High resolution nondestructive imaging of 3D tissue organization

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Technology description

Optical Polarization Tractography: A New High Resolution Imaging Technology for Early Detection of Diseased Tissues The current invention from the University of Missouri utilizes non-destructive optical polarization tractography (OPT) to generate high-resolution three-dimensional (3-D) images of tissue fiber organization from cellular to organ levels. This technology can be utilized in clinical diagnosis to identify various abnormal and diseased tissues of various types, such as skeletal muscle, nerve fiber, dental tissue, cartilage, heart muscle, and blood vessel. The technology is portable, low cost to implement, and can identify fiber disorganization/damage in skeletal and cardiac muscle for early detection of heart diseases and other tissue fiber abnormalities. Prior to this current invention, tissue imaging technologies, such as optical coherence tomography (OCT), could not provide accurate images of the fiber architecture in fibrous tissues. Changes to the fibrous structure of various biological tissues generally occur under disease or pathological conditions, such as the onset and progression of heart failure or atherosclerosis. Cellular level fiber architecture changes are excellent biomarkers for early disease diagnosis and for monitoring disease progression and response to therapy. Unfortunately, current tissue imaging technologies do not have the resolution to detect fiber organization changes at the cellular level. The current invention of OPT technology represents a revolutionary advancement in tissue imaging technology that can improve our understanding of pathogenesis, monitoring of progression of disease conditions, and assist in treatment modalities by offering unique imaging capabilities, such as detailed 3-D tissue visualization with cellular resolution, not available in existing imaging systems.

Application area

-An effective, low cost, portable imaging tool to reveal tissue fiber abnormalities in skeletal muscles, nerve fibers, dental tissue, cartilage, heart muscles, and blood vessels
-Provide more detailed images of complicated tissues by offering 3-D capabilities, high imaging speed, and cellular level spatial resolution

Advantages

-Improved and earlier clinical assessment and management of disease and pathological conditions, such as heart diseases, musculoskeletal disorders, and nerve conditions
-Can be easily implemented with existing fiber optics based imaging systems, thereby reducing the cost of manufacturing

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