DEXA-Measured VAT Robustly Predicts Impaired Glucose Tolerance and Metabolic Syndrome in Obese Women

Xia Bi
Jefferson Medical College, Thomas Jefferson University, xia.bi@jefferson.edu

C. D. Keil
Vanderbilt University

L. Seabolt
Vanderbilt University

R. Tyree
Vanderbilt University

M. Buchowski
Vanderbilt University

See next page for additional authors

Let us know how access to this document benefits you

Follow this and additional works at: http://jdc.jefferson.edu/sigmaxi

Part of the Medicine and Health Sciences Commons

Recommended Citation
http://jdc.jefferson.edu/sigmaxi/4

This Article is brought to you for free and open access by the Jefferson Digital Commons. The Jefferson Digital Commons is a service of Thomas Jefferson University’s Center for Teaching and Learning (CTL). The Commons is a showcase for Jefferson books and journals, peer-reviewed scholarly publications, unique historical collections from the University archives, and teaching tools. The Jefferson Digital Commons allows researchers and interested readers anywhere in the world to learn about and keep up to date with Jefferson scholarship. This article has been accepted for inclusion in Sigma Xi by an authorized administrator of the Jefferson Digital Commons. For more information, please contact: JeffersonDigitalCommons@jefferson.edu.
ABSTRACT
Abdominal visceral adiposity (VAT) has been shown to be an independent risk factor for metabolic and cardiovascular disease. Using enCORE analysis version 13.6 on a GE Lunar iDXA, a new fully automated analysis software to measure VAT, we determined the strength of associations between DEXA-derived VAT and other known indicators for diabetes and cardiovascular disease risk in Caucasian and African American obese women. We collected anthropometrics, vital signs, lipid profile, and DXA whole body composition scan for 229 subjects with BMI 30.0 – 49.9 kg/m^2 & age 21 to 69 y. We then performed the non-parametric Spearman correlation analysis and found that in subjects overall, DEXA-VAT is positively associated with triglyceride, fasting glucose, fasting insulin, and HOMA-IR, and negatively associated with HDL. Among all anthropometric, body composition and cardiometabolic variables, DEXA-VAT was the most robust predictor of impaired glucose tolerance (IGT) and metabolic syndrome (MetSx) in binary regression analysis, even after adjusting for race. LASSO regression after adjusting for covariates that best predicted IGT and MetSx showed that HOMA-IR and DEXA-VAT most significantly predicted IGT (p<0.001, p<0.001, respectively), and DEXA-VAT most significantly predicted MetSx (p<0.001). These observations have implications for VAT associated risk in diabetes and cardiovascular disease.

INTRODUCTION
Abdominal obesity, especially the visceral component of adipose tissue (VAT), is strongly associated with metabolic and cardiovascular risk in humans (1-2).

• The differences in sex and race with regard to body composition and metabolic risk have also been demonstrated with VAT associated risk.

• Although CT and MRI are considered the “gold standards” in the measurement of type and distribution of body fat, dual energy X-ray absorptiometry (DEXA) can accurately measure body composition with high-precision, low X-ray exposure, and short-scanning time (3).

• We previously showed strong correlations between DEXA and MRI whole body composition, with coefficients of variation of ≤2% for DEXA-derived adiposity measures (4).

• In addition to whole body composition, we now have a newly available software to estimate VAT area (cm^2) and mass (g) using enCORE analysis version 13.6 (5) on a GE Lunar iDXA.

METHODS
Study: Cross-sectional design of subjects previously recruited for studies at the Vanderbilt Clinical Research Center.

Subjects: 229 subjects with BMI 30.0 – 49.9 kg/m^2 & age 21 to 69 y. All records de-identified.

Measures
Anthropometrics
Height, weight, BMI, Waist & hip circumference (WC & HC), waist-to-hip ratio (WHR), waist-to-height ratio (WHHR)

Lipid profile
Total cholesterol, HDL, LDL, triglyceride (TG)
Fasting glucose, insulin, HOMA-IR

DEXA whole body composition scan

Metabolic disease states
• Impaired Glucose tolerance (IGT): fasting glucose ≥100 mg/dL
• Metabolic Syndrome defined as ≥3 of the following: 1. WC (>102 cm for♂, >88 cm for♀); 2. TG (≥150 mg/dL); 3. HDL (<40 mg/dL in♂, <50 mg/dL in♀); 4. Hypertension (≥130/85 mmHg); 5. Impaired fasting glucose (≥100 mg/dL).

Analysis: R version 3.0.1 analyzed with non-parametric distribution.

RESULTS

1. DEXA-VAT Robustly Predicts Impaired Glucose Tolerance and Metabolic Syndrome in Obese Women

2. Abdominal obesity, especially the visceral component of adipose tissue (VAT), is strongly associated with metabolic and cardiovascular risk in humans (1-2).

3. The differences in sex and race with regard to body composition and metabolic risk have also been demonstrated with VAT associated risk.

4. Although CT and MRI are considered the “gold standards” in the measurement of type and distribution of body fat, dual energy X-ray absorptiometry (DEXA) can accurately measure body composition with high-precision, low X-ray exposure, and short-scanning time (3).

5. We previously showed strong correlations between DEXA and MRI whole body composition, with coefficients of variation of ≤2% for DEXA-derived adiposity measures (4).

6. In addition to whole body composition, we now have a newly available software to estimate VAT area (cm^2) and mass (g) using enCORE analysis version 13.6 (5) on a GE Lunar iDXA.

REFERENCES

ACKNOWLEDGEMENT
Research supported by multiple sources obtained by Silver, Buchowski, Shibaon & NIH T35DK007383

Figure: Coronal DEXA image for a sample subject. The blue trapezoidal region of interest is used for reporting the DEXA trunk (abdominal) adipose and lean soft tissue masses.