VISCERAL ADIPOSITY INDEX AS A MARKER OF HEPATIC STEATOSIS IN OVERWEIGHT AND OBESE PREMENOPAUSAL WOMEN

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INTRODUCTION

Visceral adiposity index (VAI) is a sex-specific index based on anthropometric measurements and biochemical parameters and was initially developed as an indicator of visceral adipose function for the assessment of cardiometabolic risk. Given that enlarged visceral adipose tissue is an important regulator of nonalcoholic fatty liver disease (NAFLD) it has been also proposed for the detection of hepatic steatosis (HS). However, the diagnostic performance of VAI as a marker of HS is still under investigation.

OBJECTIVE

To evaluate the accuracy of VAI as a marker of HS in a cohort of overweight and obese premenopausal women and to compare diagnostic performance of VAI and of two other HS markers: fatty liver index (FLI) and lipid accumulation product (LAP) index.

PATIENTS – METHODS

Anthropometric measurements, biochemical testing and abdominal ultrasonography after excluding causes of secondary liver disease were performed in 110 overweight and obese premenopausal non-diabetic women, aged 18-45 years, including 40 women with polycystic ovary syndrome (PCOS) (*Rotterdam criteria*). The three markers of HS - VAI, FLI and LAP - were calculated. The diagnostic performance of VAI, FLI and LAP was assessed with receiver operating characteristic (ROC) analysis.

$$\text{VAI}: [\text{WC}/39.68 + (1.88 * \text{BMI})] * (\text{triglycerides}/1.03) * (1.31/\text{HDL}), \text{for males}; [\text{WC}/36.58 + (1.89 * \text{BMI})] * (\text{triglycerides}/0.81) * (1.52/\text{HDL}), \text{for females}.$$

$$\text{LAP}_{\text{men}} = (\text{waist circumference} - 65) \times \text{triglycerides}$$

$$\text{LAP}_{\text{women}} = (\text{waist circumference} - 58) \times \text{triglycerides}.$$

$$\text{FLI}: [e^{0.953 * \log e(\text{triglycerides}) + 0.139 * \text{BMI} + 0.718 * \log e(\text{GGT}) + 0.053 * \text{WC} - 15.745}] / [1 + e^{0.953 * \log e(\text{triglycerides}) + 0.139 * \text{BMI} + 0.718 * \log e(\text{GGT}) + 0.053 * \text{WC} - 15.745}] * 100.$$

Table 1. Clinical & biochemical characteristics and markers of HS in women with and without hepatic steatosis

Variable	HS(+) (n=71)	HS(-) (n=39)	p-value
Age (years)	32.9 ± 7.3	34.7 ± 8.1	NS
Weight (kg)	94.7 ± 16.1	80.5 ± 12.0	<0.001
BMI (Kg/m^2)	36.0 ± 6.0	30.5 ± 4.5	<0.001
Waist (cm)	100.4 ± 13.7	86.9 ± 9.1	<0.001
Waist/Hip ratio	0.84 ± 0.08	0.79 ± 0.06	0.001
Fasting glucose (mg/dl)	83.4 ± 13.6	82.0 ± 9.7	NS
Fasting insulin (mIU/ml)	15.9 ± 10.1	9.1 ± 3.1	<0.001
HOMA-IR	3.3 ± 2.1	1.81 ± 0.67	<0.001
Cholesterol (mg/dl)	188.6 ± 35.3	184.3 ± 35.5	NS
HDL (mg/dl)	47.5 ± 13.0	51.9 ± 10.2	NS
LDL (mg/dl)	121.5 ± 30.4	118.8 ± 35.9	NS
Triglycerides (mg/dl)	120.9 ± 65.5	85.8 ± 35.6	<0.01
AST (U/L)	20.2 ± 12.1	16.0 ± 3.6	NS
ALT (U/L)	25.1 ± 17.1	16.0 ± 7.4	<0.001
ALP (U/L)	77.3 ± 41.0	62.3 ± 25.3	0.01
γGT (U/L)	22.1 ± 15.9	13.6 ± 5.7	<001

HS(+): women with hepatic steatosis , HS(-): women without hepatic steatosis.
Values are expressed as mean ± SD, p<0.05 is considered statistically significant.

RESULTS

NAFLD was detected in 71/110 (64.5%) women (31 PCOS and 40 non PCOS) by ultrasonography. Women with HS were heavier, with more pronounced central adiposity and more insulin resistant (Table 1). VAI, FLI and LAP values were higher in HS(+) compared to HS(-) women (p<0.01, p<0.001 and p<0.001, respectively) (Table 2). The areas under the ROC curves (AUROCs) for VAI, FLI and LAP was 0.71 (95% CI, 0.61-0.82), 0.82 (0.73-0.90) and 0.79 (0.70-0.88), respectively (Fig. 1). The cut-offs that combine the best sensitivity with optimal specificity are shown in Table 3.

Table 2. Values of VAI, FLI and LAP in women with and without hepatic steatosis

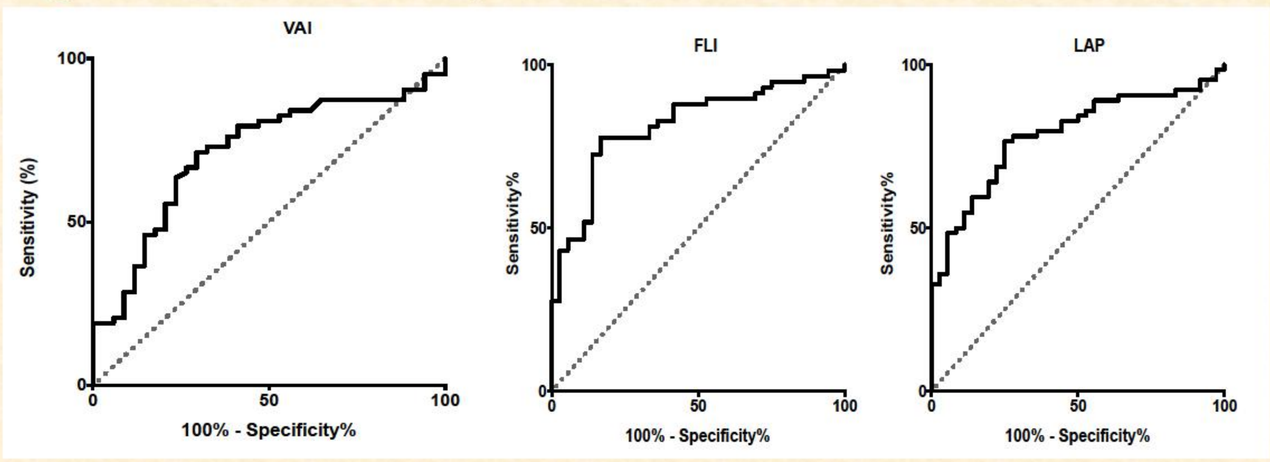
Variable	HS(+) (n=71)	HS(-) (n=39)	p-value
VAI	2.3 ±1.8	1.3 ±0.7	<0.01
FLIP	68.4±28.1	33.3±22.7	<0.001
LAP	60.8±41.7	28.6±13.9	<0.001

HS(+): women with hepatic steatosis , HS(-): women without hepatic steatosis.
Values are expressed as mean ± SD, p<0.05 is considered statistically significant.

Table 2. Sensitivity and specificity of suggested cut-off points of VAI, FLI and LAP

Variable	VAI	FLI	LAP
Cut-off point	> 1.5	>51.2	> 40.71
Sensitivity (%) (95% CI)	63.5 (50.4-75.3)	72.4 (59.1-83.3)	64.1 (51.1-75.7)
Specificity (%) (95% CI)	76.5 (58.8-89.3)	86.1 (70.5-95.3)	80.6 (64.0- 91.8)
Likelihood ratio	2.7	5.2	3.3

Figure 1. ROC curves of VAI, FLI and LAP



CONCLUSIONS

These data indicate that calculation of VAI is useful for detecting NAFLD in overweight and obese premenopausal women. However, FLI and LAP seem to have a superior diagnostic performance.

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