UNIVERSITY OF MARYLAND
UM VENTURES
MPOWERING THE STATE

www.umventures.org

Individually Optimized Uniform Enhancement in Contrast Enhanced Computed Tomography (CT) Scans

Summary

CT has become the primary method for to evaluate for pulmonary embolism (PE). However for CT to be diagnostic, uniform contrast enhancement of the pulmonary arterial tree is desired. Obtaining uniform contrast enhancement is difficult because there are numerous factors involved. There are methods for calculating the correct injection rate for contrast medium needed to reach optimal contrast enhancement. However, each of these methods has a significant limitation. The patented method describes a greatly improved way to determine the correct contrast injection rate thereby leading to optimal contrast enhancement.

Key Investigator

Ming Xue
Hao Howard Zhang
Seth Kligerman
Warren D. D'Souza
Wei Lu
Wookjin Choi

Field

Software
Radiology

Technology

Imaging

Advantages

Improved contrast enhancement

Patient optimized method for determining contrast injection rates

Status

Available for licensing

Patent Status

US 9,456,798

UMB Docket Reference

MX-2013-110

External Reference

Xue et al. (2013) *Med Phys*. 40(12):121906.

CT Scanners Market Trends. Global Industry Analysts, Inc. January 2016

Market

The global market for CT scanners was valued at ~$4.35B in 2012 and expected to reach $5.7B by 2020. The rising prominence of image-guided interventions and the need for early and accurate diagnosis drives the growth rate.

There is considerable interest in improving noninvasive methods of detecting the subclinical signs and symptoms of PE associated with cardiovascular disease. Currently, the diagnosis of PE depends on clinical results in combination with laboratory tests and imaging studies, including CT. Current estimates are that ~300,000 Americans are affected by venous thromboembolism each year and possess the potential to become PE.

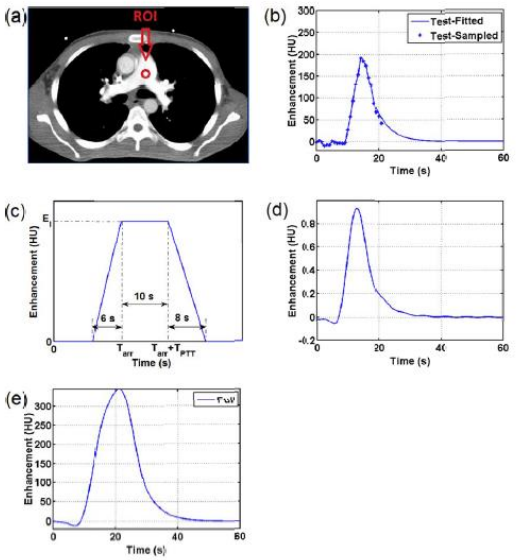

FIGURE 1. (a) A test injection CT image with ROI on pulmonary artery. (b): Measured (star) and fitted (line) test injection (20 mL at 5 mL/s) enhancement curves. (c): Targeted enhancement curve for DFT approach. (d): Patient IEF extracted from (b). (e): Simulated full bolus (65 mL at 5 mL/s) enhancement curve based on IEF in (d).

Technology

The patented technology describes a method for optimizing a contrast injection for CT imaging. Current techniques for determining a contrast injection function either treat all patients equally (exponentially decelerated injection function (EDI)) or are complex and can result in unrealistic flow rates (discrete Fourier transform (DFT)). The authors have developed a direct optimization method for obtaining an injection function that eliminates the difficulty of the current methods and assures nearly optimal contrast enhancements. The optimized method comprises two steps: (1) Computation of an image enhancement factor (IEF) based on a test bolus scan, followed by; (2) Optimization of the contrast injection function using the IEF to achieve uniform target enhancement.

Technology Status

A retrospective study conducted on a 27 patient dataset showed that the new optimization approach produced significantly better contrast enhancement (closer to the targeted uniform contrast enhancement) than the DFT approach. Additional studies using this technology have been performed in subjects with pancreatic ductal adenocarcinoma and subjects undergoing total knee arthroplasty.

Contact: Mark Wozniak
Mark.Wozniak@umaryland.edu
410-706-7293

University of Maryland, Baltimore
620 W. Lexington St., 4th Floor
Baltimore, MD 21201