Functional Evaluation of Mitral Valve Prosthesis by Doppler Blood Velocimetry*

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Various techniques have been utilized for the assessment of mitral valve prosthesis function in man. Of the external methods, phonocardiography, fluoroscopy, and echocardiography have been most frequently employed. Routine cardiac catheterization, including pressure measurement and left ventriculography, supplies important data but does not directly estimate blood flow through the artificial valve. We describe here the initial observations on the use of Doppler catheter-tip velocimetry1 as a method for the direct measurement of phasic, instantaneous blood-flow velocity through such prosthetic devices in conscious man.

Figure 1 demonstrates simultaneously recorded lead 2 of the electrocardiogram, mitral-area phonocardiogram, right atrial pressure, apexcardiogram, and phasic instantaneous blood velocity at the Beall mitral-valve prosthesis of a 59-year-old woman. Note the predominant diastolic (D) wave followed by a smaller systolic (S) fraction. The rapid upstroke of the diastolic wave is inscribed in conjunction with the opening click of the valve and the 0 point of the apexcardiogram. Ventricular extrasystoles (X) shorten the preceding diastolic blood-velocity times and result in smaller systolic-flow velocities. The double systolic wave-forms on the apexcardiogram seen in association with normal intraventricular conduction can be contrasted with the monophasic apex impulses during the premature beats.

Diastolic blood-velocity profiles recorded at the mitral valve prosthesis resemble those previously noted in human subjects with normal mitral valves2 and in experimental animals with surgically implanted prosthetic-valve flowmeters.3,4 The time to peak inflow, measured as the interval between the onset and peak of initial mitral blood velocity, varied

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from 0.04 to 0.07 second, approximating average values described for experimental animals. 

We conclude that such study provides insight into the character of phasic mitral blood-flow velocity in subjects with artificial valves and offers an area for future research into the function of various types of prostheses.

REFERENCES
1 Benchimol A, Desser KB, Cartlan JL: Left ventricular blood flow velocity in man studied with the Doppler ultrasonic flowmeter. Am Heart J 85:294-301, 1973
2 Desser KB, Benchimol A: Blood flow velocity measured at the mitral valve of man. Am J Cardiol 33:541-545, 1974

ANNOUNCEMENTS

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The California Thoracic Society will present a Postgraduate Course on Advances in the Diagnosis and Treatment of Pulmonary Disease at the Sheraton-Harbor Island Hotel, San Diego, February 25-27. Dr. Kenneth M. Moser is Chairman of the course. For information, write Ms. Betty Rhodes, California Thoracic Society, 424 Pendleton Way, Oakland 94621.

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Now available is the manual, Clinical Pulmonary Function Testing, developed by the Intermountain Thoracic Society. The contents include: Nomenclature and abbreviations; spirometry; blood gas determination; lung volumes; CO diffusing capacity; quality control and standardization; tables of normal values. The cost for each manual is $10, and may be obtained from the Intermountain Thoracic Society, 1616 South 11th East, Salt Lake City, Utah 84105.