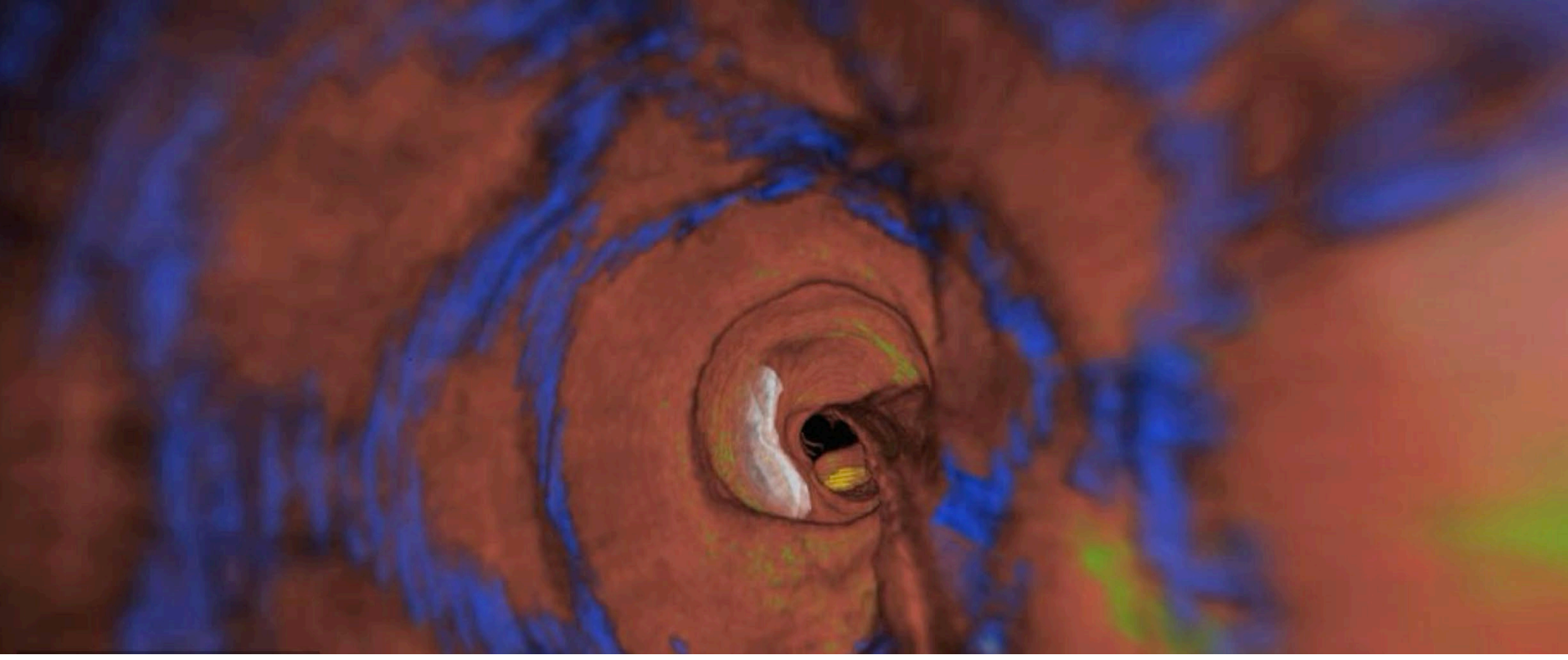
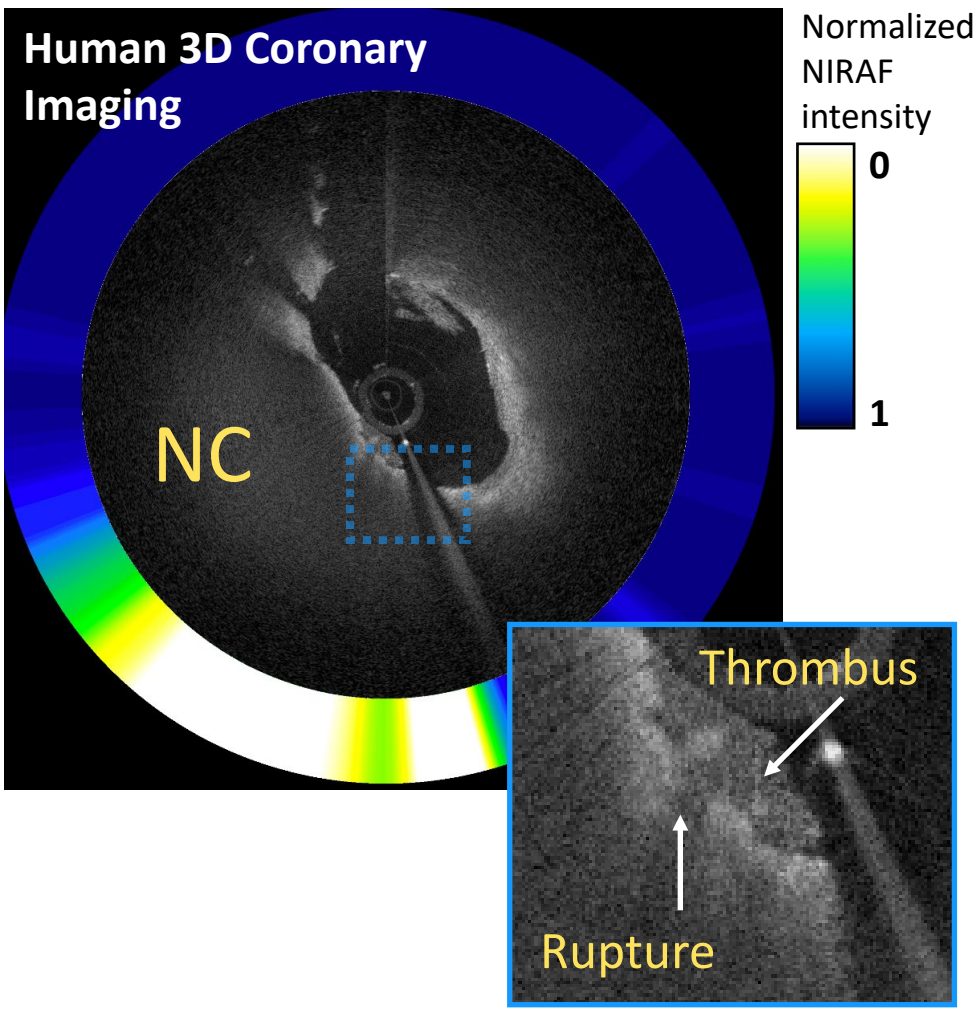


Multimodal, Minimally Invasive Imaging for Early Disease Detection



Guillermo Tearney, MD, PhD
Professor of Pathology, HMS; Pathologist, Physicist, MGH
gtearney@mgb.org

Farouc Jaffer, MD, PhD
Interventional cardiologist and Director, Coronary Intervention, MGH
fjaffer@mgh.harvard.edu

MGB Innovation Contact
Ilona Sunyovszk
isunyovszki@mgb.org
Michael Vongaramvila
mvongaramvilai@mgb.org

Clinical Need

Screening tools for early disease detection and prediction can enable preemptive intervention. We are developing technologies to detect atherosclerotic plaques in coronary arteries before they cause heart attacks and identify Barrett's esophagus (BE) at high risk of developing into cancer.

Our Innovative Approach

Optical Coherence Tomography (OCT) provides high-resolution structural imaging but is sometimes insufficient for accurate, early disease detection. We combined OCT with fluorescence, which reveals chemical and molecular information for richer, more informative, and more clinically relevant imaging.

Results

In collaboration with Canon Medical, we developed a multimodal imaging catheter integrating OCT with near-infrared autofluorescence (NIRAF). We showed that OCT-NIRAF detects "vulnerable plaques" at risk of progression. We also developed OCT-tethered capsule endomicroscopy, a swallowable device that conducts both OCT and fluorescence imaging of the upper GI tract. Our results show OCT imaging can detect BE pre-cancer, while fluorescence data can further predict the risk of progressing to cancer.

Commercial Potential

We aim to further validate and build upon our advanced multimodal screening tools, including those for cardiovascular disease (now in clinical trials) and gastrointestinal cancer (in development). These devices, designed for routine screening, hold promise for early disease detection and prediction.