1168 Ultrasound at the Bench
Tuesday, March 09, 2004, 3:00 p.m.-5:00 p.m.
Morial Convention Center, Hall G
Presentation Hour: 4:00 p.m.-5:00 p.m.

1168-151 Effect of High Intensity Focused Ultrasound on Cardiac Valves
Ryo Otsuka, Kumiko Hirata, Kana Fujikura, Yuki Oe, David Engel, Charles Marbóe, Marco Di Tullio, Robert Muratore, Fred Lizzi, Shunichi Homma, Columbia University, New York, NY; River Side Institute, New York, NY
Background: High intensity focused ultrasound (HIFU) produces immediate focal lesions with intense focused exposures within short periods. HIFU beams can be non-invasively focused within small volumes. Exposures at high intensity levels in a few seconds produced superficial thermal lesions and creating valvular lesions may prove to be useful for such procedures as valvuloplasty or valvuloplasty. The purpose of this study was to evaluate the possibility to create lesions in valve tissues in vitro.

Methods: We studied 10 calf mitral valves. Each specimen was mounted on rubber sheet and immersed in a water bath at 37°C. The focal point was set at 2.5 cm from the transducer. The operating frequency of the transducer was 4.67 MHz, and the focal zone was 10 mm depth x 1.1 mm wide. Ultrasound energy was applied with an acoustic intensity of 26.96kW/cm² for 10 seconds, 20 sec, 30 sec, 40 sec, 60 sec and 60 sec on each valve.

Results: Visible changes of the valves required more than 20 second exposure at this intensity. The surfaces of lesion on mitral valve were slightly discolored, and pathologically complete of tissue in the affected areas were observed. HIFU exposure for more than 40 sec resulted in perforation on all leaflets with mean diameter of 1.0±0.2 mm.

Conclusion: We confirmed that HIFU could create superficial thermal lesions and perforation in mitral valve tissues. With further refinement, HIFU may prove useful for valvuloplasty or valvuloplasty.

1168-152 Targeted Ablation of Myocardium Using High Intensity Focused Ultrasound in Beating Dog Hearts
Ryo Otsuka, Kana Fujikura, Todd Pulerwitz, Kumiko Hirata, Jie Wang, Daniel Burkhoff, Robert Muratore, Fred Lizzi, Shunichi Homma, Columbia University, New York, NY; River Side Institute, New York, NY
Backgrounds: High intensity focused ultrasound (HIFU) produces immediate focal lesions with intense focused exposures within short periods. HIFU beams can be non-invasively focused within small volumes. Exposures at high intensity levels in a few seconds produced superficial thermal lesions and creating valvular lesions may prove to be useful for such procedures as valvuloplasty or valvuloplasty. The purpose of this study was to evaluate the possibility of creating targeted and focused myocardial lesions in beating dog hearts.

Methods: The operating frequency of the transducer was 4.67 MHz, and the focal zone was 10 mm depth x 1.1 mm wide at a distance of 25 mm from the transducer tip. Two dogs were anesthetized and underwent a left sided thoracotomy. The left ventricular surface was coupled with the transducer surface using echotransmission gel and water bath. The timing of the HIFU exposure was set during diastole (0.2 sec before the R wave) using an ECG triggering system newly created for this purpose. The focal point was set at the middle of the left ventricular (LV) anterior wall using conventional 2D echocardiography. Ultrasound energy was delivered at an acoustic intensity of 26.96kW/cm² for 0.2 seconds. For each dog in vitro cardiac tissue, we created 6 lesions twice (ablations were performed 10, 15, 20, 25, and 30 times for each lesion, respectively). Lesion size was assessed by measuring its length and width.