Waist Circumference, a Predictive Factor for Cardiovascular Disease; Our Experience

Healthcare

Ergita Nelaj		Department of Internal Medicine, University Hospital Center "Mother Teresa", Tirane, Albania.
Margarita Gjata		Department of Internal Medicine, University Hospital Center "Mother Teresa", Tirane, Albania.
Edite Sadiku		Department of Internal Medicine, University Hospital Center "Mother Teresa", Tirane, Albania.
Mihal Tase		Department of Internal Medicine, University Hospital Center "Mother Teresa", Tirane, Albania.

Abstract

Background. Obesity worsens the prognosis of diabetic patients by increasing the cardiovascular risk and chronic complications. The aim of the study was to report the prevalence of waist circumference in individuals with diabetes and find out their association with other cardiovascular risk factors. Material and Methods We performed a transversal study, in which 100 patients with essential hypertension, and type 2 diabetes, were evaluated in comparison with 100 patients with only hypertension. We evaluate these patients for: body mass index (BMI), waist circumference (WC); intimae media thickness (IMT); microalbuminuria; fundus oculi. Results. A total of 200 hypertensive patients were enrolled in the study. The diabetic hypertensive subjects significantly had higher BMI (p= 0.01) and WC statistically significant (103.6 cm vs 98.3 cm; P = 0.005). There was a significant positive association between WC and microalbuminuria (P = 0.009); WC and IMT (P= 0.028); 84% of patients with abdominal obesity have changes of diabetic retinopathy independently of stage of changes. Conclusions. Prevalence of obesity in diabetic hypertensive patients was high. There was a positive relation of waist circumference and microalbuminuria, IMT, and diabetic retinopathy. This underlines the importance of measuring waist circumference when assessing cardiovascular risk factors in diabetic patients.

Introduction

Obesity has been shown to be associated with a higher risk of cardiovascular morbidity and mortality [1]. Cardiovascular disease (CVD) is the major cause of morbidity and mortality in patients with type 2 diabetes. Many studies have defined CVD risk associated with obesity in the context of diabetes mellitus and hypertension based on measurement of BMI as an indicator of "generalized" obesity and WC or waist-to-hip ratio (WHR) as a measure of "central" or "abdominal" obesity [2].

These anthropometric measures are useful in clinical practice since they are both non-invasive and cheap. WC is currently the most commonly used measurement for abdominal obesity, and highly associated with the risk of developing CVD [3]. Traditional risk factors do not fully explain the increased cardiovascular risk in patients with type 2 diabetes [4]. Therefore, it is of great importance to identify better and non-invasive risk factor assessment tools to predict and ultimately to prevent CVD in this group.

Furthermore abdominal obesity is associated with increased levels of inflammatory markers [5]. Low-grade inflammation is involved in the atherosclerotic process and it has previously been shown that subjects with type 2 diabetes present with higher levels of inflammatory markers compared to subjects without diabetes [6]. Intima media thickness (IMT) of the carotid arteries measured by B-mode ultrasound is a well known, non-invasive marker of subclinical atherosclerosis [8]. Systemic low grade inflammation can be measured as circulating levels of CRP [7].
The aim of the study was to report the prevalence of WC in individuals with diabetes and to explore WC as risk markers for subclinical, vascular organ damage in people with type 2 diabetes.

Material and Methods

The study group included 200 hypertensive patients, 100 of which, also had type 2 diabetes. They were divided in two subgroups: 100 patients with HTA and the other group, 100 patients, with HTA & DM. They were hospitalized at the Department of Internal Medicine.

Patients with presence of urinary tract infection, macroalbuminuria, renal failure or heart failure of any stage were excluded. The clinical data were obtained from the patient's history. Patients were characterized as hypertensive's if their blood pressure was higher than 130/80mmHg or if they were receiving antihypertensive treatment. Blood pressure was measured with the use of validated mercury sphygmomanometers. Diabetes was defined by fasting plasma glucose levels ≥126 mg/dl or by specific treatment. BMI was calculated by standart formula and expressed as kg/m2. WC was measured according to WHO's recommendations with the patient standing, after a regular expiration, to the nearest cm, midway between the lowest rib and the iliac crest (cutoffs as 90 cm in men and 80 cm in women). A fasting blood sample was drawn after 10 hour overnight fasting and the following investigations were done: plasma glucose, HbA1c, lipid profile, serum creatinine and serum PCR. For microalbuminuria, spot urine samples were collected in the early morning and microalbuminuria was defined as, a urinary albumin excretion between 30 and 300 mg/l per day. Common carotid artery IMT was measured by a B-mode ultrasound, 10 MHz transducer, with patients in the supine position with the neck extended in mild rotation. The ocular fundi, for possible retinopathy, were examined by a specialist, by direct ophthalmoscope.

Statistics

Statistical analysis was based on SPSS version 17.0. Differences in parameters of interest between groups were defined by the U Mann Whitney test. For comparison of qualitative variables Fisher's exact test and Student's test for quantitative variables was used. Statistical significance was assumed if $p < 0.05$.

Results

Among 200 patients, 138 (69%) were females and 62 (31%) males, respectively, 74 females and 26 males in DM & HTA group and 64 females and 36 males at the other group.

Mean age for HTA group was 58.2 (± 11.9) years and for the other group 60.7 (± 9.3) years. The diabetic hypertensive subjects significantly had higher BMI (p= 0.01) and WC statistically significant (103.6 cm vs 98.3 cm; P = 0.005). There was a significant positive association between WC and microalbuminuria (P = 0.009); WC and IMT (P= 0.028); Was seen a relation of waist circumference and diabetic retinopathy; 84% of patients with abdominal obesity have changes of diabetic retinopathy independently of stage of changes (Fig.1).
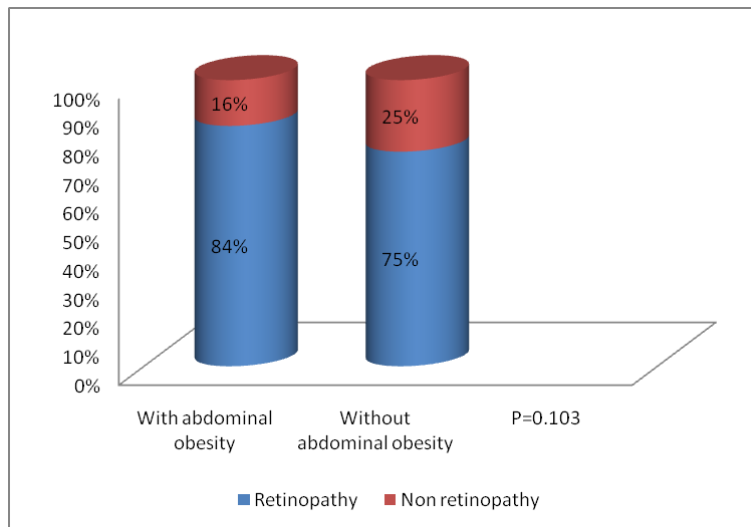

Fig.1. Patients with retinopathy according to abdominal obesity

Discussion

In our study the prevalence of obesity in diabetic hypertensive patients was high. But the association between diabetes mellitus and hypertension with central obesity (WC) is stronger than the association with BMI. Numerous studies using imaging modalities or anthropometric measures (including waist:hip ratio) have provided additional credence that visceral adipose tissue is the major contributor to cardiometabolic complications, such as diabetes mellitus and hypertension. [9]The results of this study demonstrate that central obesity, as measured by waist circumference, is an independent risk factor for incident microalbuminuria in individuals with type 1 diabetes. This association suggests that metabolic abnormalities that are associated with central obesity may contribute to the pathogenesis of microalbuminuria in type 2 diabetes. Previous studies in type 2 diabetes support the observed association between central obesity and incident microalbuminuria. [10] Insulin resistance is associated with both central obesity and microalbuminuria and may play a prominent mediating role. [11] Moreover, our results are consistent with those that were observed among patients who had type 2 diabetes and were enrolled in the United Kingdom Prospective Diabetes Study, in which greater waist circumference was associated with incident albuminuria (both microalbuminuria and clinical grade albuminuria).[11] Thus, microalbuminuria may reflect diffuse vascular damage that is related directly to central obesity. [12]

Obesity is known to be associated with carotid artery remodeling, visceral adiposity was the main determinant of premature carotid artery atherosclerosis. [13] So, in our study WC and carotid intimae media thickness, that reflects sub-clinical atherosclerosis, had significant positive association. The result is clinically highly valuable in early screening of atherosclerosis. This finding agrees with the results of previous studies concerning abdominal obesity and the risk of clinical events of atherosclerotic diseases. [14] 4-year prospective Finnish study in 2001 clarified that WC was associated with accelerated progression of carotid atherosclerosis and WC was defined as an important risk factor for atherosclerosis. [15]

Our cross-sectional study showed that abdominal obesity was associated with retinopathy. Like the present study, the Hoorn study in the Netherlands also found WC as an independent variable for retinopathy [16].

There are some limitations for this study. First, the study population enrolled is relatively limited. Secondly, this cross-sectional study cannot tell the exact causal relationship between WC and microalbuminuria, WC and IMT, WC and retinopathy. Finally, the sample size is relatively small.

In conclusion, central obesity not only reflects sub-clinical atherosclerosis in early stage, but also predicts the progression of atherosclerosis and development of microalbuminuria.The results shows that waist circumference, as a brief indicator of abdominal obesity could be used as a tool for early screening of cardiovascular risks.

References

1. Wilson PW, D'Agostino RB, Sullivan L, Parise H, Kannel WB. Overweight and obesity as determinants of cardiovascular risk: the Framingham experience. *Arch Intern Med*. 2002;162:1867–1872.
2. Deepa M, Farooq S, Deepa R, Manjula D, Mohan V (2009) Prevalence and significance of generalized and central body obesity in an urban Asian Indian population in Chennai, India (CURES: 47). Eur J Clin Nutr 63(2):259–267
3. Knowles KM, Paiva LL, Sanchez SE, Revilla L, Lopez T, Yasuda MB, Yanez ND, Gelaye B, Williams MA: Waist Circumference, Body Mass Index, and Other Measures of Adiposity in Predicting Cardiovascular Disease Risk Factors among Peruvian Adults. *IntHypertens* 2011, 2011:931402.
4. Laakso M, Lehto S: Epidemiology of risk factors for cardiovascular disease in diabetes and impaired glucose tolerance. *Atherosclerosis* 1998, 137(Suppl):S65-S73. <u>PubMed Abstract</u>

5. Mehta S, Farmer JA: Obesity and inflammation: a new look at an old problem. *Curr Atheroscler Rep* 2007, 9(2):134-138.

6. Pickup JC, Mattock MB, Chusney GD, Burt D: NIDDM as a disease of the innate immune system: association of acute-phase reactants and interleukin-6 with metabolic syndrome X.*Diabetologia* 1997, 40(11):1286 1292. PubMed Abstract | Publisher Full Text

7. Kimberly MM, Cooper GR, Myers GL: An overview of inflammatory markers in type 2 diabetes from the perspective of the clinical chemist. *Diabetes Technol Ther* 2006, 8(1):37-44.

8. Lundby-Christensen L, Almdal TP, Carstensen B, Tarnow L, Wiinberg N: Carotid intima-media thickness in individuals with and without type 2 diabetes: a reproducibility stud*y.CardiovascDiabetol* 2010, 9:40.

9. Adam Whaley-Connell and James R. Sowe**r**s: Indices of Obesity and Cardiometabolic Ris*k. Hypertension.* 2011;58:991-993;

10. Pinto-Sietsma SJ, Navis G, Janssen WM, de Zeeuw D, Gans RO, de Jong PE. A central body fat distribution is related to renal function impairment, even in lean subjects. Am J Kidney Dis. 2003;41:733–741. [PubMed]

11. Retnakaran R, Cull CA, Thorne KI, Adler AI, Holman RR. Risk factors for renal dysfunction in type 2 diabetes: UK Prospective Diabetes Study 74. Diabetes. 2006;55:1832–1839. [PubMed]

12. Ian H. de Boer, Shalamar D. Sibley, Bryan Kestenbaum, Joshua N. Sampson, Bessie Young, Patricia A. Cleary,Michael W. Steffes, Noel S. Weiss, and John D. Brunzell, for the Diabetes Control and Complications Trial/Epidemiology of Diabetes Interventions and Complications Study Research Group. Central Obesity, Incident Microalbuminuria, and Change in Creatinine Clearance in the Epidemiology of Diabetes Interventions and Complications Study: J Am Soc Nephrol. Jan 2007; 18(1): 235–243. [PubMed]

13. Kardassis D, Schönander M, Sjöström L, Karason K. Carotid artery remodelling in relation to body fat distribution, inflammation and sustained weight loss in obesity.: J Intern Med. 2014 May;275(5):534-43.

14. B Larsson, K Svärdsudd, L Welin, L Wilhelmsen, P Björntorp, and G Tibblin. Abdominal adipose tissue distribution, obesity, and risk of cardiovascular disease and death: 13 year follow up of participants in the study of men born in 1913. Br Med J (Clin Res Ed). 1984 May 12; 288(6428): 1401–1404.

15. Lakka TA, Lakka HM, Salonen R, et al. Abdominal obesity is associated with accelerated progression of carotid atherosclerosis in men. Atherosclerosis, 2001; 154, 497-504.

16. van Leiden HA, Dekker JM, Moll AC et al (2002) Blood pressure, lipids, and obesity are associated with retinopathy: the Hoorn study. Diabetes Care 25:1320–1325