Discordant Left Ventricular Pressure and Apexcardiographic Pulsus Alternans

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Pulsus alternans is frequently observed in patients with markedly compromised myocardial function. Severe coronary artery disease, sustained hypertension, aortic valvular disease and primary myocardial disease have all been associated with this physical finding. Reports have appeared describing alternation of pressure and flow in various cardiac chambers and most commonly these alternating pressures have been concordant. Discordant lesser and greater circulation pulsus alternans has occasionally been observed. We report here the unusual occurrence of discordant left ventricular pressure-apexcardiographic pulsus alternans.

A 16-year-old boy was referred to the Institute for Cardiovascular Diseases because of congestive heart failure and a presumptive diagnosis of cardiomyopathy. During the course of routine phonocardiography and external pulse recording, it was noted that the patient had alternation of the external carotid pulse and left ventricular apexcardiographic deflections. Interestingly, the respective tracings were discordant, i.e., the stronger apex beat was associated with a smaller carotid pulse (Fig 1). The patient was subjected to cardiac catheterization, which confirmed the diagnosis of cardiomyopathy. Peak left ventricular, right ventricular...
FIGURE 2. Simultaneously recorded tricuspid area (TA) phonocardiogram, lead 2 (L II) of the electrocardiogram, left ventricular apexcardiogram (ACG), left ventricular (LV) and right ventricular (RV) pressures in a 16-year-old boy with cardiomyopathy. There is discordant pulsat alternans of the apexcardiogram and the intracardiac pressures. Odd numbered QRS complexes result in a higher apex beat and smaller biventricular pressure. Note that the apexcardiographic deflections are temporally related in close association with the left ventricular pressure events.

and pulmonary artery “wedge” pressures alternated concordantly. The left ventricular apexcardiogram was, however, discordant in relation to these other tracings (Fig 2). Left ventriculography indicated marked generalized hypokinesis with no identifiable localized asynergy and fluoroscopic image intensification during invasive study confirmed that the apexcardiogram was recorded at the site of left ventricular pulsation. There was discordance between the left ventricular apex deflection and a distinct right ventricular apexcardiogram (Fig 3).

Two mechanisms have been advanced as explanations for the pathogenesis of pulsus alternans and they are: (1) alternating deletion of contracting myocardial fibers and (2) alternation of end-diastolic myocardial fiber lengths. Regardless of

FIGURE 3. Simultaneously recorded mitral area (MA), tricuspid area (TA), pulmonic area (PA) phonocardiograms, left ventricular (LV) and right ventricular (RV) apexcardiograms along with lead 2 (L II) of the electrocardiogram in the same case. The larger left ventricular apex beat is associated with a smaller right ventricular apexcardiographic amplitude.
the mechanism involved, neither can adequately explain the findings described here. It is unlikely that the transducer was "off apex" since cineangiography and fluoroscopy indicated the proper recording site over the left ventricle. An asynergic myocardial segment in proximity to the transducer might account for the discordant changes. Under these latter conditions, stronger left ventricular beats would augment outward myocardial movement. The asynergic area would then be out of phase with generalized myocardial contraction, thereby resulting in discordance. Such asynchrony was not identified during left ventriculography.

This report indicates that not all externally acquired graphic representations of myocardial function are completely understood and future investigation in this area is warranted.

REFERENCES

3 Benchimol A, Schumacher J, Desser KB: Concordant right and left heart pressure and flow velocity alternans. Chest 61:183-184, 1972

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