Methods: Pts (ages 3 d–15 yrs with weights 2.5–53 kgs) were scanned without sedation from the parasternal, apical, and sub-costal windows. The Duke RT3D system uses a matrix phased array transducer (2.5–5.1 MHz) to scan a 65° pyramidal volume at 22 vol/s with an image display of standard B scan sectors and inclined scan planes that can be oriented throughout space. Up to 3 s of moving volumetric data was acquired in real-time and stored for off-line analysis to display any combination of planes or to perform volume rendering on a computer workstation.

Results: RT3D demonstrated abnormalities of LV and/or RV outflow in all 25 pts with the following diagnoses: subaortic stenosis, aortic stenosis/atresia, pulmonic stenosis/atresia, TOF, DORV, D-TGA, L-TGA, and AP window. Inclined and intersecting scan planes enabled unique visualization of 1) conal septum in relation to VSD in TOF and DORV, 2) en-face views of the defect in AP window and in the Norwood anatomosis in aortic atresia, 3) great vessel relationships at multiple levels in D-TGA and L-TGA, and 4) type and degree of obstruction in aortic and pulmonary stenosis/atresia.

Conclusion: RT3D echo can identify ventricular outflow tract abnormalities. The ability to incline scans and perform volume rendering permits novel visualization of various complex structural abnormalities of ventricular outflow.

1231-124 Transthoracic Approach of 3D/4D Echocardiography in Congenital Heart Disease

G. Satomi, S. Yasukochi, Y. Iwasaki, A. Mizukami. *Nagano Children's Hospital, Nagano, Japan*

Background: The 3D/4D reconstructed images of intracardiac structures in congenital heart diseases could be obtained by the transthoracic approach in pediatric age.

Method: The 90 senal 2D images were obtained at every 2 degrees (gated by respiration and ECG) by the rotational scanning from either subxyphoid or parasternal approach, using rotational deveice. From these images, 3D images were reconstructed by Tomtec Echoscanafter setting the proper cutplanes. The study subjects were 93 cases with various congenital heart diseases. The age ranged from 3days to 11 years old. The BSA ranged from 0.16 to 1.48 m^2.

Result: Of 93 cases, 309 3D/4D reconstructions were attempted. 3D/4D images were obtained from 78 cases out of 93 cases (8%). In cases with BSA beyond 1.0 m^2, 3D/4D images could not be obtained because of poor penetration. Among the 309 reconstructed 3D/4D images, 123 images (30%) were evaluated as clinically useful to assess intracardiac anomalies. The round shaped ostium primum defects wre shown in 8 out of 11 cases (73%) with atrioventricular canal defect (AVCD) in the anterior aspect.

The finding of unwedge position of the aorta between right and left atrioventricular orifices was clearly seen in the cases with AVCD in the cranial aspect of atrioventricular valves. In a case with tetralogy of Fallot, aortic overriding was clearly seen in the anterior aspect of the right ventricle.

Tetralogy of Fallot

Conclusion: 3D/4D with good image quality could be obtained by the transthoracic approach in newborn and infant.

1232 Echocardiographic Quantitation of Flow Parameters

Wednesday, April 1, 1998, 3:00 p.m.–5:00 p.m.
Georgia World Congress Center, West Exhibit Hall Level
Presentation Hour: 3:00 p.m.–4:00 p.m.

1232-137 A Digital Three-dimensional Color Doppler Velocity Reconstruction Study of the Relationship Between Orifice Shape and Flow Convergence Geometry: In Vitro Experiments

X.-N. Li, T. Shiota, Y.S.P. Bong Park, B. Munt, S. Wanitkun, R.W. Martin, D.J. Sahn, G.A. Schwartz, C.M. Otto, F.H. Sheehan. *University of Washington, Seattle, WA, Oregon Health Sciences University, Portland, OR, USA*

Introduction: The proximal flow convergence method (FC) is most often employed with an assumption that a hemispherical iso-velocity surface exists for most orifices.

Methods: We derived 3D digital color Doppler data in an in vitro pulsatile flow model. Digital velocity data (prior to color assignment) from circular, rectangular, and triangular shaped orifices all of area 0.24 cm^2 were acquired at 9 flow rates (40–120 ml/sec) with an ATL HDI-3000 ultrasound system controlling rotation of a 7.4 MHZ multiplane probe. Our digital 3D method allowed velocity vector reconstructions such that various Doppler iso-velocities could be chosen, and the resulting 3D FC surfaces defined. We measured the lengths of the major and minor axis of the FC iso-velocity surface in 3D space to examine eccentricity and computed 3D surface area directly by adding FC arc lengths.

Results: The rectangular orifice produced greatest eccentricity indexes (0.85 ± 0.05, $p < 0.001$ versus circular and triangular orifices), while circular and triangular orifices yielded similar values (0.68 ± 0.07 and 0.63 ± 0.06, p = NS). The 3D derived FC flow rates correlated quite well with the actual flow rates (r = 0.82, 0.83 and 0.87 for circular, rectangular and triangular orifices, respectively).

Conclusion: The digital 3D Doppler method we developed allows post acquisition choice of directly measurable 3D iso-velocity surfaces yielding robust and accurate FC flow rate computations.

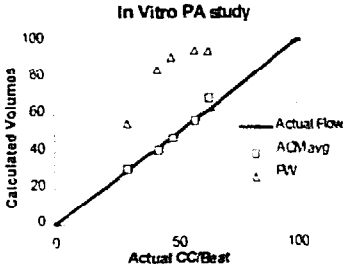
1232-138 Advantages of a Digital Color Doppler Method for Computing Flow in Highly Pulsatile Vessels

G. Byrd, T. Shiota, S. Wanitkun, A. Young, S. Martin, D.J. Sahn. *Oregon Hlth Sci Univ, Portland, OR, USA*

Background: The aim of this study was to determine the accuracy of digital color Doppler calculation (ACM) for determining regional flows in highly pulsatile vessels and also compare it with the conventional Pulsed Wave (PW) Doppler flow calculation method.

Methods: In a flexible, distensible pulsatile Pulmonary Artery (PA) flow model, we measured the volume flow from digital color) Doppler images with a Toshiba PowerVision (ACM), at 0°, 45°, and 90° axes across the elliptical cross of the "PA", which varied in shape as well as in diameter (50% variation) with the cardiac cycle.

Results: Over 45 flows with a range of volumes from 28 cc to 63 cc/beat. The ACM method proved to be substantially more accurate than the PW method (Fig.). ACM computes changes flow area and flow for profiles automatically; also, it's rapidity and ease of use allowed us to calculate and average the flows on the different crossectional vessel axes.



Conclusion: In highly pulsatile great arteries the ACM method should have distinct advantages over the PW method.

WEDNESDAY POSTER