Single Catheter System Combining Intravascular Ultrasound and Fiber-Based Fluorescence Lifetime Imaging

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ABSTRACT

Researchers at the University of California, Davis have developed a catheter device that combines intravascular ultrasound with fluorescence lifetime imaging to better detect significant vascular conditions.

FULL DESCRIPTION

Intravascular ultrasound (IVUS) and fluorescence lifetime imaging (FLIm) are two distinct methods of medical imaging. IVUS has established clinical uses to detect both vascular plaque and arterial stenosis – but has several diagnostic limitations when used by itself. FLIm is effective at overcoming some IVUS limitations – such as the inability of IVUS to measure inflammation or plaque composition precisely. And, although FLIm has inferior penetration depth, it can be used to calculate PH levels, viscosity, and even blood chemical composition within a micro-environment. Thus, a diagnostic technology that combines both these techniques offers clinical advantages when assessing vascular health compared to either IVUS or FLIm used in isolation. However, previous attempts to combine these diagnostic techniques have not overcome limitations related to processing the IVUS and FLIm images simultaneously and in real-time.

Researchers at the University of California Davis have developed an integrated IVUS and FLIm catheter system that offers the combined, functional benefits of each technology. The catheter system includes an optical connector, fiber optics, and data acquisition electronics. Enhanced image processing functionality integrates the multi-spectral FLIm images with the structural images of blood vessels obtained from the IVUS echo signal. By combining these imaging techniques into a single imaging core, the result is a real-time, enhanced, comprehensive image of vascular conditions – including the ability to accurately characterize the morphology and composition of plaque within unhealthy blood vessels.

APPLICATIONS

- Cardiovascular imaging
- Plaque diagnostics - including morphology, composition, and pathological features

FEATURES/BENEFITS

- High resolution vascular imaging
- Resistant to interference from signal sources and external tissue
- Does not require exogenous dye or markers Compact design allows the device to use standard IVUS entry techniques

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	11,350,907	06/07/2022	2016-069

Additional Patent Pending

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OTHER INFORMATION

KEYWORDS

Catheter, Cardiovascular imaging, Intravascular ultrasound, IVUS, Fluorescence imaging, FLIm, Plaque detection and characterization

CATEGORIZED AS

- **Imaging**
  - Medical
- **Medical**
  - Devices
  - Diagnostics
  - Disease: Cardiovascular and Circulatory System
  - Imaging
  - Screening

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2016-069-0

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