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Smaller Thighs Associated With Heart Disease, Early Death

Deborah Brauser

September 9, 2009 — Men and women with smaller thighs have an increased risk for heart disease and early death compared with those with larger thighs, according to results of a large cohort study reported online September 4 in the *BMJ*.

"We found independent inverse associations between thigh circumference and total death and morbidity from cardiovascular disease in both men and women that were particularly evident when thigh circumference was below a threshold of around 60 cm," write Berit L. Heitmann, professor and director of the Research Unit for Dietary Studies at the Institute of Preventive Medicine at Copenhagen University Hospital in Denmark, and head of section at the Research Centre for Prevention and Health at Glostrup University Hospital, Denmark, and colleagues. "The measure of thigh circumference might be a relevant anthropometric measure to help general practitioners in early identification of individuals at an increased risk of premature morbidity and mortality," the authors add. Although several studies have suggested that both a high and a low body mass index (BMI) are associated with premature death, recent data suggest that a low BMI may be more closely linked to the risk associated with low fat-free mass than with low fat mass.

In addition, a recent study has suggested that "among patients with chronic obstructive pulmonary disease, a condition characterized by wasting of muscle, particularly of the lower extremities...the cross sectional area of mid-thigh muscle was a far better predictor of mortality than BMI," write the study authors.

Search for a Threshold Effect

For this study, the investigators' objective was to examine associations between thigh circumference and incident cardiovascular disease, coronary heart disease, and total mortality among the general population. "We hypothesized that a threshold effect would be evident, above which no further protection from large thighs would be evident because of a sufficient thigh tissue mass," they write. Professor Heitmann and her team examined data from 1436 men (mean age, 50.1 years) and 1380 women (mean age, 49.7 years) who participated in the Danish MONICA (monitoring trends in and determinants of cardiovascular disease) project and who were free from coronary heart disease, stroke, or cancer at baseline.

All participants were examined between 1987 and 1988 for height, weight, and body composition by impedance, as well as for thigh, hip, and waist circumference. They were then followed up until December 2002 through the National Registers of Hospital Discharge and Death Registry for an average of 12.5 years for all causes of death, and for 10 years until January 1999 for incident cardiovascular and coronary heart diseases. All anthropometric measurements were taken in accordance with World Health Organization standards. A BIA-103 RJL system analyzer was used to measure electrical impedance, and systolic blood pressure was measured with a sphygmomanometer; lipids were analyzed using commercial enzymatic methods. In addition, 4 separate proportional hazard regression models were used to measure associations. Patients also self-reported physical activity, smoking status, alcohol consumption, and education. At the end of the study, 257 men and 155 women died, 263 men and 140 women experienced cardiovascular disease, and 103 men and 34 women suffered from coronary heart disease.

The investigators found that both men and women with thigh circumferences below median values had lower BMI, body fat, fat-free mass, waist circumference, and height. In addition, the effects of thigh circumference were independently related to total death and cardiovascular and coronary heart diseases

for men and to total death for women. A smaller thigh circumference was also related to cardiovascular disease in women, but associations with coronary heart disease did not reach significance. There were no significant interactions between age groups (all $P > .05$), "suggesting that associations with thigh circumference were similar for younger and older people," write the study authors.

Threshold Effect Evident

A threshold effect was evident for both the men and women, suggesting the existence of a critically low thigh circumstance. This threshold was 62 cm in relation to total mortality for both sexes and 56 cm in relation to cardiovascular and coronary heart disease for men. For women, the threshold was 68 cm in relation to cardiovascular disease and 60 cm in relation to coronary heart disease. Above the threshold, there seemed to be no additional protective effect of having larger thighs in either sex, whereas the risk was greatly increased below the threshold.

These findings were independent of abdominal and general obesity, lifestyle, and cardiovascular risk factors such as blood pressure and lipid concentration. "We found that having smaller thighs was associated with development of cardiovascular morbidity and early mortality...and that the risk was more highly related to thigh circumference than to waist circumference," write the study authors.

They add that the risk from narrow thighs could be associated with too little muscle mass in the region, which could lead to low insulin sensitivity and type 2 diabetes. "The fact that more than half of the men and women aged 35–65 have thigh circumferences below the threshold is worrying," write the study authors. "General practitioners could use thigh circumference as an early marker to identify patients at later risk of cardiovascular disease and early mortality."

In addition, they write that thigh muscle mass can be selectively increased by lower body physical activity and that "a clear public health recommendation to change this risk factor can be easily communicated." Limitations of this study included residual confounding by smoking or exercise and a lack of power, which may have prevented finding significant age differences in associations and thresholds, stronger associations between thigh size and mortality for smokers, and associations in relation to coronary heart disease.

A Chance Finding?

In an accompanying editorial, Ian A. Scott, MD, director of internal medicine and clinical epidemiology at Princess Alexandra Hospital in Brisbane, Australia, writes that the results from this study "raise several questions. Is this association real and independent, or a spurious or chance finding?"

Dr. Scott writes that the statistical modeling used was rigorous, removing the effects of known conventional risk factors and minimizing residual confounding. "Unfortunately, with regard to coronary heart disease for both sexes and cardiovascular disease for women, the hazard ratios became non-significant as more variables were added to the models, which may not have happened if the sample had been larger. "Will this association help clinicians predict risk in individual patients more accurately than they already do using readily accessible and validated risk calculators? The answer is — we do not know," adds Dr. Scott. "More research is needed to see whether measuring the thigh circumference with a tape measure adds anything more to our clinical management than eliciting risk factors from the history, examining the cardiovascular system, and measuring serum lipids."

In addition, he writes that randomized trials are needed to test whether interventions that increase thigh muscle mass through increased physical activity decrease cardiovascular risk more than current practice. "If this approach is shown to be effective, the public health implications would be intriguing," Dr. Scott concludes.

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