

Body Mass Index and Body Fat Composition are Both Related to Central Precocious Puberty in Chinese Girls

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Background

Obesity in children and adolescents has become an increasing clinical and public health concern. It was reported that obesity is positively associated with sexual maturation in both boys and girls in China. However, the effect of obesity on pubertal development is incompletely elucidated.

Objective and hypotheses

To evaluate the fat mass and body composition by dual-energy x-ray absorptiometry (DEXA) in Chinese precocious puberty girls, and to examine the association between body fat composition, body mass index (BMI) and pubertal mutation in girls.

Method

Sexual maturation was evaluated by physical assessment. Skeletal age was determined by a left-hand roentgenogram and assessed by a radiologist according to the technique of Gruelich and Pyle. Ovarian volume was estimated by trans-abdominal ultrasound. Basal estradiol, luteinizing hormone (LH) and follicle-stimulating hormone (FSH) were measured. CPP girls were diagnosed according to their clinical characters and the results of LHRH stimulating test. Total body fat mass and percent body fat (%BF) was assessed with DEXA.

Results

Altogether, 37 central precocious puberty (CPP) girls and 39 age-matched prepubertal girls (age, 7 to 9 years) were enrolled in this study. The %BF of the CPP girls was significantly higher than control group (29.96 ± 4.43 VS 27.49 ± 3.56 , $p=0.009$); while the BMI of the two groups was 16.61 ± 1.62 and 15.38 ± 1.42 , respectively ($p=0.001$). In the CPP girls, the peak LH level in the LHRH stimulating test was negative correlated with the %BF and BMI. ROC curve showed BMI, Est.VAT volume and %BF had higher sensitivity and specificity for the CPP diagnosis.

Table. 1 the difference of BMI and %BF in the ICPP group and control group

	Control group (n=39)	ICPP group (n=37)	t	P
%BF	27.49 ± 3.56	29.96 ± 4.43	-2.686	0.009
Left arm %BF	33.69 ± 7.57	36.95 ± 7.27	-1.876	0.065
Right arm %BF	31.75 ± 7.68	34.37 ± 7.66	-1.469	0.146
Trunk %BF	23.45 ± 4.24	26.35 ± 5.32	-2.589	0.012
Left leg %BF	33.21 ± 5.04	35.41 ± 5.03	-1.878	0.064
Right leg %BF	33.18 ± 4.48	35.25 ± 4.98	-1.887	0.063
Est. VAT volume (cm3) *	65.15 ± 46.09	102.45 ± 52.89	-3.022	0.004
Est. VAT mass (g)	60.28 ± 42.67	94.80 ± 48.95	-3.022	0.004
BMI (kg/m2)	15.38 ± 1.42	16.61 ± 1.62	-3.518	0.001

* Est. VAT: Estimated Visceral Adipose Tissue

Conclusion

Higher BMI and %BF are found in CPP girls and adiposity is associated with early pubertal development in Chinese girls. The use of DEXA has been shown to be a reliable and accurate measurement of fat mass while BMI is also an equivalent measure for assessed the degree of obesity in Chinese girls. Because of its low cost and rapid administration, BMI is still a useful measurement for screening obesity and puberty in large population samples.

Acknowledgements

The study was funded by the Research Council of Science Technology Department of Zhejiang Province (grant numbers: 2016C33130)

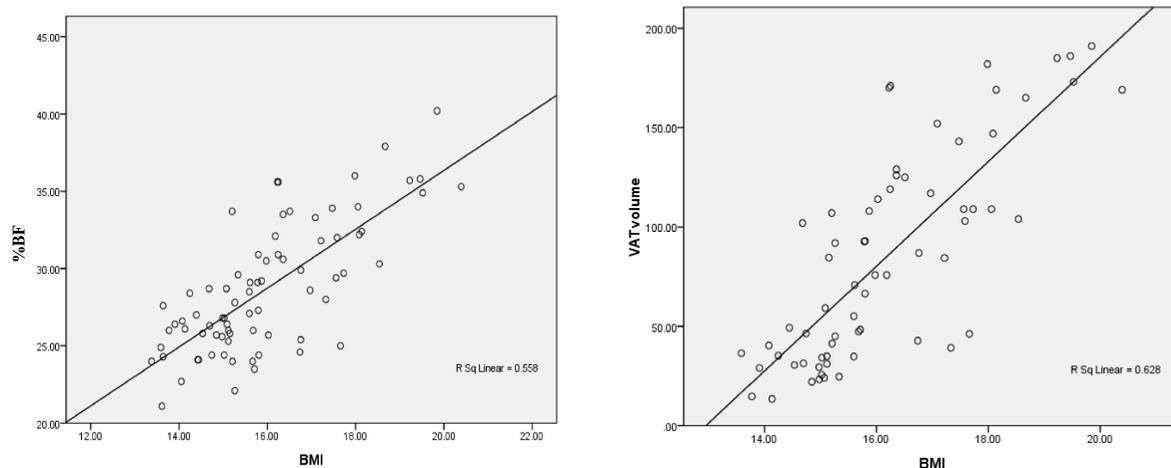


Fig.1 BMI and %BF, VAT volume

BMI correlated positively with %BF ($R=0.747$, $p=0.000$) and VAT volume ($R=0.792$, $p=0.000$)

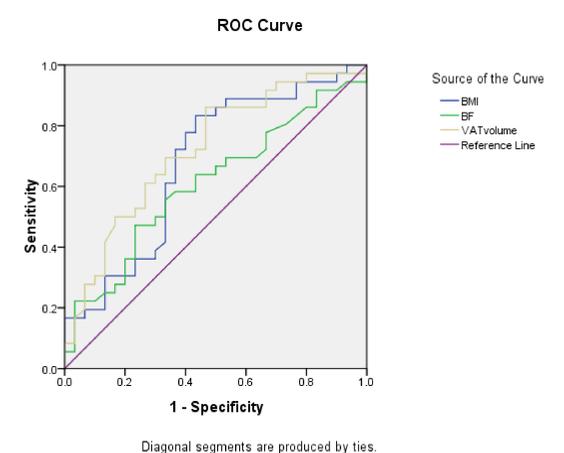


Fig.2 ROC curve for the diagnosis of CPP

ROC curve showed BMI, Est.VAT volume and %BF had higher sensitivity and specificity for the CPP diagnosis.