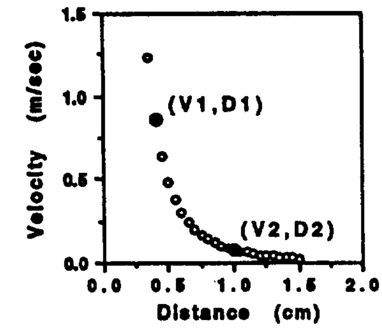
ity/distance points (Figure). The product of "a" and "b" correlated well with the flow rate Q_G ($AG*CW_{Vel}$ and Q_{PHT} (A_{PHT}-^{CW}) (r = 0.77 and 0.86, SEE = 40.0 and 26.6 ml/sec respectively), although "a" or "b" alone were not well related to CW velocity, orifice area or maximal flow rate. In addition, when a*b was normalized by CW velocity A*B/CW correlated well with the orifice area determined by both Gorlin and Doppler PHT methods (R = 0.75 and r = 0.84, SEE = 0.23 and 0.14 cm^2). Our study suggests that a velocity function generated from merely 2 velocities in the flow acceleration field can be applied to determine forward flow rate and orifice area estimates in mitral stenosis.



3:00

795-5 Digital Particle Image Velocimetry: A New Technique for Verification of Color Doppler Flow Mapping Data

Robin Shandas, Morteza Gharib, David Sahn, Lilliam Valdes-Cruz. *California Institute of Technology, Pasadena, CA; The Childrens Hospital, Denver, CO*

Many color Doppler flow mapping (CDFM) systems now provide direct access to digital velocity and variance data, thereby promising true flow quantitation. However, the accuracy of flow information thus obtained has not been adequately verified. We used laser based Digital Particle Image Velocimetry (DPIV) to measure two-dimensional velocity components proximal and distal to various sized orifices (0.1 cm^2 – 1 cm^2) for steady flows (0.2 – 3 L/min). Immediately after the DPIV studies and without changing flow conditions, digital CDFM velocity and variance measurements were obtained at identical proximal and distal points. CDFM/digital velocity data showed excellent agreement with the DPIV measurements although three main discrepancies were found: 1) CDFM velocities underestimated DPIV velocities at points of large angulation between ultrasound beam and flow direction although an angle correction algorithm significantly reduced this error. 2) CDFM velocity measurements underestimated DPIV velocities to a maximum of 48% (mean = 21%) at points of high velocity shear such as the jet boundary, presumably due to the averaging nature and limited time envelope for CDFM velocity measurements. 3) Normalized variance as a percentage of maximum reflected Doppler signal bandwidth (0–100%) provided by the CDFM system was present in significant quantity (>30%) in locations of low turbulence intensity as measured by DPIV indicating substantial variation between CDFM variance and hydrodynamic turbulence. DPIV is a promising and highly accurate technique for in-vitro measurements of complex cardiac flow conditions. DPIV also provides an ideal gold-standard for verification of CDFM data and should lead to improved understanding of CDFM information obtained in patients.

3:15

795-6 Comparison Between Three-Dimensional Reconstruction and Two-Dimensional Imaging for Evaluating Regurgitant Jets: An In Vitro Study

Zheng Gong, Xiaodong Zhou, Takahiro Shiota, Brian Sinclair, Shuping Ge, Jinping Xu, Berthold Klas, Richard Derman, David J. Sahn. *Oregon Hlth Sci Univ, Portland, OR*

The aim of our study was to investigate the applicability of the 3D reconstruction for evaluating color Doppler regurgitant jet imaging compared to conventional 2D color Doppler flow mapping. *Methods:* Steady flows (20–80 cc/sec) were driven through a rectangular orifice (24 mm^2, length = 8 × width) using a steady flow pump. The regurgitant jets were imaged using 3 different Nyquist velocities (35, 52 and 78 cm/sec) with an Interspec ultrasound system and analyzed using 3D reconstruction with a Tomtec computer. An oblique "birds eye" view from above the orifice plane gave a side view of the flattened jet. Volumes of 3D regurgitant jets were measured and were compared to the conventional color Doppler 2D maximal jet area. *Results:* The 3D reconstructions showed characteristically elongated and flaring jet propagation for all flow conditions (Figure). Jet areas sliced parallel to the orifice plane provided the most quantifiable jet propagation pattern. A linear relationship between flow rates and 3D jet *volumes* was obtained (r = 0.91, p < 0.001) whereas conventional 2D maximal jet areas showed a less well defined relationship with actual flow rates (r = 0.87, p < 0.01). The consistency of the relationship between flow rates and jet area in 3D volume over the various Nyquist units was also better for 3D volumes. *Conclusion:* Our study suggests that three-dimensional jet volume methods should provide more accurate approaches for quantifying regurgitant jets than the conventional 2D jet area measurement.

796 Peripheral Vascular PTA and Stenting

Wednesday, March 22, 1995, 2:00 p.m.–3:30 p.m.
Ernest N. Morial Convention Center, Room 9

2:00

796-1 Non Surgical Revascularization in Carotid Arteries: Role of Percutaneous Transluminal Angioplasty

Alfredo E. Rodríguez, Mario Fernández, Eduardo Mele, Ernesto Peyregne, Néstor A Pérez Baliño *Anchorena Hospital, Buenos Aires, Argentina*

The role of Percutaneous Transluminal Angioplasty (PTA) in the revascularization of carotid arteries is not well established. The aim of this study was to asses the efficacy of PTA in revascularizing patients with carotid arterial stenosis. Thirteen consecutive patients (mean age 68 ± 7.7 years) underwent 13 PTA procedures in the carotid arteries during September 1992 to March 1994. The indication for revascularization was recurrent ischemic attacks with severe (>50%) carotid stenosis in the 13 cases. Time between symptoms onset to PTA was more than one month in all cases. The lesions were located in the internal carotid arteries (first extracraneal segment) in nine patients and in the common carotid arteries in four. This group included one patient treated by severe internal carotid stenosis with complete occlussion in the contralateral internal carotid vessel. PTA was performed using conventional technique. The balloon/artery ratio was 0.8–0.9/1 in all cases (Mean balloon size 5.3 ± 0.5 mm). *Results:* PTA was successfully performed in all patients with the diameter stenosis reduced from, 77.5 ± 5% to 19.7 ± 4%. Four patients had bradycardia and hypotension during balloon inflation. Two patients had transient neurologic deficit immediately after the procedure, resolved within 24 hours. No patient had a residual neurologic deficit upon discharge (mean 48 hours). At late clinical follow up (mean time 10 ± 7 months) one patient had restenosis with a new successful PTA. *Conclusion:* This early experience showed that PTA can be performed successfully and safely in selected cases of patients with symptomatic severe stenosis in carotid arteries. However, larger groups of patients and longer follow-up should need to compare this technique with surgical-endarterectomy.

2:15

796-2 Application of Lessons Learned from Cardiac Interventional Techniques to Carotid Angioplasty (PTA)

Sanjay S. Yadav, Gary S. Roubin, Sriram Iyer, Suresh Jain, Gerald Blackwell, Jiri Vitek, Natalia Plyuscheva, Dennis Doblars, Winfield Fisher, Gerald M. Pohost *University of Alabama at Birmingham, Birmingham, AL*

PTA of the carotid and vertebral arteries remains a challenging area of vascular intervention and optimal techniques have yet to be determined. We describe our initial experience with a novel approach to carotid PTA utilizing: 1) "active" perfusion, as is done during coronary angioplasty, which allows prolonged balloon inflations without cerebral ischemia; 2) transcranial doppler (TCD) monitoring, when anatomically feasible, during PTA to assess antegrade flow and detect cerebral emboli; 3) temporary pacing for bradycardia during intra-carotid balloon inflation; and 4) magnetic resonance angiography (MRA) for screening and follow-up. We have also used the previously described "protected" carotid PTA technique using an additional occluding