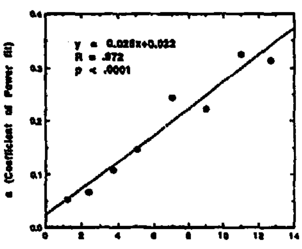
tion and 18 stable hemodynamic states were obtained pharmacologically. At distance increments of 0.384 mm, continuous axial centerline velocity (V)/distance (D) profiles of the regurgitant flow convergence region were derived digitally by color Doppler imaging. The relative error, {(RE) = (Qc – Qo)/Qo} where Qc and Qo are the calculated and reference flow rates, was determined over a wide range of V/D pairs (V = 0.28 ± 0.11 to 1.00 ± 0.39 cm/sec, D = 0.21 ± 0.19 to 0.75 ± 0.31 cm). For all the hemodynamic states (MR fraction ranged from 8% to 54%), a region with minimal RE (–1.0% ± 4.9%) could be located in the plot of RE against V or D (Figure).

Optimal (Ro) was related to maximal MR rate (r = 0.79) and MR orifice area (r = 0.75) and MR regurgitant fraction % (r = 0.72), and could be identified using the coefficients of centerline velocity profile: $V = a\ R^{-b}$ (r = 0.75, Ro = 1.4a + 0.46b – 0.04 or r = 0.82, Vo = 0.24 + 2.2ab). The FC method can be applied accurately for MR quantitation if either the radius or the velocity is properly selected using the centerline velocity profile.

966-90 Optimal Methods for Quantifying Mitral Regurgitation Using the Flow Convergence Method in Prolapsed Mitral Valves: An In Vitro Study

Lorissa Foster, Takahiro Shiota, David J. Sahn. *Oregon Hlth Sci Univ, Portland, OR*

The purpose of this study was to test the recently reported flow convergence centerline velocity/distance profile methods for calculating regurgitant flow rates through a complex orifice geometry mimicking mitral prolapse. A total of eight different flows (for pulsatile flows maximal flow rates = 1.2–12.7 l/min) were generated in an in vitro model with a modeled prolapsed mitral valve (with a crescent shaped orifice of 0.24 cm^2). A Vingmed 750 scanner (Vingmed Sound, A/S) interfaced with a Macintosh IIci computer with a 5 MHz transducer was used to record the velocities along the centerline through the regurgitant orifice. All of the digitally acquired velocity/distance acceleration curves for flow toward the mitral regurgitant orifice showed organized acceleration flow fields with highly significant correlations using multiplicative regression fits ($y = \text{"a"} \cdot x^{-\text{"b"}}$ r = 0.97–0.99, p < 0.001). Using the centerline profile, the most accurate calculations were made at distances from 0.46 to 1.46 cm away from the orifice and also at velocities from 0.10 to 0.58 m/sec. Applicable aliasing zone velocities and distances increased as the flow rate increased, with velocity in a relatively fixed relationship (7–11%) to maximal CW velocity.

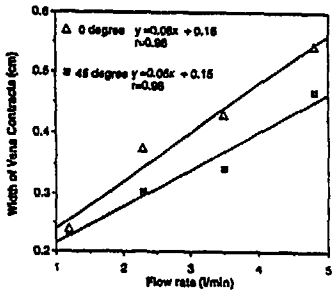


In addition, the coefficient "a" was closely related to the actual flow rates (r = 0.97, p < 0.0001, Fig.). The centerline method was useful for evaluating regurgitant flow rates.

966-91 Effect of Imaging Angle on the Color Doppler Imaged Vena Contracta: An In Vitro Study

Masahiro Ishii, Takahiro Shiota, Xiaodong Zhou, Brian G. Sinclair, David J. Sahn. *Oregon Hlth Sci Univ, Portland, OR*

The aim of our study was to evaluate the effect of the angle between imaging direction and flow direction on color Doppler (CD) flow images of the vena contracta (VC) which corresponds hydrodynamically to the smallest regurgitant flow cross-sectional area and correlates with effective regurgitant orifice area. In our in vitro model of "AI", steady flow at 4 different flow rates 1.2, 2.3, 3.5, and 4.8 l/min.) was studied with a circular orifice (orifice diameter = 5.5 mm, area = 0.24 cm^2) which was imaged at 2 different angles (0°-parallel or at a 45° angle to flow). The VC was imaged as the junction between the laminar flow convergence region and the turbulent regurgitant jet using a VingMed 775 system. Regression analysis between the width of VC and flow rate showed excellent correlations for both orientations. The VC widths at the different angles were significantly different (0.4 ± 0.13 cm at 0° vs. 0.34 ± 0.10 cm at 45°, p < 0.05). The signal-to-noise ratio and the consistency of CD imaging were better in images of VC obtained at 0°. Both approaches underestimated calculated effective regurgitant orifice size.



The effect of CD interrogation angle on VC width may be of importance when imaged VC measurement is used for evaluating clinical valvular regurgitation.

966-92 Limitations of Continuous Wave Doppler Grading in Aortic Regurgitation: A Chronic Animal Model Study

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Although the continuous wave (CW) Doppler deceleration slope (DS) and pressure half-time (PHT) methods have been used clinically for evaluating aortic regurgitation (AR), there have been no studies comparing for either with a quantifiable reference for regurgitant severity. To evaluate the accuracy of these CW Doppler methods for quantifying chronic AR. Eight sheep were studied 8 to 20 weeks after surgery to create chronic aortic regurgitation (AR). Twenty-nine hemodynamically different states were obtained pharmacologically. CW Doppler traces of the AR jets were obtained from the apical as well as from other standard transducer positions to yield maximal Doppler envelopes. AR was quantified as peak and mean regurgitant flow rates (RFR), regurgitant stroke volumes (RSV) and regurgitant fractions (RF) determined using pulmonary and aortic electromagnetic flow probes and meters balanced against each other.

Results: Peak RFR varied from 1.8 to 13.6 l/min (6.3 ± 3.2 l/min) (mean ± SD), mean RFR varied from 0.7 to 4.9 l/min (2.7 ± 1.3 l/min), RSV varied from 7.0 to 48.0 ml/beat (26.9 ± 12.2 ml/beat) and RF varied from 23% to 78% (53 ± 16%). Correlations between reference indexes, DS and PHT were:

	Peak RFR	Mean RFR	RSV	RF
DS	r = 0.73	r = 0.68	r = 0.59	r = 0.68
(m/sec^2)	(SEE = 2.0)	(SEE = 2.1)	(SEE = 2.4)	(SEE = 2.1)
PHT	r = 0.65	r = 0.69	r = 0.58	r = 0.69
(sec)	(SEE = 0.16)	(SEE = 0.15)	(SEE = 0.17)	(SEE = 0.15)

DS in the mild AR range (peak RFR < 5 l/min) showed a slightly improved correlation (r = 0.78). Our study shows that the CW Doppler DS and PHT methods have limited use for quantifying AR.

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Tuesday, March 26, 1996, Noon–2:00 p.m.
Orange County Convention Center, Hall E
Presentation Hour: 1:00 p.m.–2:00 p.m.

967-93 Accurate Estimation of Left Ventricular Mass in Vivo by Voxel-Based Three-Dimensional Echocardiography

Cleo Laskari, Alain Delabays, Jiefen Yao, Qi-Ling Cao, Giuseppina Magni, Stefano De Castro, Philippe Acar, Mani Vannan, Steven Schwartz, Natesa Pandian. *Tufts-New England Medical Center, Boston, Massachusetts*

Voxel-based 3-dimensional echocardiography (3DE) provides tissue-depiction images of the left ventricle (LV) and has quantitative capabilities. We have previously shown its accuracy in yielding LV mass (M) in vitro. How reliable is *in vivo* 3DE for LV M determination is not known. To assess this, we performed 3DE using a harmonic imaging system along with an IV contrast agent in 10 dogs with ECG and respiration gating. 2DE images were acquired using a rotational approach and 3DE reconstructions performed. For M determinations, LV myocardium was contoured, labeled and extracted in

TUESDAY POSTER