Analysis of growth hormone levels in the blood of patients with drug-resistant depression

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Introduction  Human growth hormone (HGH), also called somatotropin, is a peptide that is excreted by somatotropic cells in the anterior pituitary gland. This hormone has multiple functions, with the most important being stimulation of cell growth, reproduction, and regeneration in humans.¹ The role of HGH in adults has not been fully understood for many years. Several studies involving patients with HGH deficiency have suggested the importance of HGH for both mental and emotional well-being, as well as cognitive function.² The beneficial effects of HGH replacement on the quality of life of adult patients with growth hormone deficiency were also confirmed by McGauley.³

HGH deficiency in adults, called somatopause, can be associated with brain injury, cancers, and radiotherapy of the pituitary gland. HGH secretion can also diminish with age, which is connected with a decrease in lean body mass, an increase in body fat, and an increase in low-density lipoprotein cholesterol levels.⁴ A reduction in muscle mass, energy, and quality of life was observed in adults with HGH deficiency.⁵ In another study, HGH deficiency was related to decreased energy, increased tiredness, pain, irritability, and depression.⁶ Despite publications reporting mood disturbances in patients with age-related somatopause, the association between drug-resistant depression and HGH deficiency remains unknown. Therefore, the aim of the present study was to analyze serum HGH levels in patients with drug-resistant depression and to assess the effect of age-related somatopause on the symptoms of depression in adult patients.

Methods  A total of 50 patients (19 men, 31 women) were enrolled. The study group included 24 patients (10 men, 14 women; mean [SD] age, 43 [12.36] years) with unipolar depression, who developed the first symptoms of the disease after the age of 20. Patients were diagnosed with drug-resistant depression according to the International Classification of Diseases, Tenth Revision.⁷ They received at least 2 treatments with different classes of antidepressants at an optimal dosage, and treatment ineffectiveness lasted for at least 4 weeks. The control group consisted of 26 patients (9 men, 17 women; mean [SD] age, 46.88 [17.73] years). Controls did not have any psychiatric disorders, such as depression. Individuals with any disease of the central nervous system or the pituitary gland were excluded.

In both groups, the serum HGH level was measured between 8 AM and 10 AM, using an immunoenzymatic method. Samples were obtained in the fasting state, and participants were only allowed to drink water. Physical examination was performed and medical histories were taken from all participants. Psychiatric examinations were also performed to exclude patients with any symptoms of depression from the control group. The study was approved by the local ethics committee.

Statistical analysis  The Shapiro–Wilk and Mann–Whitney tests were used to compare the HGH results between groups. The correlation between body mass index (BMI) and HGH levels was analyzed using the Pearson R test. The χ² test was used to analyze the correlation between the HGH level and the occurrence of diabetes and arterial hypertension.

Results  First, the Shapiro–Wilk test was used to test the analyzed variable (HGH level) for...
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mental and emotional well-being as well as cognitive
function of patients, but its association with drug-
resistant depression remains unclear. Atypical
depression connected with growth hormone de-
iciency was described by Mahajan et al. In their
study, 61% of patients with HGH deficiency had
symptoms of depression, but their mood, energy
level, and sleep disturbances improved after 2 months of HGH treatment. In a study by Matussek and Laakmaan, patients with endogenous depression had a significantly reduced growth hormone response after desipramine administra-
tion, as compared with patients with neurontic
depression and controls. In a 9-year follow-up,
Gilchrist et al observed a significant decline in
mental and physical health in untreated HGH-
deficient adults. In contrast, patients who re-
ceived HGH showed improved quality of life, in-
cluding mood, energy level, and vitality.

In our study, patients with drug-resistant de-
pression, who developed the illness after the age
of 20, had a significantly lower blood HGH levels
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sion, especially in patients with disease onset af-
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HGH starts to decrease. The hormone’s mecha-
nism of action on the brain has not been elucidated,
but Johansson et al revealed that the levels of insulin-like growth factor 1 and insulin-like
growth factor-binding protein 3, as well as immu-
noreactive β-endorphin, were increased in the ce-
rebrospinal fluid of patients after treatment with
HGH when compared with pretreatment values.
In the case of homovanillic acid and vasoactive
intestinal peptide, reduced HGH levels were ob-
served in the cerebrospinal fluid. Another study
revealed that changes in the levels of homovanil-
lic acid and free thyroxine after HGH administra-
tion are similar to those reported after successful
reatment of depressive disorders with anti-
depressant drugs. Although studies have report-
ed the beneficial effects of HGH substitution in
patients with HGH deficiency on the quality of
life, there have been no studies evaluating the ef-
fectiveness and safety of HGH in drug-resistant depression.

HGH deficiency can also cause other symp-
toms, such as increased adipose tissue mass ac-
panied by reduced lean tissue mass and re-
duced extracellular water, visceral obesity, re-
duced bone mineral density, reduced exercise ca-
pacity, increased risk of coronary heart disease,
increased insulin resistance, and kidney function
disorders. In our study, patients with HGH de-
iciency had a higher BMI than controls. The oc-
currence of hypertension and diabetes was simi-
lar in both groups.

Discussion Drug-resistant depression is a con-
siderable challenge in modern medicine. Despite
new treatment methods, 60% of patients with uni-
polar disease are still unable to achieve remission
after treatment with 2 antidepressants at the ade-
quately dosage. The role of HGH in the pathogene-
sis of depression in adults still seems to be under-
estimated and not fully understood. Several stud-
ies have suggested that HGH is crucial for men-
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resistant depression remains unclear. Atypical
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HGH is secreted by the pituitary gland in a pul-
satile manner, so its blood level can change dur-
ing the day. In the present study, blood samples
were taken between 8 AM and 10 AM to reduce the probability of incorrect results due to the nat-
ural fluctuation of the HGH level. Further re-
search with HGH stimulation by arginine, L-dopa,
or clonidine is needed to evaluate the dynamics
and periodicity of HGH secretion in patients with
drug-resistant depression. Future studies should
also include a larger group of patients with uni-
polar disease and evaluate the effectiveness
and safety of HGH treatment.

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