Molecular imaging predicts risk for abdominal aortic aneurysms

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Several newly identified markers could provide valuable insight to predict the risk of rupture abdominal aortic aneurysms (AAA), according to new research published in the October issue of the *Journal of Nuclear Medicine*. Imaging with positron emission tomography/computed tomography (PET/CT) has shown that dense white blood cells in the outermost connective tissue in the vascular wall, increased C-reactive protein and a loss of smooth muscle cells in the middle layer of the vascular wall are all factors that may indicate future AAA rupture.

An abdominal aneurysm places stress on the wall of the aorta, which can cause it to rupture. Rupture of AAA is the 13th leading cause of death in western society and leads to significant morbidity and mortality in the aging population. AAA is generally asymptomatic, so the accurate prediction of rupture is essential to benefit public health.

To determine potential markers that could be predictive of AAA rupture, researchers conducted 18F-FDG PET/CT scans on 18 patients with AAA diagnosed by ultrasound. Ten of the patients had no uptake of the 18F-FDG, while eight had positive uptake of the radiopharmaceutical. Biopsies were then taken from each of the patients; patients with positive 18F-FDG uptake had tissue removed from both the site of the positive uptake and a distant negative site of the aortic wall.

"Our approach allows us—for the first time to our knowledge—to

analyze spots of high 18F-FDG uptake and compare them to a distant inactive zone of the same aneurysm. We further compared these biopsies to fragments collected in patients with negative 18F-FDG uptake. This strategy allowed for the discrimination of biologic alterations associated with 18F-FDG uptake that would help identify relevant biologic markers predictive of rupture," said Audrey Courtois, PhD, lead author of the study "18F-FDG Uptake Assessed by PET/CT in Abdominal Aortic Aneurysms Is Associated with Cellular and Molecular Alterations Prefacing Wall Deterioration and Rupture."

The tissue from the area of positive 18F-FDG uptake were characterized by an increased number of inflammatory cells in the outermost connective tissue, a high level of C-reactive protein and a drastic reduction in smooth muscle cells, as compared to the biopsies from areas of no uptake. Additionally, an increase in several matrix metalloproteinases enzymes was observed in the tissue with positive 18F-FDG uptake.

"These data suggest that a PET scan with positive 18F-FDG uptake provide diagnostic support to proceed without delay to aneurysm surgery, despite a person's age or operative risk. However, the absence of FDG uptake at the level of the aneurismal aortic wall can help us make a safe decision to avoid unnecessary surgery and decrease the burden of health care costs," said Courtois.

She continued, "This 18F-FDG PET/CT study, with an arterial phase CT, allows us to fully characterize the disease, including the conventional risk factors such as the size of the aneurysm. Although much of the current research is being conducted in the field of oncology, the current study further strengthens 18F-FDG PET/CT as a decisive tool in the management of inflammatory disorders."

More information: "18F-FDG Uptake Assessed by PET/CT in

Abdominal Aortic Aneurysms Is Associated with Cellular and Molecular Alterations Prefacing Wall Deterioration and Rupture", *Journal of Nuclear Medicine*.