Assessment of body composition of children with short stature on growth hormone therapy and its relation to serum IGF-1

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Introduction

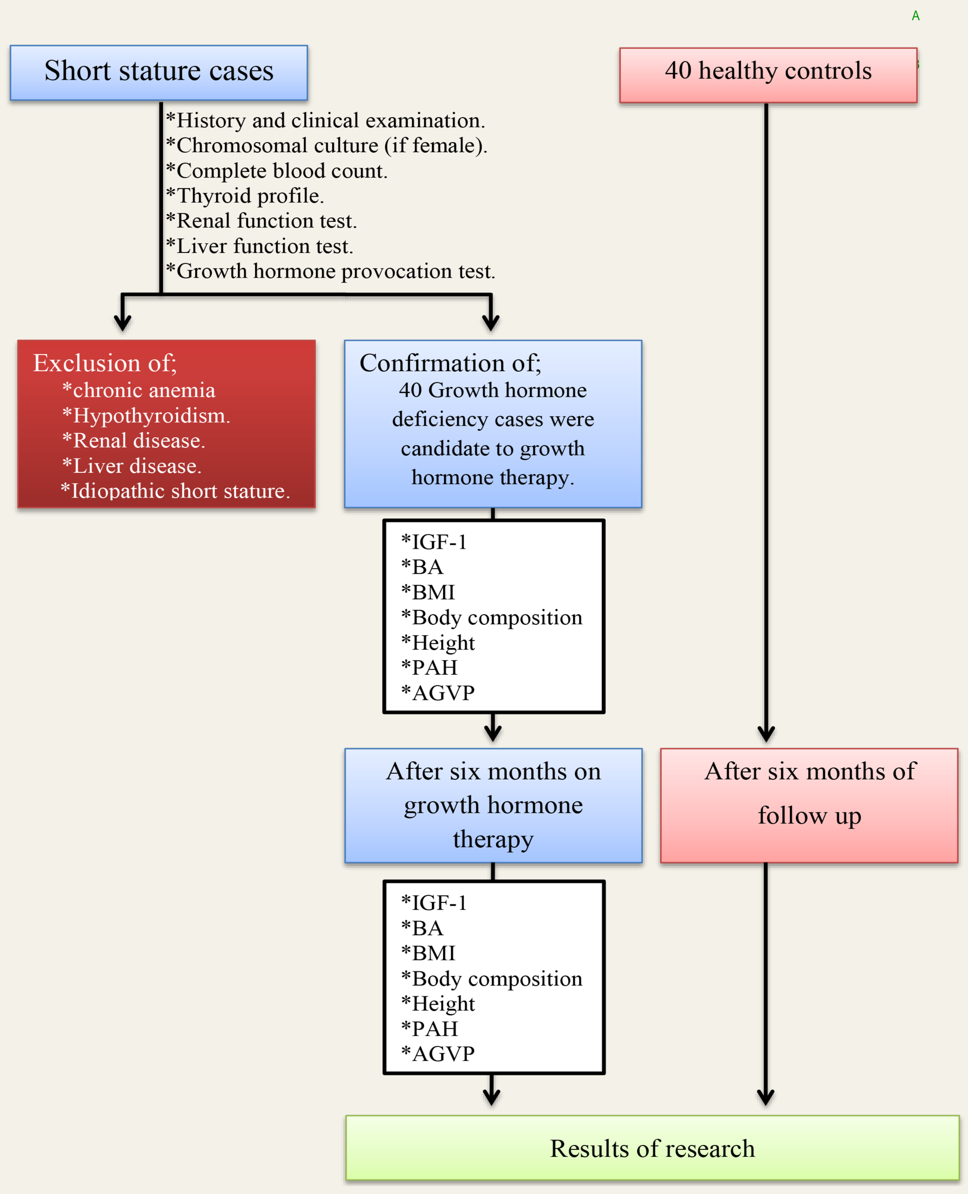
Short stature is one of the most common causes of referring children to pediatric endocrinologists. Familial and constitutional growth delays are the main causes, followed by growth hormone deficiency (GHD). Both growth hormone GH and IGF-1 have major role in controlling body composition through regulation of muscle metabolism by promoting positive protein balance via increasing protein synthesis and inhibiting protein breakdown through up-regulation of Lipoprotein lipase expression. GH has remarkable effect on lipid metabolism with influence on IGF-1 through stimulation of lipolysis and ketogenesis. This study aimed to prospectively assess body composition among isolated GHD group starting GH replacement and after six month of therapy versus control group and its relation to serum IGF1.

Subjects and methods

forty isolated GHD subjects (22 males and 18 females) with age mean 11.34±4.03 years. Auxological anthropometry and biochemical changes including height standard deviation score (HT-SDS), predicted adult height (PAH), age of growth velocity peak (AGVP), body mass index (BMI), bone age (BA), (IGF-1) and body composition were compared to control group (n=40) at start of growth hormone therapy and after six months of follow up.

Growth hormone deficiency proved by provocation test (by insulin, clonidine); peak less than 7 µg/L. our results revealed peak of GH was 1.42±0.77 µg/L.

Body composition was obtained through bioelectrical impedance analysis (BIA) technique, using body composition analyzer "Tanita BC-418 MA" (Tanita coop, Tokyo, Japan) prior to GH therapy and after six months.



Results

After six months of GH therapy, there was significant change in body composition with significant increase in free fat mass (FFM), muscle mass (MM) in relation to the increased level of serum IGF-1. While there was significant decrease in BMI, fat mass (FM) compared to control group. There was significant increase in HT-SDS, PAH, AGVP, with no significant increase in bone age compared to control group.

There was no significant correlation of IGF-1 at baseline or after six month of follow up and body composition variables in both case and control group.

Difference of IGF 1 from baseline to six months follow up in studied groups:

	Cases group (n=40)	Control group (n=40)	P-value
Delta IGF1 (ng/ml) Median (Min-Max)	34.46 (0.87-101.7)	5.55 (0.66-16.99)	<0.001

** Mann-Whitney test*

Difference of BMI from baseline to six months follow up in studied groups:

Difference (After6m-baseline)	Cases group (n=40)	Control group (n=40)	P-value
BMI (Kg/m^2) Median (Min-Max)	-0.80 (-3.30-0)	-0.05 (-0.60-0.2)	<0.001

**BMI=Body mass index.*
**Mann-Whitney test was used.*

Difference of PAH and AGVP from baseline to six months follow up in studied groups:

Difference (After6m-baseline)	Cases group (n=40)	Control group (n=40)	P-value
PAH (cm) Median (Min-Max)	2.50 (-12.8- 8.60)	-1.20 (-3.00 - 0.00)	<0.001
AGVP (years) Median (Min-Max)	0.20 (-0.50 - 0.90)	0.00 (-0.20- 0.10)	<0.001

**PAH=predicted adult height, AGVP= age of growth velocity peak.*
**Mann-Whitney test was used.*

Differences of body composition variables from baseline to six months follow up in studied groups:

Delta (Post-Pre)	Cases group (n=40)	Control group (n=40)	p-value
Total body			
Fat%	-2.58(-9 - -1.33)	-0.5 (- 1 - 0.00)	<0.001
Fat mass	-2.3 (-3.1 - -1)	-0.7 (0.4 – 2)	<0.001
FFM	1.9 (0.9 – 3.1)	0.8 (1.2 – 0.3)	<0.001
Arms			
Fat%	-2.67 (-9.20 - -1.50)	0.00 (-0.50- 0.50)	<0.001
FFM	0.20 (0.10- 0.50)	0.05 (-0.05- 0.05)	<0.001
MS mass	0.25 (0.10- 0.75)	0.02 (0.00- 0.10)	<0.001
legs			
Fat%	-3.00 (-15.50--1.50)	0.00 (-0.50- 0.50)	<0.001
FFM	0.45 (0.15- 1.25)	0.05 (0.00 - 0.15)	<0.001
MS mass	0.40 (0.15- 1.25)	0.05 (0.00 - 0.10)	<0.001
Trunk			
Fat%	-2.70 (-7.10 - -0.80)	0.00 (-1.00 - 0.00)	<0.001
FFM	0.50 (-1.90- 2.50)	0.15 (0.00- 1.00)	<0.001

** FFM= free fat mass, MS= muscle, FFMI= free fat mass index and FMI= fat mass index.*
**Mann–Whitney was used.*

conclusion

After six months of GH therapy for isolated GHD children, GH has its effect on body composition mainly muscle mass rather than fat mass with the significant increase of IGF-1 level, PAH and AGVP. Six month of therapy was not significant duration to produce changes on bone age.