Adiponectin Protects Against Metabolic Syndrome by its Modulation of Lipid and Glucose Metabolism

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Background

- Adiponectin, an insulin sensitizer hormone uniquely expressed in adipose tissue, has an important role in regulating glucose and lipid metabolism by suppressing hepatic gluconeogenesis and increasing fatty acid oxidation.
- Although the mechanisms for development of hypoadiponectinemia are not well defined, low levels of plasma adiponectin have been reported in subjects with obesity, insulin resistance, type 2 diabetes and cardiovascular disease.
- As a result hypoadiponectinemia may be related with the development of Metabolic Syndrome (MS).

Objective

- To examine the relationship of adiponectin with MS in patients from cardiovascular and metabolism units of two tertiary university hospitals.

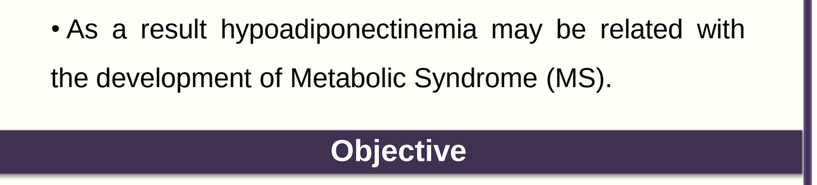
Subjects and Methods

Design

- Cross-sectional study

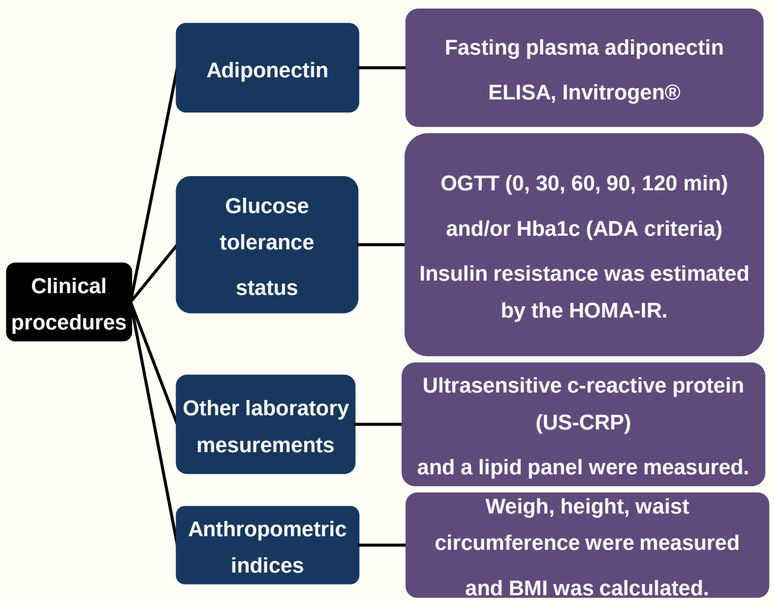
Subjects

- Patients from the Metabolism Unit of Hospital de Clínicas de Porto Alegre (HCPA) of Federal Universiiy of Rio Grande do Sul and from the Metabolism and Cardiovascular Units of Hospital São Paulo from Federal University of São Paulo (UNIFESP).



Methods

- MS was defined by at least three of the following: hypertension, low HDL and/or high triglycerides levels, hyperglycemia and high waist circumference and/or BMI (IDF 2009).



Statistical Analysis

- Data was expressed as absolute number (%), mean ± standard deviation (SD), median (P25-P75). Chi-square test and ANOVA were used as appropriate.
- Variables with a non-normal distribution were log transformed before analyses.
- Pearson's correlation coefficient was used for normally distributed variables.
- Multiple logistic regression analyses were performed to assess the relationship between adiponectin levels and MS while adjusting for confounders.
- A two-sided P value <0.05 was considered significant.

Results

Table 1: Subjects characteristics according to the presence of metabolic syndrome

	HCPA cohort			UNIFESP cohort		
	MS – (n=36)	MS + (n=136)	p	MS – (n=39)	MS + (n=383)	p
Female sex (%)	78	70	0.531	25	47	0.010
Age (years)	48 ± 12	54 ± 11	0.010	59 ± 12	60 ± 10	0.647
Total cholesterol (mg/dL)	201 ± 41	205 ± 42	0.649	272 ± 48	270 ± 54	0.861
HbA1c (%)	5.5 ± 0.6	6.4 ± 1.2	<0.001	5.7 ± 0.8	6.9 ± 1.6	<0.001
NGT/PDM/ DM (%)	89/3/8	12/56/32	<0.001	52/32/16	13/31/56	<0.001
HOMA-IR	1.6 (1.1-2.4)	3.3 (1.9-4.7)	0.004	0.5 (0.3-0.6)	1 (0.6-1.6)	<0.001
HOMA-BETA	103(63-152)	114 (64-159)	0.496	54 ± 17	72 ± 35	<0.001
Metabolic syndrome criteria						
	HCPA cohort			UNIFESP cohort		
	MS – (n=36)	MS + (n=136)	p	MS – (n=39)	MS + (n=383)	p
BMI (Kg/m^2)	28 ± 6	33 ± 6	-	23 ± 3	29 ± 5	-
Waist circumference (cm)	94 ± 15	106 ± 12	-	84 ± 7	99 ± 12	-
HDL-cholesterol (mg/dL)	55 ± 13	47 ± 12	-	46 ± 12	38 ± 10	-
Triglycerides (mg/dL)	100 ± 40	162 ± 91	-	96 ± 26	163 ± 92	-
FPG (mg/dL)	91 ± 11	114 ± 41	-	100 ± 24	126 ± 47	-
2h-PG (mg/dL)	111 ± 43	191 ± 81	-	-	-	-
SBP (mmHg)	125 ± 19	144 ± 22	-	138 ± 24	141 ± 23	-
DBP (mmHg)	79 ± 11	87 ± 13	-	79 ± 15	80 ± 13	-

Data expressed as absolute number (%), mean ± SD or median (P25-75).

FPG = fasting plasma glucose; 2h-PG = 2 hour plasma glucose; NGT = normal glucose tolerance; PDM = prediabetes; DM = diabetes;

SBP = systolic blood pressure; DBP = diastolic blood pressure

Comparison of adiponectin levels according to the presence of metabolic syndrome, number of criteria and glucose tolerance

Figure 1. Adiponectin vs. Presence of MS

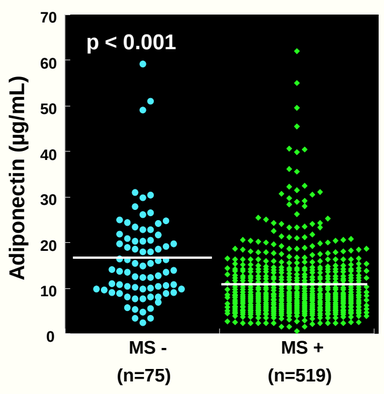


Figure 2. Adiponectin vs. Number of criteria

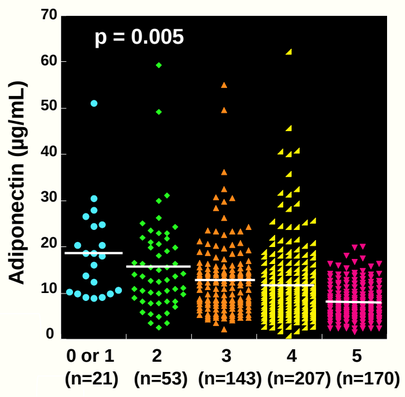
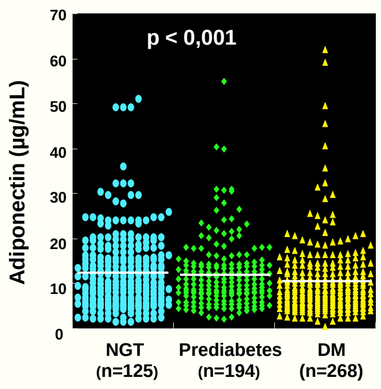
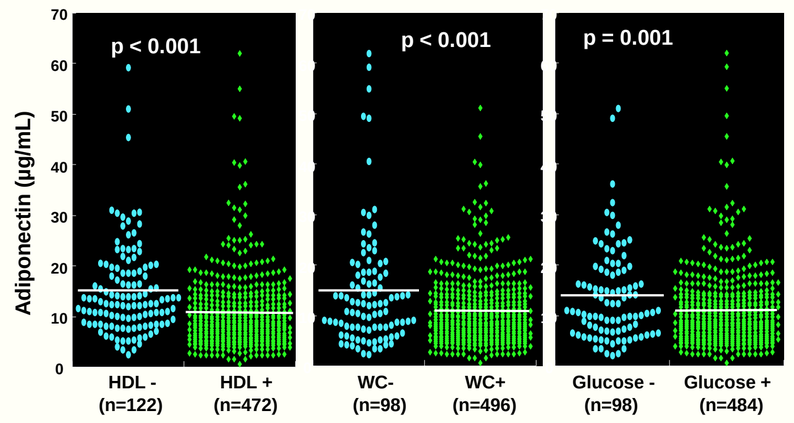


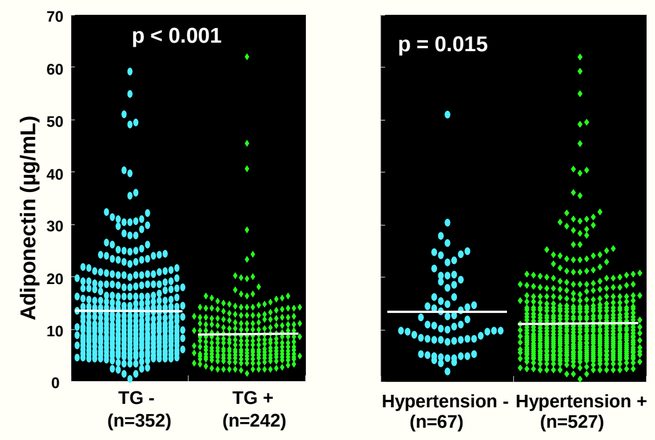
Figure 3. Adiponectin vs. Glucose tolerance status



How do adiponectin levels differ by the presence of each component of Metabolic Syndrome?

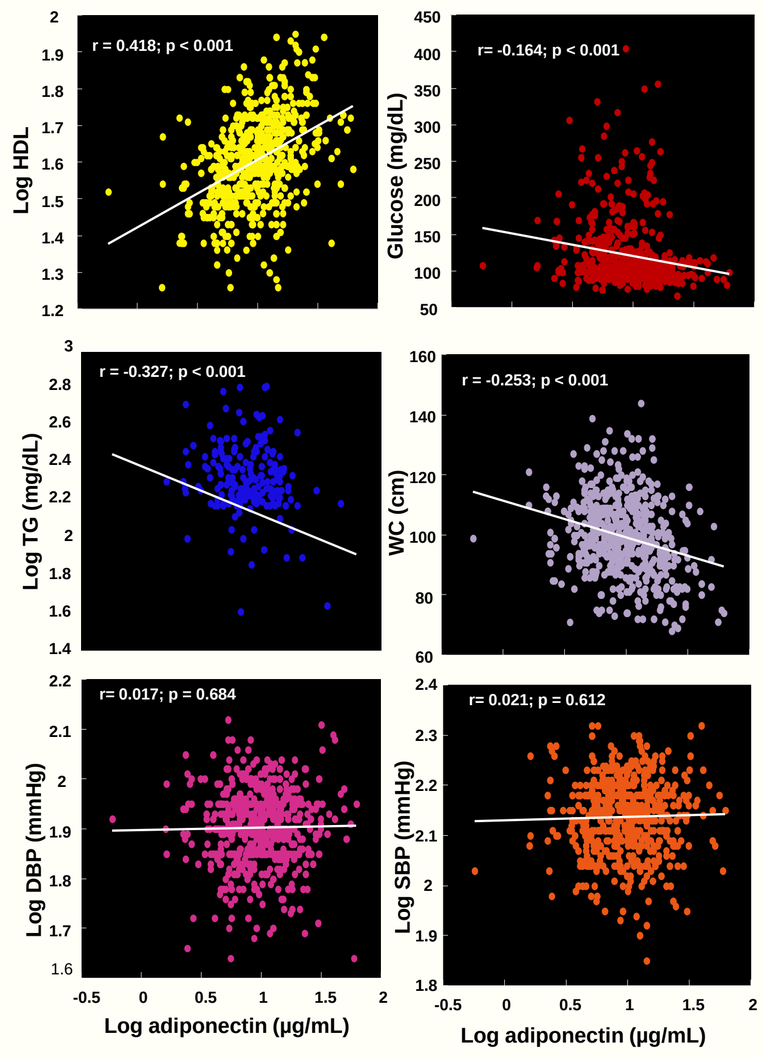
Figure 4. Adiponectin levels according to the components of metabolic syndrome





How do Adiponectin levels correlate to each Metabolic Syndrome criteria?

Figure 5. Correlations among adiponectin levels and Metabolic Syndrome criteria



Association between metabolic syndrome and adiponectin levels while adjusting for possible confounders (Poisson Multiple Regression)

Table 2 - HCPA and UNIFESP

Independent Variables	HCPA			UNIFESP		
	PR	CI 95%	p	PR	CI 95%	p
Gender	0.96	0.82 – 1.13	0.635	1,12	1,04 – 1,22	0,003
Age	1.01	1.01 – 1.02	< 0.001	1,00	0,99 – 1,01	0,236
1 DP Adiponectin*	0.87	0.79 – 0.97	0.012	0,93	0,89 – 0,98	0,006
US-PCR	1,01	1,00 – 1,02	0,001			
HOMA-IR	1,02	1,00 – 1,03	0,021	1,06	1,02 – 1,09	0,001
ISIMatsuda	0,96	0,93 – 0,99	0,003			

* 1 DP Adiponectin = **7,063 µg/mL**

Conclusions

Protection against MS associated with increasing adiponectin levels is not affected by sex, age, HOMA-IR and US-PCR, being possibly related to its positive modulation of lipid and glucose metabolism.

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