormonal confirmatory tests can be conducted.

Growth hormone, also known as somatropin, is a protein produced by the pituitary gland; the "master gland" located at the base of the brain. The pituitary gland not only controls physical growth, but also regulates other glands throughout the body that produce hormones such as testosterone and estrogen.

Growth in humans involves an increase in length and height with accretion of protein and not merely weight gain due to fat deposition or salt and water retention. It is a complex phenomenon affected by several factors. These can be classified as hormonal and non-hormonal factors. Hormonal factors include Growth Hormone(primarily), Insulin Growth Factors (IGFs), thyroid hormones, sex steroids, glucocorticoids and insulin. The major stimulus for growth is Growth hormone. It is a single chain polypeptide molecule with 191 amino acids secreted by cells of the anterior pituitary (somatotropes). Its secretion is circadian in nature with the highest occurring during sleep. Growth hormone secretion is also pulsatile throughout the day hence measurement of basal hormone levels is not very useful.

GH acts through binding to membrane receptors stimulating synthesis and release of substances called somatomedins which include Insulin-like growth factor I (IGF-I) which stimulates growth. IGF-I is mainly carried in plasma by 'Insulin Growth Factor Binding Protein 3' and the level of this receptor is GH dependent. IGF-II plays a major role in the growth of the foetus before birth.

Growth hormone causes the growth of almost all tissues in the body. It acts by promoting increased sizes of cells, increased mitosis and cellular differentiation e.g., bone cells. GH release is mainly stimulated by Growth hormone releasing hormone, GHRH, released from the arcuate nucleus of the hypothalamus. It is also stimulated by a gastric hormone, Ghrelin. GHRH is secreted in pulses that elicit spikes of GH release. Other stimuli that increase GH secretion include sleep, stress, malnutrition, fasting, exercise, hypoglycaemia, arginine infusion, glucagon, estrogens and androgens.

Pituitary tumours, chronic illness, side effects of therapy for other medical conditions, and processes associated with aging all can contribute to reduced pituitary function and decreased production of growth hormone.

The story of human growth hormone (HGH) is interesting as this complex protein source has progressed from crude extract to recombinant growth hormone which is in current use globally.

The huge cost and profit of making the growth hormone molecule has encouraged manufacturers to find other uses for hGH beyond the initial indication for children with stunted growth as reported in the three cases published in this edition. This case series reported three girls of ages 8years+, 13 years+ and 5 years with short stature and underscoring the fact that timely diagnosis of growth hormone deficiency is very important.

Other current indications for human growth hormone therapy include AIDS Wasting syndrome(cachexia), HIV lipodystrophy and thymic dysfunction.

Currently human growth hormone is produced by several companies and marketed under various brand names. The main distinction between them is that they are produced in different types of cell lines and have been evaluated in clinical trials for different indications. Most physicians believe that the different versions of human growth hormone have the same biological effects.

Growth hormone can be very beneficial for correcting a deficiency, but having too much of it does not necessarily bring added benefit -- though it does increase the risk of side effects. Nevertheless, illicit use of hGH appears to be widespread globally with unproven claims of halting the aging process or by bodybuilders to rapidly increase muscle mass.

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