sturation and was significantly higher in the secretory phase (Fig. 1C).

Dysmorphic erythrocytes (morphologically variable) have been reported to be a marker for glomerular bleeding and isomorphic erythrocytes (morphologically uniform) for nonglomerular bleeding (2). The present study revealed that most erythrocytes in the menstrual phase are isomorphic but that all erythrocytes detected in the other phases are dysmorphic, suggesting the existence of dysmorphic erythrocytes in urine from healthy women, especially in the proliferative and secretory phases of the menstrual cycle.

Little is known about the usual variation in urinary leukocytes among healthy women. In the present study, leukocytes displayed significant size changes and were largest in the menstrual phase, decreasing in size thereafter. Recently reported cyclic changes in granulocyte colony-stimulating factor expression in the human follicle during the normal menstrual cycle (3) may be associated with our results, but the underlying mechanisms remain to be elucidated.

During the menstrual cycle, estrogens influence the proliferation and maturation of the vaginal epithelial cell layers during the proliferative phase, whereas progesterone is associated with shedding of the superficial epithelial cell layers during the secretory phase (4, 5). The number of small epithelial cells increases after menstruation and peaks in the secretory phase. Physiologic changes in vaginal secretions during the menstrual cycle could explain this.

In conclusion, although the number of participants was limited and an investigation of the same individuals during the menstrual phases will provide more appropriate and valid information, our results suggest an important influence of menstrual cycle on the morphology of urine particles.

References


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Waist Circumference Is Simpler than Body Mass Index

To the Editor:

In his review on the metabolic syndrome (1), Dr. G. Reaven suggests that the body mass index (BMI) measurement is “a simpler and more effective way” to quantify obesity and preferable to the measurement of waist circumference (WC).

BMI determination is not a simple process as it requires the measurement of both height and weight followed by either a calculation or the use of precalculated tables. On the other hand, the WC measure is done once, and the information is readily available. In addition, clinicians and health professionals are to encourage self-management and awareness of health, and it is easier for patients to understand and track WC than BMI. In fact, few patients understand the concept of BMI.

BMI is also flawed because changes in BMI may be attributable to changes in skeletal muscle rather than body fat, whereas WC changes are attributable entirely to changes in abdominal fat. The use of BMI perpetuates the myth that excess weight is the prime concern when the true concern is excess body fat, especially around the abdominal area. Several studies have demonstrated that the WC is superior to BMI as a risk marker (2, 3). Some studies have indicated that peripheral body fat is negatively associated with indicators of insulin resistance, whereas central body fat is positively associated with insulin resistance (4). Exclusive use of BMI would not differentiate between these two body fat distribution profiles.

Dr. Reaven (1) suggests that there are no data available with respect to the reproducibility of WC measurement. We have demonstrated that the intra- and interobserver intraclass correlation coefficients were 0.987 (95% confidence interval, 0.983–0.990) and 0.988 (0.982–0.993), suggesting excellent reproducibility (5).

The current BMI targets have been developed from populations of primarily European or Caucasian origin. Substantial research has indicated that these targets are not appropriate for people of Asian origin, who present with manifestations of insulin resistance at lower BMI values (6–8). Because Chinese and South Asian populations constitute 30% of the world’s population, identification of appropriate ethnic-specific targets, whether BMI or WC, will have a major impact on prevention of diabetes and cardiovascular disease on a population level.

Lastly, a tape measure costs no more than US $5.00, is portable, and can be more readily included in the clinical tools of health professionals worldwide than can the scale and stadiometer required for BMI measurements.
drome. In his zeal to champion the virtues of measuring WC, Dr. Lear seems to have overlooked the overall thrust of my comments concerning the relationship between obesity, insulin resistance, and the ATP III criteria for identifying the metabolic syndrome. The major point I tried to make was that obesity (no matter how it is measured) is not a consequence of insulin resistance, but simply makes it more likely that a person will be insulin resistant and that a substantial number of obese individuals are neither insulin resistant nor at increased risk of cardiovascular disease (2–5). Indeed, it is likely that differences in degree of fitness are as powerful as variations in adiposity in modulation of insulin action (2).

Turning now to the specific issues raised by Dr. Lear, I agree that measurement of body mass index (BMI) is not a perfect way to quantify adiposity. However, in a recent analysis (6) of data from ~20,000 participants in the National Health and Nutrition Survey, measurements of BMI and WC were shown to be highly correlated (r > 0.9) irrespective of age, gender, and ethnicity. Furthermore, although the ATP III proposed specific numbers to identify an individual as being abdominally obese, the panel did not offer any instruction on how to quantify WC. In this context, the authors of a recent report (7) pointed out that at least 14 different anatomical sites have been used to measure WC in studies aimed at relating differences in abdominal obesity to adverse outcomes, and even the 4 most commonly used sites yield quite different absolute values for WC. Furthermore, as pointed out by Dr. Lear, the relationship between excess adiposity and insulin resistance (and its consequences) will vary as a function of ethnicity, generating the need, as stated by Dr. Lear, to establish “appropriate ethnic-specific targets” to quantify adiposity. In the absence of agreement on how to quantify WC, questions concerning the likelihood that different healthcare facilities will perform the measurement with the identical method and/or degree of serious-ness, and the need to have different cut points for every ethnic group, it seemed reasonable to question the notion of some specific value of WC with which to decide whether an individual was at increased risk of an adverse outcome.

Viewing all of this information in the context of the ATP III criteria for diagnosing the metabolic syndrome, I suggested that it might be simpler to measure height and weight, and calculate BMI, with the understanding that the higher the BMI, the more likely an individual is to be insulin resistant (1). Implicit in this statement is the belief that there is no magic value of WC that possesses unique clinical utility, a totally different point of view than the proposal by the ATP III of specific criteria for WC that enable a clinician to decide whether an individual is, or is not, at increased risk of cardiovascular disease. If the focus is on excess adiposity as increasing the risk of insulin resistance and its consequences, rather than on a specific value of WC as having some unique clinical significance, it is not clear to me whether it makes a great deal of difference if you measure BMI or WC. Although Dr. Lear feels that there is greater educational virtue in overweight/obese persons knowing their WC compared with their BMI, I am not sure that either would mean as much as just knowing their weight and how much they should lose. More importantly, Dr. Lear also suggests that “WC is superior to BMI as a risk marker”. This issue is an important one that cannot be discussed in detail in this context, but it may not be as simple as implied. For example, in Pima Indians, BMI was the estimate of adiposity with the highest hazard ratio in the prediction of type 2 diabetes (8). Furthermore, adding WC to that study’s model did not improve its predictive ability. In a prospective study of Mexican Americans, Haffner et al. (9) reported that individuals with the highest baseline plasma glucose and insulin values were most likely to develop type 2 diabetes independently of differences in age, BMI, or central obesity. It has also been

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Dr. Reaven responds:

To the Editor:

Given the level of heresy in my recent critique (1) of the notion of the metabolic syndrome as defined by the Adult Treatment Panel III (ATP III), I am surprised that the only concern expressed by Dr. Lear related to my skepticism concerning the clinical utility of using measurements of waist circumference (WC) to “diagnose” the metabolic syn-