International Chair on Cardiometabolic Risk

Abdominal obesity

Epidemiological studies published over the last 50 years have shed light on the many factors that increase cardiovascular disease (CVD) risk. Among them, although obesity is generally an acknowledged health hazard and a risk factor for CVD and type 2 diabetes, physicians have long been puzzled by the remarkable heterogeneity seen in clinical practice among individuals with a similar excess of body weight. Some obese patients have no clinical signs of CVD or type 2 diabetes, whereas other patients – who may be only slightly or moderately overweight – have a metabolic profile that predisposes them to CVD and/or type 2 diabetes. Indeed, studies have shown that the risk of CVD and type 2 diabetes does not depend on excess body weight per se, but rather on the location of this excess weight. In light of this, it is now recognized that abdominal obesity (or android obesity, central obesity or upper body obesity) is the form of obesity most likely to be associated with an altered risk factor profile contributing to an increased CVD and type 2 diabetes risk while gynoid obesity (or lower body obesity with fat located around the hips and buttocks) is seldom associated with metabolic complications[1]. Therefore, it is important to emphasize the importance of abdominal obesity as the form of overweight/obesity most likely to entail the highest risk of CVD and type 2 diabetes.

With the development of sophisticated non-invasive imaging techniques such as computed tomography (CT scanners), it has even been possible to clearly distinguish two different depots of abdominal fat: 1- intra-abdominal (visceral) obesity (excess fat in the abdominal cavity) from 2- abdominal subcutaneous fat (the fat located just under the skin) (Figure 1)[2]. Several studies have shown that a selective excess of intra-abdominal fat increases the risk of CVD and type 2 diabetes even in the absence of obesity[3,4]. For example, some very obese individuals have normal blood pressure, a normal plasma lipid profile, and normal blood glucose despite having a large amount of fat. However, other individuals with an apparently “healthy” body weight sometimes have a disturbed metabolic risk factors profile which includes atherogenic dyslipidemia (elevated triglycerides and low levels of good HDL cholesterol), elevated blood glucose and a state of insulin resistance, elevated blood pressure as well as inflammatory and pro-thrombotic (tendency to form clots in the blood, impeding blood flow) profile[2,5,6,7,8].

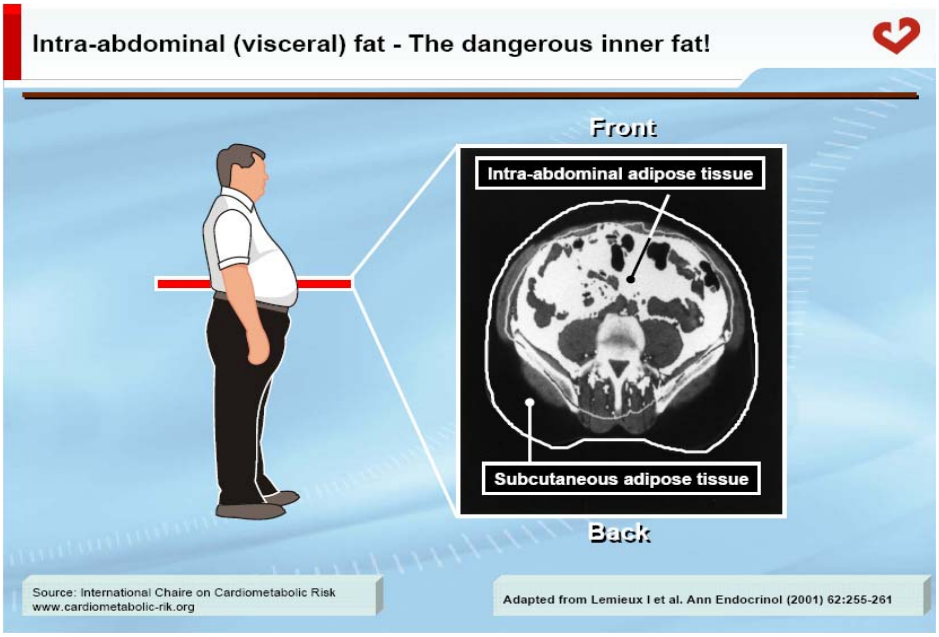


Figure 1: Intra-abdominal (visceral) fat – The dangerous inner fat

Role of adipose tissue

One of the main functions of adipocytes (adipose cells) is the storage of fat (lipids), which can be burned to meet future energy needs of the body. This function is what enabled populations to better survive. With the discovery of leptin, a hormone secreted by these adipose cells, scientists learned that adipose tissue is in fact an active endocrine gland, able to communicate with the brain to participate in the regulation of various body functions. Through its production of other important proteins including pro-thrombotic products such as plasminogen activator inhibitor-1, pro-inflammatory cytokines, such as TNF-α (tumor necrosis factor - α), IL-6 (interleukin-6), renin-angiotensin system proteins, adiponectin and others, adipose tissue actively participates in disease evolution processes which can lead to hypertension, insulin resistance and type 2 diabetes as well as CVD[9].

It has therefore been proposed that excess intra-abdominal fat may indicate that an individual's subcutaneous adipose tissue is unable to serve as an "energy sink" for a calorie surplus resulting from excess energy intake and/or reduced energy expenditure. This inability of subcutaneous adipose tissue to store the excess energy may cause fat to accumulate at undesired locations (liver, heart, muscle, etc.), a phenomenon that has been described as ectopic fat deposition[10]. Excess intra-abdominal fat may therefore be a "red light" or warning sign that excess energy is being stored as fat in unusual places, increasing the risk of type 2 diabetes and CVD.

Influence of modern lifestyle

Modern lifestyle has had a major influence on body energy use vs. storage. With all kinds of foods becoming readily available at any times while humans are sedentary, the combination of higher energy intake and less energy expenditure is at the heart of the obesity problem around the world and one of the most important health issues to be tackled by modern society (Figure 2).

Figure 2: Saving and overconsuming energy

Some factors shown to be involved in abdominal obesity include age, gender, ethnic, inherited genes, stress, sex steroid hormones, nutrition, and physical activity/exercise. While therapeutic solutions have allowed numerous people to live longer, it has become clear that lifestyle solutions must now, more than ever before, become an integral part of management strategies for patients with cardiometabolic risk factors. Healthy nutrition and physical activity have not only proven their efficacy on various modifiable risk markers, they are also much more cost effective.

Necessary changes for clinical practice

With the importance of abdominal obesity, there is therefore a clear need to shift emphasis from weight to waist circumference as more needs to be done to fight abdominal obesity.

This form of obesity has now been clearly linked to a greater risk of type 2 diabetes and CVD. Most physicians have been concerned with body mass index (BMI) which is only a ratio of weight

over height. While this index is useful for judging whether a person is overweight or obese, it does not help to evaluate the location of the excess fat and related health risk. Evidence is continuing to grow around the fact that when physicians, in addition to measuring BMI, measure patients' waist circumference and adjust their therapeutic strategies accordingly, they are better able to reduce global cardiometabolic risk. Although somewhat crude, the simple proper measurement of waist circumference has been proven to be an effective marker of intra-abdominal adiposity (Figure 3)[11].

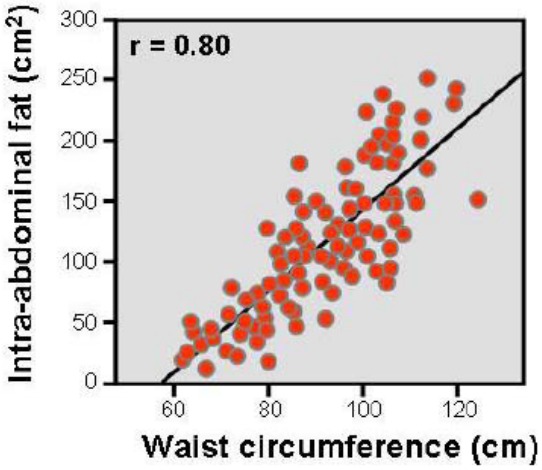
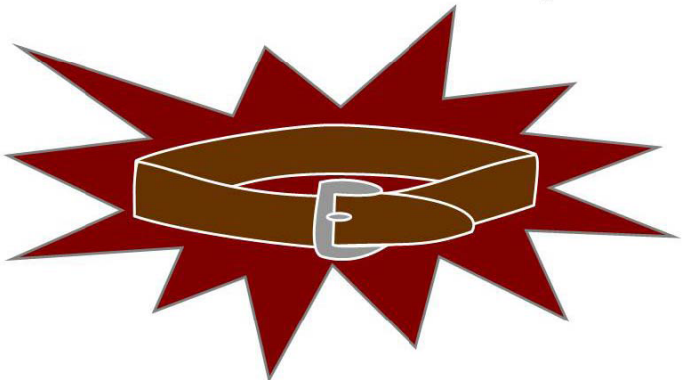


Figure 3: Relationship between waist circumference and intra-abdominal adipose tissue accumulation

Routine measures of waist circumference can also be used as a surrogate marker of abdominal fat to monitor the efficacy of weight loss management strategies[12]. This will help to avoid the expense of radiological imaging techniques and still allows for adequate prediction of health outcomes in both men and women. Waist circumference has become a vital sign and a therapeutic target, the "cholesterol" of the 21st century.

Waist circumference:

The cholesterol of the 21st century



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