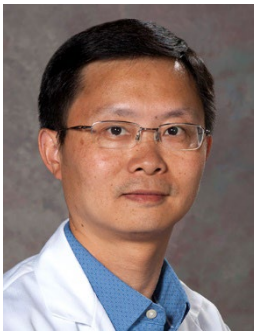


Molecular Imaging of Nonalcoholic Steatohepatitis (NASH): A Collaborative Team Effort at UC Davis Health

[1]Guobao Wang, [2]Victoria Lyo, [3]Karen Matsukuma, [4]Shuai Chen, [1]Michael Corwin, [1]Ramsey D. Badawi, [5]Valentina Medici, [5,1,6]Souvik Sarkar

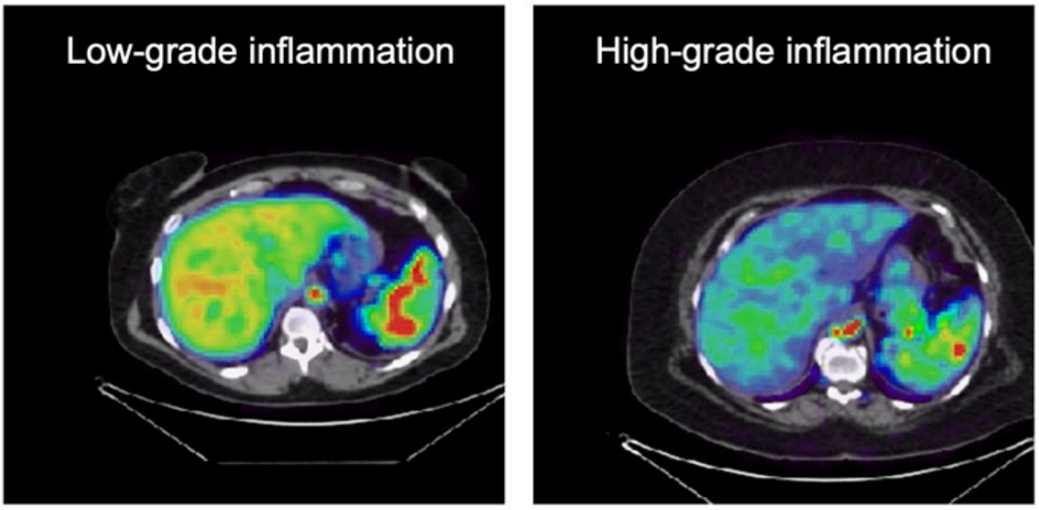
[1]Department of Radiology, [2]Department of Surgery, [3]Department of Pathology and Lab Medicine, [4]Department of Public Health, [5]Department of Internal Medicine, UC Davis Health, [6]Florida Research Institute

Introduction: Nonalcoholic steatohepatitis (NASH) is the most severe form of nonalcoholic fatty liver disease that affects a large population along with the increasing rate of obesity in both adults and children. NASH is also believed to affect multiple organ systems including the heart, kidney, and brain. However, noninvasive imaging tools to quantify the severity of disease have been very limited in this emerging landscape. We hypothesize that liver inflammation, a diagnostic hallmark that differentiates NASH from simple fatty liver, is associated with change of glucose transport in the liver and extrahepatic organs. To explore this hypothesis, we have built a team of scientists and physicians at UC Davis Health to develop PET molecular imaging tools and apply the tools for clinical study of NASH.

Methods: We developed a parametric PET method that exploits dynamic PET imaging and advanced kinetic modeling to measure glucose transport properties using the widely accessible radiotracer ^{18}F-fluorodeoxyglucose (FDG). The method was tested in patients with biopsy-confirmed fatty liver disease on a conventional PET/CT scanner for assessing liver (60 patients) or on the EXPLORER total-body PET/CT system for total-body multiorgan evaluation (over 20 patients).

Results: Our studies suggest that increased liver inflammation is associated with decreased liver glucose transport rate as measured by parametric PET. This PET biomarker of liver inflammation led to a high accuracy for diagnosing NASH when it is jointly used with a CT-based method for measuring liver steatosis. The technique and clinical evaluation were reported in four peer-reviewed journal papers. Initial results from the total-body PET study suggest changes of glucose transport may also occur in extrahepatic organs, including the brain.

Conclusion: Parametric PET of glucose transport can be a sensitive tool for evaluating NASH. Future directions include new tracer studies (e.g., to image fibrosis), evaluation of intervention (e.g., bariatric surgery), and multicenter studies. These efforts would not be possible without an interdisciplinary team collaboration approach.



Parametric image of liver blood-to-tissue glucose transport rate