Repletion of Intramyocellular Lipids (IMCL) is Different in GHD Patients with Growth Hormone Deficiency (GHD) Compared to Control Subjects (CS) 24h after a 2h Aerobic Exercise

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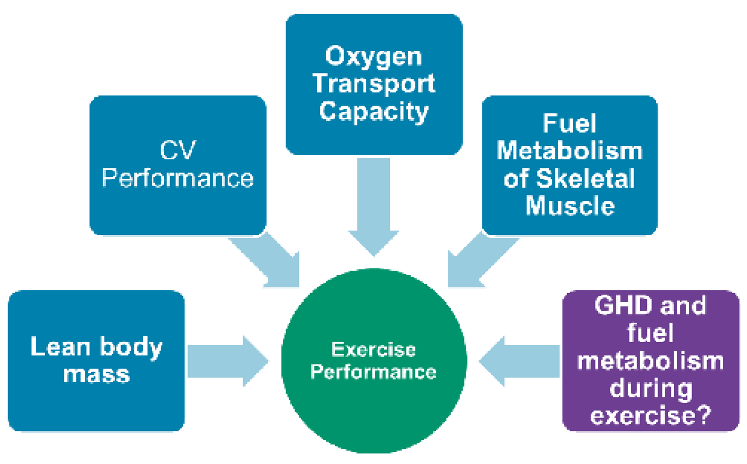
Background

Growth hormone deficiency is associated with decreased exercise capacity, impaired body composition with increase in fat mass and a reduction in lean body mass.

Fat can be stored in adipose tissue but also in non-adipose tissue such as skeletal muscle and liver tissue, so-called ectopic lipids.

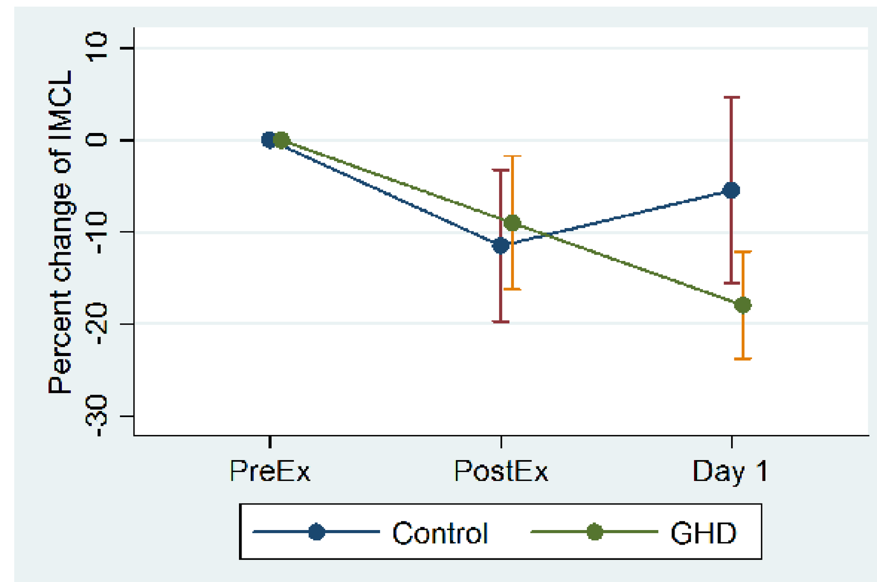


Aims

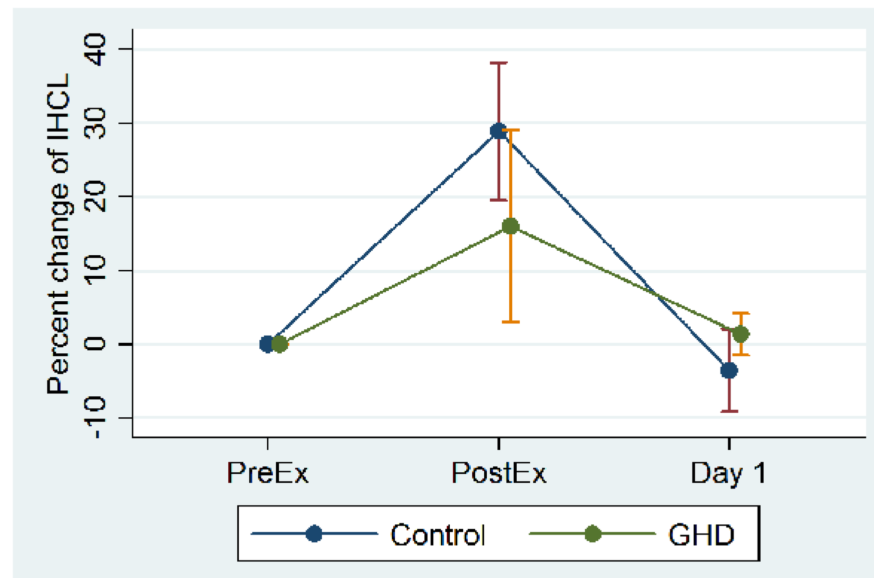
We and others have shown that ectopic lipids are flexible fuel stores in healthy subjects, in patients with type 1 diabetes and in GHD. IMCL are depleted by exercise and repleted by diet. In contrast, 2h aerobic exercise increases intrahepatocellular lipids (IHCL) immediately after exercise.

So far, it is not clear whether the exercise-induced flexibility of IMCL and IHCL persists until 24h and whether healthy subjects and patients with GHD behave differently.

IMCL and IHCL results

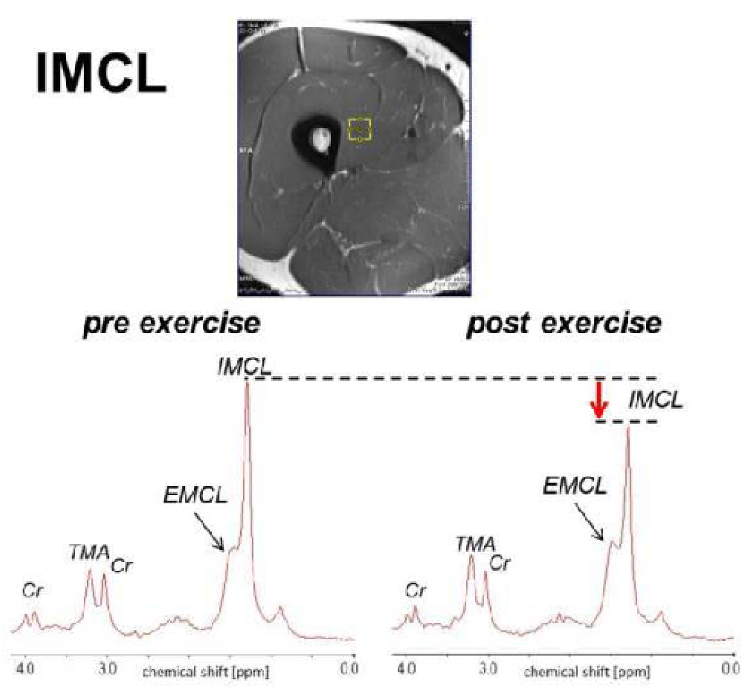


IMCL were decreased during aerobic exercise in both groups (-11.5±21.9% in CS and -8.9%±19.1% in GHD) and repleted after 24h in CS (-5.5±26.6% compared to baseline) but not in GHD (-17.9±15.3%), (p=0.048 for interaction)

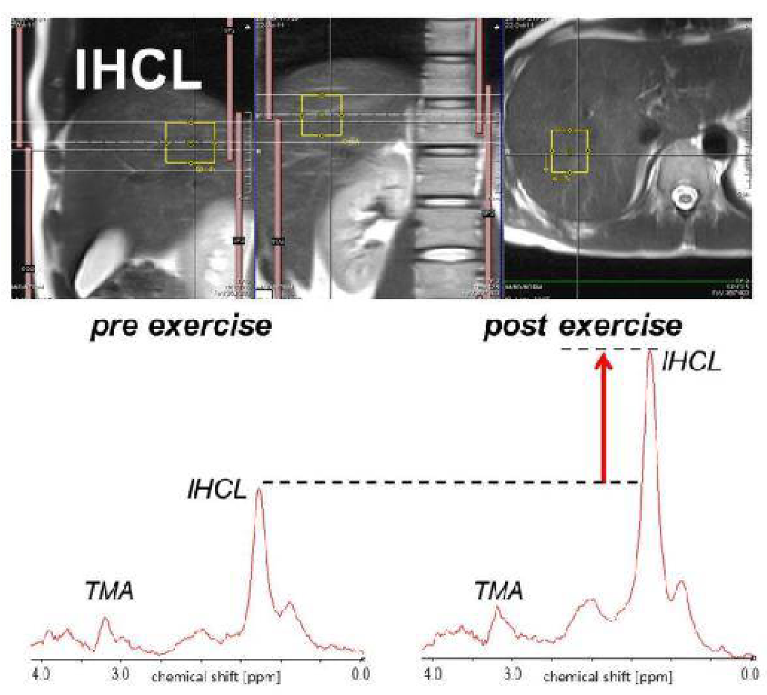


IHCL increased immediately after exercise and decreased to baseline after 24h (p=NS for interaction).

Methods



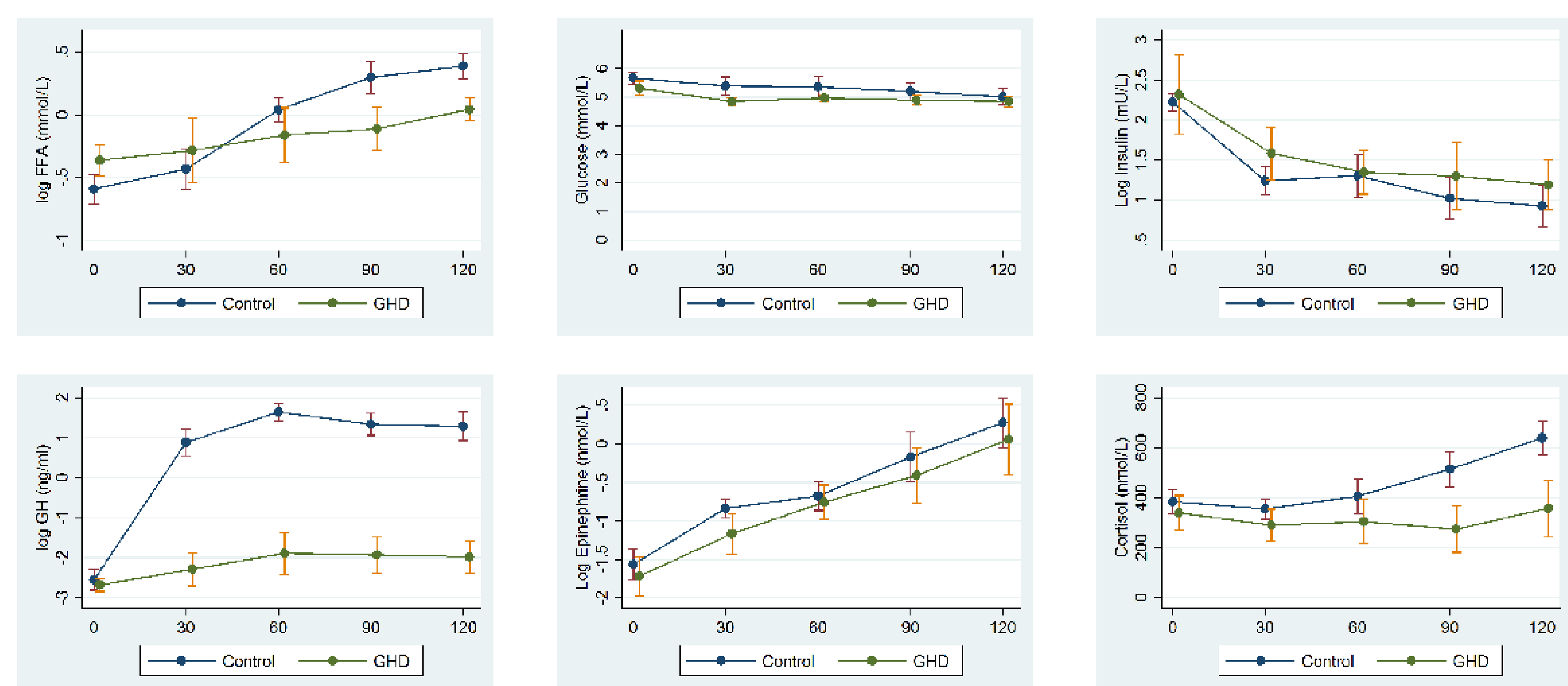
[1]H-MRS : quantification of ectopic lipids in skeletal muscle



[1]H-MRS : quantification of ectopic lipids in liver

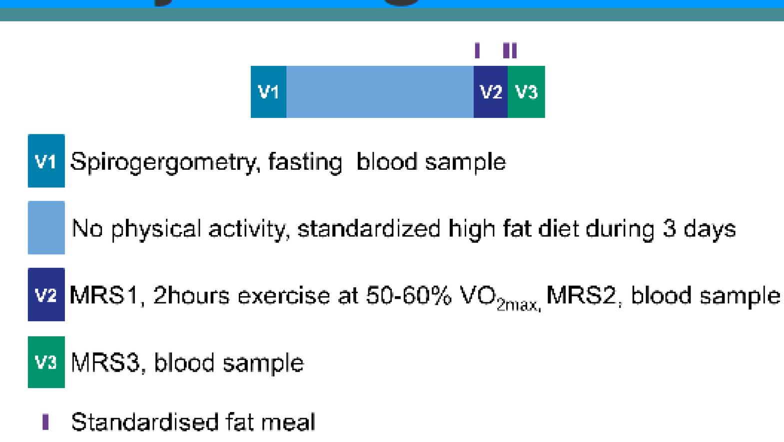
- Male patients with GHD and sedentary male CS matched for age, BMI and waist circumference were included
- $\dot{V}_{O_2}$max was assessed by spiroergometry
- [1]H-MR-spectroscopy was performed in the M. vastus intermedius (quantification of IMCL) and the liver (quantification of IHCL)

Results for metabolites and hormones



Hormones and metabolites during 2h exercise: FFA=free fatty acids, glucose, insulin, growth hormone, epinephrine, cortisol

Study design



Conclusions

1. Flexibility of IMCL was different in patients with GHD 24h after exercise whereas the kinetics of IHCL were similar
2. Possible explanation: lack of lipolytic action of GH in patients with GHD with reduced fat availability following exercise thereby reducing the repletion of IMCL at 24h
3. Moreover the reduced exercise capacity of GHD may play a role

Results

- 14 men were recruited; Mean±SD age was 46.9±11.7 and 39±12.6 years in GHD and CS, respectively (p=NS)
- GHD patients had a significantly lower IGF-1 (ng/ml) compared to CI (80.2±47.5 and 139.5±33.2, respectively; p<0.05)
- $\dot{V}_{O_2}$max was 30.5±6.2 and 42.8±10.9 ($ml \cdot min^{-1} \cdot kg^{-1}$) in GHD and CS, respectively (p<0.05)