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Ambulatory arterial stiffness index is increased in obese children

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Background

Altered arterial stiffness is a recognized risk factor of poor cardiovascular health. Arterial Stiffness is already increased in obese children and adolescents but challenging to measure at daily routine. Therefore, ambulatory arterial stiffness index (AASI), a surrogate marker of arterial stiffness, was developped. It is already increased in lean hypertensive children, patients with diabetes mellitus type 1 and in children after renal transplantation. We tested the hypothesis that AASI is increased in obese children compared to healthy subjects.

Conclusion

This study showed increased arterial stiffness in obese children as assessed by measurement of AASI. AASI seems to be influenced by BMI independently to blood pressure values, suggesting that other factors are involved in increased arterial stiffness in obese children. These factors might involve values of vitamin D levels, inflammatory cytokines, adipokines or activation of sympathetic nervous system.

Methods

Retrospective analysis with data collection from January 2012 to December 2013. AASI is defined as one minus the regression slope of diastolic on systolic bloodpressure values derived from a 24 h blood pressure monitoring (abpm). AASI values were calculated in 101 obese children, 7 values were excluded due to insignificant regression slopes or insufficient data. 94 obese children, 45% girls (BMI-SDS median 2.9 (interquartile range (IQR) 2.4-3.8), median age 11.5 years (IQR 9.0-13.4) were compared with an age- and gender matched healthy control group of 71 subjects (49% girls) with BMI SDS median 0.0 (IQR -0.75 to 0.5), median age 12 years (IQR 10.0-14.0). Correlation analysis was done with Pearson and Spearman test, Mann Whitney U-test was performed for group comparison. Finally, multivariate regression analysis was applied to identify significant independent factors explaining AASI variability.

Results

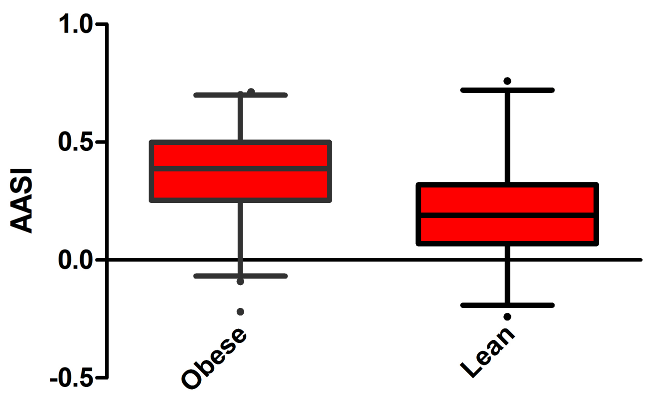
AASI was significantly higher in obese children compared to controls (0.388 (IQR 0.253-0.499) versus 0.190 (0.070-0.320), p<0.0001) (Figure 1), whereas systolic and diastolic blood pressure values were not different. In a multivariate analysis including obese children only, AASI was independently predicted by BMI and daytime systolic blood pressure (p=0.012); and in a multivariate analysis including obese children and controls BMI and pulse pressure independently influenced AASI (p<0.001) (Table 1).

Table 1:Influence of anthropometric parameters, blood pressure and metabolic parameters on AASI (Multivariate Regression Analysis)

	Anthropometric, blood pressure or metabolic parameters	*Standard Coefficient β*	*r^2*	*p*
AASI in obese participants only	24-h SBP SDS	0.34	0.12	0.012
AASI in obese participants & controls	BMI SDS	0.27	0.24	<0.001
	Pulse pressure	0.35	0.17	<0.001

Parameters included for obese only: age, BMI SDS, waist/height ratio, total cholesterol, HDL-cholesterol, LDL-cholesterol, triglycerides, glucose, insulin, pulse pressure, dipping, 24-h systolic blood pressure SDS, 24-h diastolic pressure SDS
Parameters included for obese and lean participants: age, BMI SDS, 24-h systolic blood pressure SDS, 24-h diastolic blood pressure SDS, 24-h pulse pressure

Figure 1: AASI values in obese (n=94) and lean children (n=71)



AASI in obese children was 0.388 (IQR 0.253-0.499) versus lean children 0.190 (IQR 0.070-0.320), p < 0.0001