Published in final edited form as:

J Clin Densitom. 2015 October ; 18(4): 455–456. doi:10.1016/j.jocd.2015.04.002.

Spine-Hip Thickness Ratio and Diabetes

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The human population is becoming more obese, and this trend has increased the burden of obesity-related illnesses. There are various, largely overlapping diagnostic criteria for the metabolic syndrome, with the World Health Organization defining it as insulin resistance, impaired fasting glucose, or frank type 2 diabetes mellitus, and two of the following: hypertension, central obesity, dyslipidemia, and microalbuminuria¹. Body fat distribution, in addition to the absolute degree of adiposity, is associated with the metabolic phenotype². Individuals with larger depots of visceral fat are at higher risk for manifestations of the metabolic syndrome³. Typically, greater visceral adiposity leads to “apple-shaped,” central obesity, while greater subcutaneous adiposity leads to “pear-shaped” obesity. In the clinic, this feature is often quantified as either waist circumference or waist-hip circumference ratio.

Adipose tissue distribution is sexually dimorphic, with men displaying predominantly central adiposity. This difference in adipose tissue distribution has been hypothesized to contribute to men’s greater age-adjusted risk of developing atherosclerotic disease⁴. DXA can be used to measure body composition as well as bone density, and body composition analysis includes calculation of “android” and “gynoid” adiposity. Regional adiposity measured by DXA is strongly correlated with visceral fat mass⁵. DXA is an excellent tool for measuring body composition, but it is unable to measure visceral and subcutaneous adipose tissue depots directly. CT or MRI is needed for this, as the determination requires detailed knowledge of cross-sectional anatomy. In spite of this limitation, DXA-determined android/gynoid adiposity ratios are useful.

In this issue of the *Journal of Clinical Densitometry*, Leslie and colleagues adapt a feature of scans performed for bone mineral density (BMD) to explore the association between central

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DISCLOSURES:

RDB is a consultant for Bristol-Myers Squibb.

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adiposity and diabetes⁶. During the performance of BMD measurement, body thickness is measured. Using the Manitoba bone densitometry registry, the authors calculated the ratio of spine (near waist) to hip thickness as a measure of central adiposity, and then showed in a large community-based sample that higher spine-hip thickness ratios are associated with diabetes, and that the relationship is stronger in women than in men. They demonstrate that men have higher spine-hip thickness than women do, reflecting the known higher prevalence of central adiposity in males. Strengths of the study include the province-wide population based sample and rigorous adjustment for covariates. Two important limitations of their study are its cross-sectional nature and the inclusion of relatively few men. The higher risk gradient in women reported by the authors can't be explained by the smaller number of male subjects. Rather, it likely reflects the greater waist:hip ratio of normal weight men, which would attenuate the ratio's utility as a clinical marker.

It is worth noting that a population-based registry, such as that which exists in Manitoba, is particularly well suited for a subsequent longitudinal study of the same topic. The investigators have published a related longitudinal study in women, in which they used spine thickness alone as an index of central obesity⁷. It remains an open question whether the spine-hip thickness ratio improves the ability to predict incident diabetes. While there is a large literature showing the association of central adiposity with other manifestations of the metabolic syndrome, little progress has been made in determining whether adipose tissue distribution is a cause or an effect of the other manifestations of metabolic syndrome, the authors' prior report notwithstanding. A follow-up investigation therefore has the potential to advance understanding of metabolic syndrome pathogenesis. The work reported here has refined the methodology to make this possible.

Body composition and central BMD can't be determined from a single DXA scan, as positioning differs for these studies. This study shows that a clinically important measure that historically has been extracted from body composition measurement can also be approximated by scans performed to measure central BMD. For the majority of patients this may be sufficient information to prompt a discussion about modifying diet and activity. Dedicated body composition analysis will retain its utility as a tool in athletic training and other specialized settings. The thickness ratio developed by the authors will not provide any insight into muscle mass, a critical measure in the athletic training setting.

Acknowledgments

This work was supported in part by SPiRe Award RRS 1121 RX001440 from the United States Department of Veterans Affairs Rehabilitation Research and Development Service and performed at the Clement J. Zablocki VAMC. The views expressed here are those of the author and do not reflect those of the Department of Veterans Affairs or the United States government.

This publication was supported in part by the National Institute of Arthritis and Musculoskeletal and Skin Diseases of the National Institutes of Health under Award Number AR54753.

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