Cut – off point values of the estimated central obesity index determined with dual-energy x-ray absorptiometry in diagnosing the abdominal obesity in women

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INTRODUCTION

- Cushing's syndrome (CS) is associated with weight gain and extreme central, visceral, abdominal obesity.
- Obesity and especially central, abdominal obesity in CS and non CS abdominal obese with the metabolic syndrome are known risk factors for cardiovascular and metabolic diseases.
- Dual-energy X-ray absorptiometry (DXA) is considered to be a gold standard method which enables accurate, precise body composition and body fat distribution (BFD) assessment and determines central obesity index (COI) values.
- Estimated COI (eCOI) is an indicator of central, abdominal obesity, which is the main characteristic of the metabolic syndrome.
- To date, cut-off point values (CPV) of eCOI have not been provided in order to precisely confirm abdominal obesity in CS and non CS obese and for that reason it is the aim of this study.

MATERIALS AND METHODS

- Values of eCOI were determined as a ratio of estimated android (eA) and gynoid (eG) tissue percent fat (eCOI=eA/eG) in 3 groups of women: 1st group with CS (n=14), 2nd group of obese women (O) not different according to their age and BMI from group 1 (n=21), and 3rd group of non obese healthy women (C) with normal BMI (n=22).
- Cut off point value CPV_1 was determined of the DXA index of central, abdominal obesity $eCOI_1$, that best differentiated CS with confirmed extreme abdominal obesity and O matched for age, menopausal status, and BMI and CPV_2 of $eCOI_2$ that best differentiated group C and O and excluded abdominal obesity, during regular spine and hip scans for osteoporotic risk assessment. Their sensitivity (S), specificity (SP), positive and negative predictive value (PPV and NPV) and diagnostic accuracy (DG) were evaluated. DXA assessment in this study was performed with DXA System Lunar DPX-NT, which uses enCore Windows-XP Professional OS computer.

MATERIALS AND METHODS

• Cut-off point values (CPV) were determined for DXA indexes and their sensitivity (S), specificity (SP), positive and negative predictive value (PPV and NPV) and diagnostic accuracy (DG) were evaluated in the following way:

• Sensitivity (true positive rate) is the probability that a test result will be positive; there is extreme visceral obesity when the CS disease is present.

• Specificity (true negative rate) is the probability that a test result will be negative; there is no extreme central body fat distribution when the disease is not present in C and O.

• Positive predictive value (PPV) is the proportion of those with a positive test result (extreme central body fat distribution) who actually have a disease (CS).

• Negative predictive value (NPV) is the proportion of those with a negative test result (without extreme central obesity) who do not have a disease (C and O).

RESULTS

	COI_1>0.9	$eCOI_1$>0.95
Sensitivity (%)	85.71	85.71
Specificity (%)	47.62	57.14
PPV (%)	52.17	50
NPV (%)	83.33	90.91
DG (%)	62.86	67.56

	COI_2 <0.83	$eCOI_2$<0.87
Sensitivity (%)	76.19	80.95
Specificity (%)	95.45	95.45
PPV (%)	84.21	94.44
NPV (%)	87.5	95.45
DG (%)	84.09	88.37

COI_1 - Central obesity index $_1$ $eCOI_1$ - Estimated Central obesity index $_1$

COI_2 - Central obesity index $_2$ $eCOI_2$ - Estimated Central obesity index $_2$

PPV – positive predictive value NPV – negative predictive value DG - Diagnostic accuracy

DISCUSSION

- Obesity and especially central body fat distribution are known risk factors for cardiovascular and metabolic diseases.
- Android obesity in CS and in non CS abdominal obesity with the metabolic syndrome, which is predominantly visceral, intra-abdominal, is more predictive of adipose-related comorbidities than gynecoid obesity, which has a relatively peripheral (gluteal) distribution.
- Effective methods for assessing abdominal, visceral fat are important to investigate its role for the increased health risks in obesity.
- For this reason the evaluation of body composition and body fat distribution is clinically important.

DISCUSSION

- DXA is considered to be a gold standard for assessment of bone health and body composition, because of its reliability, precision, and the fact that it is based on a three-compartment model.
- DXA is used to quantify abdominal fat mass and enables precise, accurate body composition and body fat distribution assessment and determines central obesity index values.
- Increased central fat mass is characteristic of active CS.
- The first study concerning the measurements of body composition in CS using DXA and CT was published by Wajchenberg et al.* Patients with CS had no increase in total body fat region, but had a higher intra-abdominal fat area compared to obese subjects.
- Patients with CS had less than a twofold increase in subcutaneous fat and greater than a fivefold increase in intra-abdominal fat compared with values in healthy subjects.
- Body composition and fat distribution measured by DXA in women with CS compared with healthy control women matched for age, menopausal status, and BMI discovered that trunk fat mass percentage was significantly higher in CS and leg fat mass was not significantly different between the two groups. Fat mass was higher and lean body mass was lower in CS**.
- These findings suggest that fat in different body compartments responds differently to disease processes and that DXA can be used to measure these changes.

*Wajchenberg BL et al. J Clin Endocrinol Metab. 1995 Sep; 80(9):2791-2794.

**Garrapa GG et al. J Clin Endocrinol Metab. 2001;86(11):5301-5306.

CONCLUSIONS

- DXA index eCOI discovered extreme central body fat distribution in CS women. Values of $eCOI_1$ lower than 0.87 showed normal body fat distribution and differentiated the best group C from O and $eCOI_2$ CPV_2 values higher than 0.95 differentiated the best extreme central, visceral body fat distribution in CS women from suspected O and C.
- $eCOI_2$ value of 0.95 showed abdominal obesity, and could be used as diagnostic DXA index and criterion of extreme central, abdominal obesity in CS and non CS abdominal obese women in DXA body composition and fat distribution assessment.
- Determination of eCOI is reliable, practical, fast, with low radiation and acceptable as a routine diagnostic DXA screening procedure for body composition and BFD assessment, during regular spine and hip scans for osteoporotic risk assessment.