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Abdominal Obesity: Why it Matters

Yoko M. Nakao[1]*, and Koji Kawakami[2]

[1]*Department of Diabetes, Endocrinology, and Clinical Nutrition, Graduate School of Medicine, Kyoto University, Japan*
[2]*Department of Pharmacoepidemiology, Graduate School of Medicine and Public Health, Kyoto University, Japan*

The metabolic syndrome is a cluster of multiple risk factors for cardiovascular disease and diabetes that are deserving of more clinical attention. In 1988, Reaven reported that several risk factors like hypertension, dyslipidemia, and hyperglycemia commonly cluster together [1]. In 1998, World Health Organization proposed the first formalized definition using the term metabolic syndrome [2]. Then, various diagnostic criteria have been proposed by different organizations over the past decade [2-15]. In Japan, a consultation group on the definition of metabolic syndrome identified abdominal obesity as the major underlying risk factor and a prerequisite component for diagnosis of metabolic syndrome [16]. However, there has been a debate as to whether this feature should be a mandatory clinical criterion and additional inspection has been necessary.

The MEtabolic syndRome and abdominaL ObesiTy (MERLOT) study [17] is a single-center, hospital-based non-concurrent prospective cohort study designed to investigate the significance of abdominal obesity on components of the metabolic syndrome including high blood pressure, dyslipidemia, and hyperglycemia. The study included 25,255 subjects, aged 21 and 70 years old, underwent a corporate subsidized general health check program annually from 1994 to 2010. Using this cohort, we investigated whether intra-abdominal fat area (IAFA) measured by computed tomography is an independent predictor for the new onset of individual components of the metabolic syndrome in healthy Japanese. During 3.6 years of the mean follow-up period, one of metabolic syndrome components occurred in 54% of healthy subjects. The multiple Cox regression analysis disclosed that IAFA is significantly associated with onset of metabolic syndrome components (hazard ratio: 1.37 per 1SD, 95%CI: 1.28-1.46). This finding was independent of body mass index (BMI), and significant even in non-obese individuals with BMI <25 kg/m^2. There was no significant difference in test for interaction between obese (BMI ≥ 25 kg/m^2) or non-obese (BMI <25 kg/m^2) and IAFA in predicting metabolic syndrome components (p=0.278). Thus, IAFA can be a better predictor for the new onset of cardiometabolic risk factors and play an important role among parameters in rational cardiometabolic risk stratification of health people, especially in normal BMI.

While IAFA may be a uniquely important pathophysiological fat depot in cardiometabolic risk [18,19], there has been much debate regarding the role of abdominal subcutaneous fat area (aSFA). Some studies have suggested a beneficial role of abdominal subcutaneous fat adiposity [20]. Other studies found that aSFA was inversely correlated with subclinical atherosclerosis and the occurrence of metabolic syndrome [21]. Furthermore, some studies assessed which is more strongly associated with cardiometabolic risk, IAFA or aSFA [19,22]. The previous cross-sectional study revealed that both IAFA and aSFA are associated with cardiometabolic risk profile but IAFA is more strongly associated with an adverse metabolic risk [19]. We have observed similar results in the longitudinal analysis from the MERLOT study. However, it is difficult to separate the effects of IAFA from aSFA because of the highly correlation between IAFA and aSFA and further evaluation is needed.

More recently, the Framingham Heart Study reported fat quality of intra-abdominal adipose tissue and subcutaneous adipose tissue evaluated by lower computed tomography attenuation as measured in Hounsfield units was associated with adverse cardiometabolic risk [23]. This was independent of IAFA and aSFA, suggesting the fat quality is associated with cardiometabolic risk factors above and beyond absolute levels of fat volumes. Future research on this topic may help to determine the underlying pathophysiology of obesity and cardiometabolic risk factors [24].

Now, Japan face growing challenged from super aging and noncommunicable diseases. As the rising health care costs of the government relating to noncommunicable diseases, the spotlight is on the prevention and control of those diseases, as the means of ensuring sustained health for the elderly. In 2008, Japan developed the pioneering approach to quash national obesity (especially abdominal obesity). Under the national law, companies and local governments must evaluate abdominal obesity for citizens between the ages of 40 and 74 as part of their annual checkups. If these individuals exceed the limit, they are considered at risk for obesity-related conditions like diabetes and heart disease and are offered exercise and dieting guidance. If after six months they still don't meet the requirement, they are given further re-education. We are working on the analysis of the "big data" and will provide new insight regarding abdominal obesity.

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***Corresponding author:** Koji Kawakami MD, PhD, Department of Pharmacoepidemiology, Graduate School of Medicine and Public Health, Kyoto University, Yoshida Konoecho, Sakyoku, Kyoto 606-8501, Japan, Tel:+81-75-753- 4459; Fax: +81-75-753-4469; E-mail: kawakami.koji.4e@kyoto-u.ac.jp

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