EXAMINING THE DISTRIBUTION OF ABDOMINAL FAT IN GROWTH HORMONE DEFICIENCY USING MAGNETIC RESONANCE IMAGING

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Background

- Adults with growth hormone deficiency (GHD) reportedly present with altered body composition characterised by an increase in fat mass, predominantly in the visceral compartment[1].
- The ratio of visceral to subcutaneous fat, a metric of body fat distribution, is a unique correlate of cardio metabolic risk[2].
- Magnetic resonance imaging (MRI) offers high precision measurements for visceral fat quantification without the radiation risks of computerised tomography (CT).
- To our knowledge, there have been no detailed MR based investigations into the abdominal fat distribution of the GH deficient state in comparison to matched GH-treated GHD adults and healthy controls.

Aims

- To compare abdominal fat distribution in **untreated GHD adults** with **treated GHD adults** and **healthy controls.**

Untreated GHD | Treated GHD | Healthy controls

Methods

- Cross-sectional study.
- 22 untreated GHD, 23 treated GHD & 20 matched healthy controls were recruited.
- All subjects underwent anthropometry and body fat % measurement with a bio-impedance scale.
- MR studies were performed using a 3 Tesla Philips Achieva scanner. Subcutaneous (s.c.) and visceral abdominal fat content was measured by acquiring images at the L4/L5 junction.
- REC approval obtained.
- Statistical tests as described (Minitab v16).

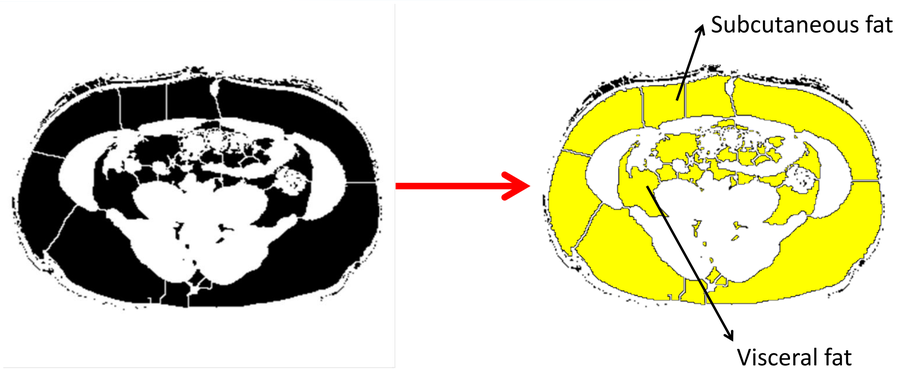

Fig 1: Axial images were are acquired at L4/L5 during a breath hold. Fat and water were separated and binary gating applied to produce a map of structures containing >50% fat, identified as s.c. fat and visceral fat. A watershed algorithm was used to divide the binary image into distinct areas and allow easy separation. Image J, an image-processing program, was used to subtract the 2 areas.

Results

Mean ±SD	OFF GH	ON GH	Controls	P value
Total No	22	23	20	
Age	27.85± 9.34	29.76± 10.07	31.05± 7.93	0.54
Sex ratio	59.2% males	65.2% males	60% males	
Aetiology of GHD:				
MPHD / Isolated GHD	17/5	20/3	NA	0.40
Childhood /Adult onset	18/4	15/8	NA	0.21
CNS Surgery	14	9	NA	0.48
Cranial radiotherapy	16	8	NA	0.48
Chemotherapy	6	1	NA	0.48
Anthropometry:				
BMI (kg/m^2)	29.9 ± 8.7	29.6 ± 6.7	25.1 ± 4.2	0.058
Waist (cms)	94.8 ± 21.9	99.5 ± 16.9	86.8 ± 10.8	0.085
Body fat %	31.2 ± 13.4	30.1 ± 9.9	22.5 ± 9.1	0.031
Activity level (MET min/week)	1622†	2043†	2735†	0.246*
Metabolic parameters:				
HOMA index	2.5 ± 1.9	2.7 ± 2.8	1.4 ± 1.3	0.198
HbA1c (%)	5.6 ± 0.8	5.5 ± 0.4	5.2 ± 0.4	0.254
Total cholesterol (mmol/L)	5.3 ± 1.1	5.1 ± 1.1	4.8 ± 1.1	0.450
HDL (mmol/L)	1.2 ± 0.3	1.5 ± 0.4	1.4 ± 0.3	0.007
LDL (mmol/L)	3.3 ± 1.1	2.9 ± 1.2	2.7 ± 0.8	0.292

Table 1: above shows the subject characteristics including aetiology, anthropometry and metabolic profiles (ANOVA and Kruskal-Wallis* tests undertaken, † indicates median)

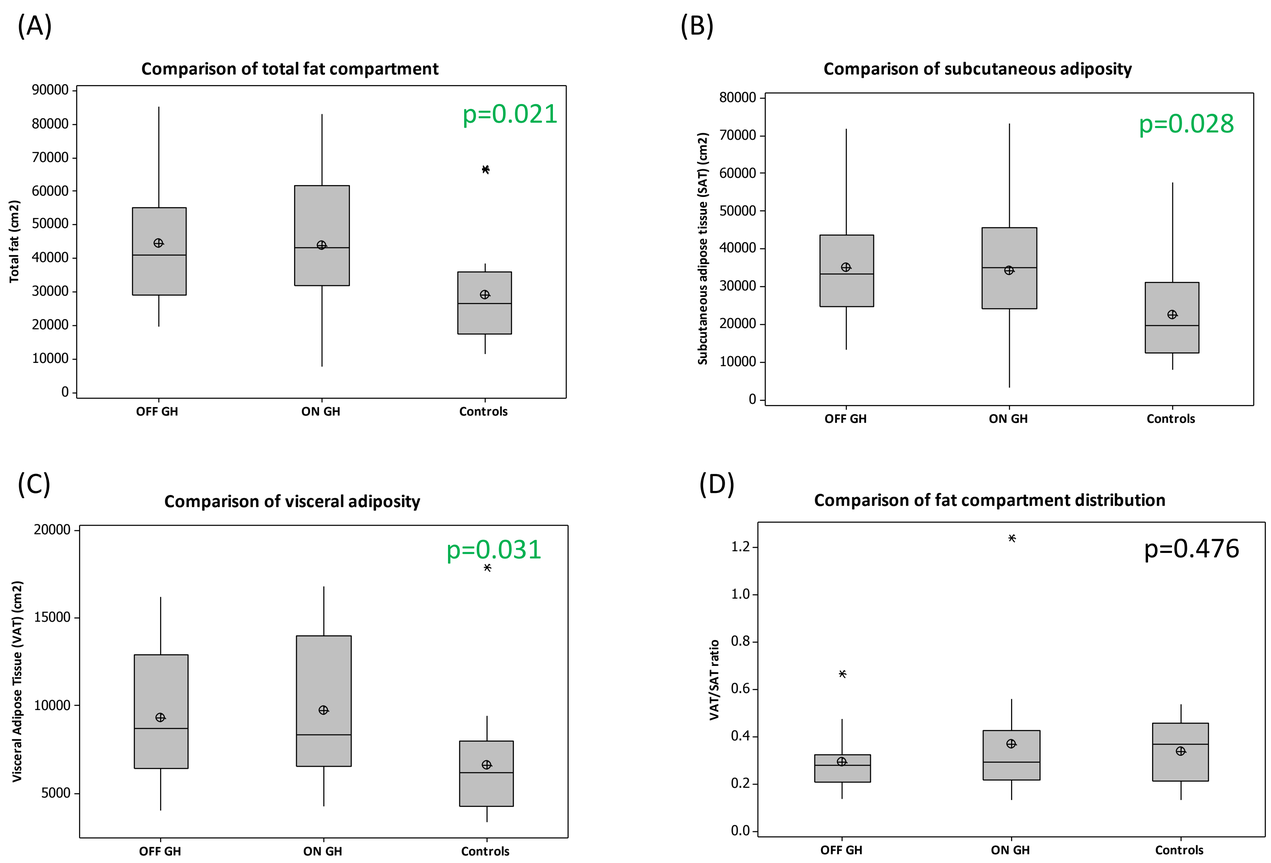

Fig 2: Comparison of body composition of untreated GHD patients, treated GHD patients and healthy controls (A) Total fat content, (B) subcutaneous fat content -SAT, (C) visceral fat content-VAT, (D) fat compartment distribution-VAT/SAT (one-way ANOVA)

Conclusions

- Hypopituitary (both untreated GHD and treated GHD) patients have increased total, subcutaneous and visceral abdominal fat compared to age, sex and physical activity matched healthy controls.
- Untreated GHD adults do not demonstrate altered abdominal fat distribution (VAT/SAT) when compared to treated GHD adults and healthy controls.
- Other factors such as underlying CNS malformation, exposure to radiotherapy and chemotherapy appear to be more important in determining body composition than GH status.

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References:

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