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### Title

AN EXPLANATION FOR THE VARIABILITY IN INTRAVASCULAR ULTRASOUND IMAGES

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**A Comparison of Four Intravascular Ultrasound Imaging Systems**

Takafumi Hiro, Cyril Y. Leung, Robert J. Russo, Dan E. Gutfinger, Ali R. Farvid, Houshang Karimi, Jonathan M. Tobis, University of California, Irvine and Scripps Clinic and Research Foundation, La Jolla, California

Varying interpretations of intravascular ultrasound (IVUS) images may be due to differences in the imaging systems used. Four commercially available IVUS machines were compared in vitro by examining 20 formalin-fixed human coronary arteries with varying degrees of intimal hyperplasia from 17 necropsies (age range:15-93 y.o.). IVUS measurements of lumen, intima and media areas were compared to histologic (HIST) measurements. Of the 4 devices, 3 used mechanical rotation (A:30MHz/2.9F, B:25MHz/3.9F, C:30MHz/3.5F) and one used synthetic aperture (D:20MHz/3.5F). Inter-observer variability (VAR) of the measurements was obtained as the percent difference between observers.

	<u>IVUS vs. HIST Area ( r value)</u>			<u>VAR (mean+SD)</u>		<u>Ability to Visualize</u>	
	<u>Lumen</u>	<u>Intima</u>	<u>Media</u>	<u>Lumen</u>	<u>Intima</u>	<u>Plaque</u>	<u>Boundary</u>
A	0.84	0.77	0.05	1±16%	30±45%	100%	
B	0.84	0.83	0.30	1±14%	11±28%	90%	
C	0.84	0.85	0.19	2±8%	14±17%	95%	
D	0.87	0.85	0.26	9±10%*	35±59%	75%†	

(\*:p<0.01, vs. C, by ANOVA; †:p<0.05, vs. A)

The mechanical rotating catheters provided sharper distinction between tissue interfaces, permitting more definitive boundary recognition. All of the systems had difficulty identifying the media clearly. Although the mean values were similar, the inter-observer variability in measurements was poorer for the synthetic aperture device (D).