

Title page

Title:

Systematic Method to Assess Microvascular Recruitment using Contrast-Enhanced Ultrasound.
Application to Insulin-Induced Capillary Recruitment in Subjects with T1DM

Authors:

Alice Chan

Diabetes Technology Center, University of Virginia Health System
P.O. 400 888, Charlottesville, VA 22908-4888
(phone) 646-919-9330
(fax) 434-982-6765
alicechan@virginia.edu

Stacey M. Anderson, M.D.

University of Virginia Health System, Department of Internal Medicine
P.O. Box 800466
Charlottesville, VA 22908
Phone : 434-924-5607
SG4C@hscmail.mcc.virginia.edu

Boris P. Kovatchev, Ph.D.

Diabetes Technology Center, University of Virginia Health System
P.O. 400 888, Charlottesville, VA 22908-4888
(phone) 434-924-5592
(fax) 434-982-6765
boris@virginia.edu

Marc D. Breton, Ph.D.

Diabetes Technology Center, University of Virginia Health System
P.O. 400 888, Charlottesville, VA 22908-4888
(phone) 434-982-6484
(fax) 434-982-6765
mb6nt@virginia.edu

Abstract:

Contrast-enhanced ultrasound (CEU) is an ultrasound imaging technique used to assess tissue perfusion. Analysis of microvascular recruitment necessitates the definition of a region of interest (ROI) containing exclusively the tissues to be studied. Conventional ROI selection requires examining the images and drawing the ROI by hand, making the analysis of CEU images non-reproducible and analyst-dependent.

We have designed a systematic ROI selection method that is both reproducible and analyst-independent. Microvascular blood volume (MBV) assessed in 21 sequences of images was used to correlate the systematic ROI selection method with the conventional method performed by two independent analysts (correlation of 0.88 and 0.87 respectively) and the MBV sample distribution from the systematic method was not significantly different from those obtained from the conventional one. Using the systematic method, we found no significant insulin-induced capillary recruitment in subjects with type 1 diabetes mellitus, which might be related to the observed low glucose uptake during the hyperinsulinemic euglycemic clamp compared to healthy patients.

Keywords:

contrast-enhanced ultrasound; ROI selection; systematic method; microvascular recruitment

Author of correspondence:

Alice Chan

University of Virginia Health System

P.O. 400 888, Charlottesville, VA 22908-4888

Phone: 646-919-9330

Fax: 434-982-6765

Email: alicechan@virginia.edu