Label-free 3D vascular extraction and/or Vascular Metabolic Imaging (VMI)

OTT ID #1660

APPLICATIONS

Vascular Imaging, 3D Vessel Network, Label-Free Imaging, Fluorescence Imaging, Whole Organ Imaging, and Diagnostics.

TARGET PROBLEMS

- There are no advanced technologies available to delineate the anatomy of the vasculature for preclinical or clinical whole organ imaging.
- Current diagnostic utility involves the use of vascular stains, fillers and contrast agents that can interfere in precise extraction of vasculature and introduce deformations.

KEY FEATURES

- **Label Free Imaging** - Vascular images are obtained without the use of any extrinsic contrast agents or tissue clearing solvents that may induce structural deformations.
- **High Resolution –** Current method enables high quality images compared to X-Ray and Ultrasound.
- **Speed and Sensitivity –** Co-registration of metabolic and vascular images allow perfect precision, and simultaneous acquisition of vasculature and mitochondrial metabolism in multiple organs.
- **Easy Sample Preparation** – Requires only snap-freezing of the sample in liquid nitrogen and can be implemented without any major hardware modifications.
- **Wider Applications** – Can be used in whole organ imaging in kidneys, lungs, heart, and the liver along with other organ biopsy images such as eye, skin wounds and tumor.

TECHNOLOGY

Inventors at University of Wisconsin-Milwaukee have developed a method that utilizes autofluorescence metabolic imaging to evaluate mitochondrial metabolites such as Nicotinamide Adenine Dinucleotide (NADH) and Flavin Adenine Dinucleotide (FAD). The imaging method involves a 3-dimensional (3D) vascular segmentation technique known as “vascular metabolic imaging (VMI)” that leverages inverted intrinsic fluorescence imaging of whole organs.

By measuring fluorescence from naturally occurring mitochondrial metabolites combined with light-absorbing properties of hemoglobin, the 3D structure of the vascular tree of lungs, kidneys, heart, and the liver of animal models are successfully extracted using VMI. The VMI technology is capable of high-resolution imaging compared to X-ray or ultrasound instruments. Simultaneous vascular and metabolic information extracted from the VMI has potential diagnostic utility without the use of vascular stains, fillers and contrast agents or their combinations. The outcome of the images using vascular segmentation is as shown in figure.

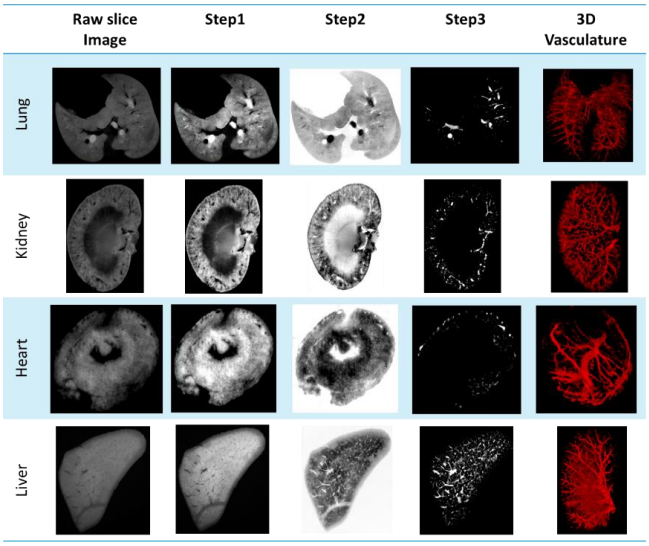

Figure: The outcome images of the vasculature segmentation.

INTELLECTUAL PROPERTY

Provision Patent Application filed May 15th, 2020.

This technology is a part of an ongoing research in Dr. Ranji's lab that was recently awarded with $ 444K from national institutes of health (NIH) to better understand diabetic retinopathy.

INVENTOR(S)

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