Liver enzymes and triglycerides predict biomarkers of insulin sensitivity in obese, non - diabetic adult patients

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Introduction

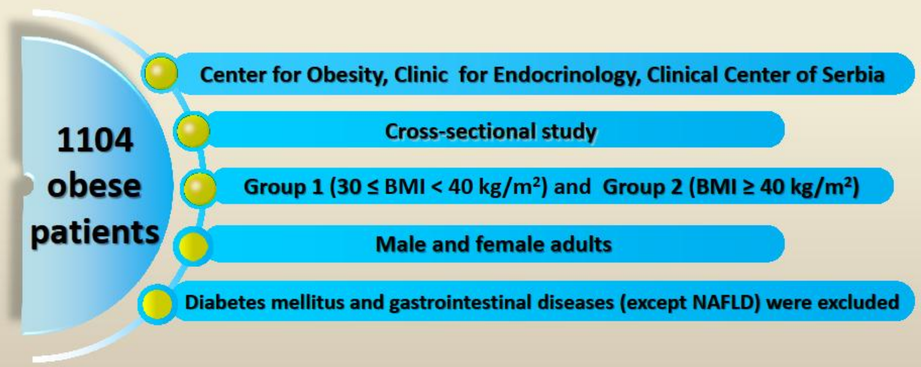
Obesity is the key risk factor for the development of insulin resistance, type 2 diabetes, cardiovascular diseases and non-alcoholic fatty liver disease (NAFLD).

NAFLD refers to a spectrum of conditions that ranges from simple hepatic steatosis to more severe disorders, including non-alcoholic steatohepatitis (NASH), fibrosis and finally, cirrhosis. NAFLD is characterized by elevated level of liver enzymes in the circulation. In particular, some prospective studies have shown that ALT and GGT are independent predictors of type 2 diabetes incidence.

Objectives

- Determination of eventual association between liver enzymes and cardiometabolic risk factors
- Identification of key anthropometric and biochemical parameters that predict insulin sensitivity according to the certain degree of obesity
- Assessing biomarkers in order to target individuals at risk for the introduction of weight management strategies

Methods



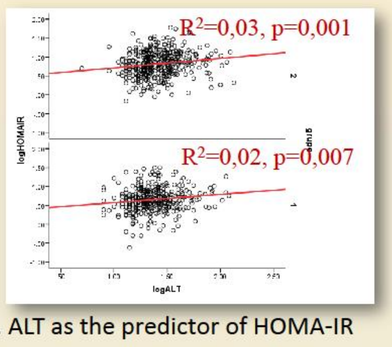
Results

Table 1. Anthropometric and metabolic characteristics of the study subjects stratified into two groups (A and B) according to BMI

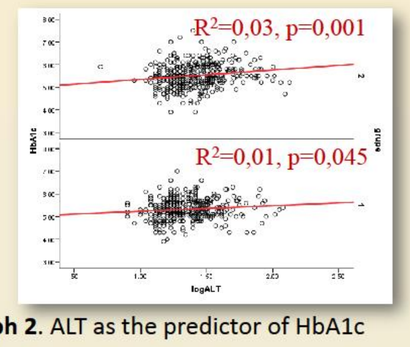
	BMI (kg/m²)		
	Group 1 (30.0-39.9)	Group 2 (≥40.0)	p
n	499	605	
Gender (male %/female %)	16.2 % / 83.8 %	27.1 % / 72.9 %	0.001
Age (years)	40.51 ± 13.22	39.62 ± 11.11	<0.0001
BMI (kg/m2)	35.53 ± 2.86	47.31 ± 6.21	<0.0001
Waist circumference (cm)	109.85 ± 8.79	131.68 ± 11.60	<0.0001
WHR	0.92 ± 0.07	0.94 ± 0.07	0.3
Fat (%)	42.75 ± 4.96	46.42 ± 5.94	<0.0001
Fasting glycemia (mmol/l)	4.21 ± 0.66	4.33 ± 0.73	0.017
Glycemia 60. min. OGTT (mmol/l)	6.89 ± 2.44	7.68 ± 1.93	0.017
Glycemia 120.min. OGTT (mmol/l)	5.50 ± 1.55	5.75 ± 1.61	0.041
Fasting insulin (mIU/l)	29.94 ± 22.56	44.87 ± 33.44	0.147
Insulin 60. min. OGTT (mIU/l)	140.79 ± 89.2	155.80 ± 89.12	0.44
Insulin 120. min. OGTT (mIU/l)	111.58 ± 94.4	120.29 ± 92.32	0.374
HOMA-IR	5.44 ± 4.50	8.76 ± 6.85	0.264
HbA 1c (%)	5.26 ± 0.52	5.84 ± 4.89	0.229
AST (U/l)	23.62 ± 7.63	26.16 ±12.11	0.108
GGT (U/l)	27.93 ± 24.84	30.98 ± 18.51	0.367
ALT (U/l)	24.67 ± 15.78	30.22 ± 18.54	0.801
Total cholesterol (mg/dl)	5.29 ± 1.02	5.22 ± 0.98	0.003
HDL (mg/dl)	1.37 ± 0.60	1.16 ± 0.27	0.01
LDL (mg/dl)	3.25 ± 0.89	3.28 ± 0.84	0.096
Triglycerides (mg/dl)	1.46 ± 0.75	1.67 ± 0.69	0.265
CRP (mg/l)	4.67 ± 5.37	7.97 ± 5.63	<0.0001

Table 2. Univariate correlations between liver enzymes and anthropometric and metabolic variables (adjusted for age and gender)

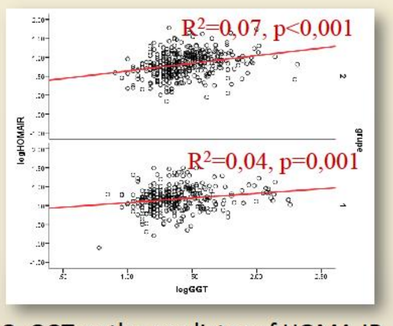
	ALT		AST		GGT	
	r	*p*	*r*	*p*	*r*	*p*
BMI (kg/m²)	0.05	0.168	0.01	0.732	0.11	0.005
waist circumference (cm)	0.11	0.015	0.07	0.132	0.18	<0.0001
WHR	0.17	0.003	0.13	0.023	0.22	<0.0001
Fat (%)	0.07	0.135	0.09	0.072	0.06	0.253
Fasting glycemia (mmol/l)	0.08	0.049	0.04	0.358	0.08	0.042
Glycemia 60. min. OGTT (mmol/l)	0.15	<0.0001	0.08	0.037	0.14	0.001
Glycemia 120.min. OGTT (mmol/l)	0.15	<0.0001	0.08	0.038	0.14	<0.0001
log Fasting insulin (mIU/l)	0.15	<0.0001	0.06	0.166	0.24	<0.0001
log Insulin 60. min. OGTT (mIU/l)	0.09	0.032	0.09	0.032	0.17	<0.0001
log Insulin 120. min. OGTT (mIU/l)	0.16	<0.0001	0.15	<0.0001	0.18	<0.0001
log HOMA-IR	0.18	<0.0001	0.05	0.248	0.27	<0.0001
HbA 1c (%)	0.05	0.125	-0.004	0.928	0.11	0.008
log CRP (mg/l)	-0.02	0.577	0.001	0.974	0.11	0.011
Total cholesterol (mg/dl)	0.1	0.011	-0.2	0.676	0.19	<0.0001
HDL (mg/dl)	-0.004	0.926	-0.14	0.716	-0.32	0.425
LDL (mg/dl)	0.07	0.099	-0.043	0.273	0.14	<0.0001
Triglycerides (mg/dl)	0.14	0.001	0.063	0.108	0.18	<0.0001



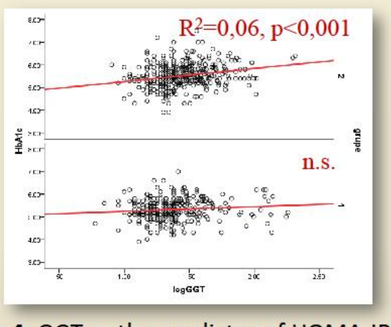
Graph 1. ALT as the predictor of HOMA-IR



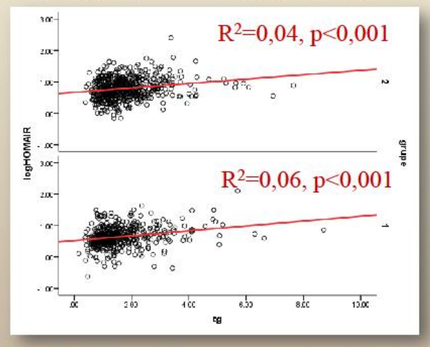
Graph 2. ALT as the predictor of HbA1c



Graph 3. GGT as the predictor of HOMA-IR



Graph 4. GGT as the predictor of HOMA-IR



Graph 5. Triglycerides as predictor of HOMA-IR

Conclusion

- **A significant correlation was found between liver biomarkers (in particular ALT and GGT) on one hand, and anthropometric parameters of abdominal obesity, HOMA-IR, one- and two- hours post-load plasma glucose and insulin levels and plasma triglycerides, on the other hand**
- **Parameters of insulin sensitivity and glucoregulation in obese patients could be presumed mainly by levels of liver enzymes and triglycerides regardless of the degree of obesity**

References

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