Background: Growth hormone is fundamental in skeletal growth during puberty, but however, detailed studies of body composition analyses in adolescents with GH deficiency on growth hormone therapy are scarce. Moreover, there are few studies on the psychologic aspects of rhGH therapy in this population.

Objective and hypotheses: In this case-control study, we investigated differences in body composition based on bio-impedance measurements between adolescents with idiopathic growth hormone deficiency (GHD) who were treated with recombinant human growth hormone (rhGH) for at least 6 months (treatment group) and adolescents with idiopathic short stature who had not received rhGH as yet (control group).

Method: Participants were evaluated for short stature and were matched for age, height, body mass index (BMI) and bone age, were enrolled. (p=0.047) and extracellular (p=0.038) water volumes were significantly increased in the treatment group. Body cell mass protein (p=0.023), extracellular fluid protein (p=0.022), bone mass (p=0.038), soft tissue mineral content (p=0.016) and body calcium (p=0.017) were increased, along with increased metabolism of the bones (p=0.016) and skeletal muscles (p=0.022). Interestingly, no statistically significant differences in fat mass and in the QOLISSY-C and CODI questionnaires were found between the two groups.

Conclusion: Bio-impedance analysis is a potent, non-invasive tool for assaying body composition, confirming the expected beneficial changes of rhGH treatment. The lack of differences in the psychometric questionnaires may reflect the negative effects of short stature in both groups.

Abstract

Study design-Setting
It is a cross-sectional study, which was conducted in the Unit of Applied Research in Endocrinology & Diabetes, Athens University Medical School, Athens, Greece between September 2014 and May 2015. The study was approved by the Ethics Committee of Athens University Medical School, Athens, Greece and conformed to the Helsinki Declaration for human studies.

Participants
Adolescents, males and females, aged 10 - 19 years, with idiopathic Growth hormone deficiency, who were treated with recombinant human growth hormone (rhGH) for at least 6 months (treatment group) and adolescents with idiopathic short stature who had not received rhGH as yet (control group).

Variables-Measurements
BIA measurements
Bioelectric impedance analysis was performed with the BIA-ACC device (BIOTEKNA, Inc., Venice, Italy). This device applies alternating currents using two different frequencies, 50 and 1.5 kHz (bi-frequency measurement method), to measure body composition based on a multi-compartment model (2C, 3C, 4C, 5C). The individual lies supine on a flat surface that is non-metallic elements. Two electrodes are applied on the dorsal surface of the right hand and two electrodes on the dorsal surface of the right foot. The formulas used for computations have been previously described in detail. This method is bloodless, simple and rapid; does not require skilled staff, is relatively inexpensive, and does not expose patients to radiation. The BIA-ACC device distinguishes between healthy and diseased populations and has been validated in an earlier study of a very large number of participants.

Quality of Life in Short Stature Youth - QOLISSY-C Questionnaire
The QOLISSY questionnaire was developed as a patient reported instrument for short stature children (8-12 y) and adolescents (13-18 y) with growth hormone deficiency or idiopathic short stature. It consists of three core dimensions (Physical, Social & Emotional QoL) with 22, 5-point Likert-scaled, items and three additional domains (Coping, Attitude & Treatment QoL) with 28, 5-point Likert-scaled items, from not at all/never (0 points) to Extremely/Always (4 points).

Conclusions
Our results have demonstrated the anabolic effects of GH in the group, receiving hormonal replacement, while, also, confirmed the expected beneficial changes in body composition. These findings were associated with increased metabolism of bone and skeletal muscle tissue. The lack of differences in the psychometric questionnaires may reflect the negative effects of short stature in both groups and the lack of systematic psychologic follow-up of the patients with short stature. Bio-impedance analysis seems to be a potent, non-invasive tool for assaying body composition, confirming the expected beneficial changes of rhGH treatment.

References