Department of Radiological Sciences

RESEARCH SEMINAR SERIES

Diagnosis and Quantification of Liver Steatosis with Quantitative Ultrasound Backscatter Technique

Wednesday, October 21, 2015 12:00—1:00 Noon

Telecast: UC Irvine Douglas Hospital Radiology Conference Room 0117

Live: UC Irvine Campus Medical Education Building, Colloquium 3070

NOTE: Guest Speaker will be in Medical Education Colloquium 3070. Videocast will be in UCIMC Radiology Conference Room, Douglas Hospital Room 0117

Abstract:

Nonalcoholic fatty liver disease (NAFLD) is the most common cause of chronic liver disease in the United States, affects 30% of adult Americans and may progress to more serious diseases. Liver biopsy is the standard method for diagnosing NAFLD. MRI can accurately diagnose and quantify hepatic steatosis but is expensive. Sonography with qualitative interpretation by radiologists is lower cost, more accessible but less sensitive for detection. The objective of this study, using MRI proton density fat fraction (PDFF) as reference, is to assess the accuracy for diagnosing and quantifying steatosis with two quantitative US parameters--backscatter coefficient (BSC) and attenuation coefficient (AC)--derived from RF signals using the calibration phantom technique. We performed a prospective, cross-sectional analysis of a cohort of adults (n=204) with NAFLD (MRI-PDFF≥5%) and without NAFLD (controls). Subjects underwent MRI-PDFF and BSC and AC US analyses of the liver on the same day. Patients were randomly assigned to training (n=102, mean age 51±17 years, mean body mass index 31±7 kg/m^2 and validation (n=102, mean age 49±17 years, body mass index 30±6 kg/m^2) groups; 69% of patients in each group had NAFLD. BSC provided AUC 0.98 (95% CI 0.95-1.00, p<0.0001) for diagnosis of NAFLD; the optimal BSC cut-off provided sensitivity, specificity, positive and negative predictive values (PPV, NPV) of 87%, 91%, 95%, and 76%, respectively. AC provided AUC 0.89 (95% CI 0.81-0.96, p<0.0001) for diagnosis of steatosis; the optimal AC cut-off provided sensitivity, specificity, PPV, NPV of 80%, 84%, 92%, and 66%, respectively. BSC and AC both correlated significantly with MRI-PDFF (P<0.0001). QUS BSC and AC can accurately diagnose and quantify hepatic steatosis, using MRI-PDFF as reference. With further validation, QUS may emerge as an inexpensive, widely available tool for NAFLD assessment.

Michael Andre, Ph.D
Professor of Radiology
UC San Diego
San Diego VA Healthcare System

About the Presenter:

Dr. Michael Andre received the M.S. and Ph.D. degrees in Medical Physics from the University of California, Los Angeles. Since 1981 he has been on the faculty of the School of Medicine at the University of California, San Diego where he is Professor of Radiology and Chief of the Physics & Engineering Division. He is also Chief Physicist at the Veterans Affairs Healthcare System. As a physical scientist with medical assignments he is active in many areas of medical imaging including computer-aided diagnosis, quantitative x-ray computed tomography, ultrasound, digital mammography and patient dose reduction. He is probably best known for his research in quantitative ultrasound techniques in the breast and liver, including inverse scattering ultrasound computed tomography.

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