Visceral Fat Is Linked to Inflammation in Dialysis Patients, While Subcutaneous Fat Marks Nutritional Status

In dialysis patients, visceral fat is a marker of inflammation while subcutaneous fat is a marker of nutritional status, suggests a study in American Journal of Kidney Diseases.

The cross-sectional study included 609 adult hemodialysis patients enrolled in the US Renal Data System’s ACTIV/ADIPOSE study. Participants underwent several measurements: body mass index (BMI), waist circumference as an indicator of visceral fat, and percentage body fat as an indicator of subcutaneous fat. The two fat measures were evaluated for association with inflammatory markers, nutrition, and adiposity-related hormones.

Body mass index was directly related to the inflammatory markers C-reactive protein and interleukin-6 (IL-6), but not with markers of nutrition, i.e., prealbumin or albumin. BMI was inversely associated with adiponectin and directly related to leptin. In a model including proxies for both visceral and subcutaneous fat, percentage body fat—the indicator for subcutaneous fat—was unrelated to C-reactive protein, but was inversely associated with IL-6.

Also in this model, waist circumference was associated with markers of inflammation but was inversely associated with prealbumin and albumin. Percentage body fat was directly related to these nutritional markers. Waist circumference was inversely related to adiponectin and indirectly related to leptin.

Dialysis patients with BMI higher than the normal range generally have a higher survival rate, a phenomenon called the “obesity paradox,” which has confounded researchers and practitioners. Yet BMI is a general marker of adiposity and does not distinguish between subcutaneous and visceral fat, which may have differing metabolic and inflammatory characteristics. Determining the type of fat—visceral or subcutaneous—may help unravel the obesity paradox, but longitudinal studies are needed to clarify the associations between measures of body fat and markers of inflammation.

Added to previous findings, the results of this cohort study of dialysis patients suggest that “higher subcutaneous fat may account for the observed survival advantage associated with higher BMI.”


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According to Dr. Tam, the work provides a novel approach to slow the development of renal injury through chronic blockade of peripheral CB1Rs. “And, it also supports strategies aimed at reducing the activity of the endocannabinoid system, specifically in the kidney, to attenuate the development of RPTC dysfunction in obesity.”

Allan Friedman, MD, who was not involved with the work and is a nephrologist and clinical investigator at Indiana University School of Medicine, noted that the intimate connection between rising rates of obesity and chronic kidney disease makes it likely that this topic will become increasingly prominent in the coming years. “These intriguing animal studies expand our understanding of how endocannabinoid biology influences kidney health,” he said. “The next step will be to extend these findings in humans through the testing of endocannabinoid receptor antagonists.” In his 2011 Kidney News article, Dr. Friedman pointed to other possible factors, including alterations in levels of adipocyte-related cytokines such as leptin and adiponectin (as well as other hormones) and upregulation of the renin-angiotensin axis and sympathetic nervous system activity. Many unanswered questions remain surrounding both the causes of obesity-related kidney disease and its optimal treatment.