Studies on Some Parameters of Tricuspid Valve Echocardiogram in the Early Diagnosis of Chronic Cor Pulmonale

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Summary: Using tricuspid valve echocardiogram, the right ventricular time intervals and relevant parameters of the normal persons were studied and compared with those of the patients with chronic cor pulmonale. Six parameters related to time intervals in a cardiac cycle for the early diagnosis of cor pulmonale were proposed, i.e., \( R_{IT} > 37 \text{ ms} \), \( R_{IT}/C-D > 0.076 \), \( R_{IT}/DML > 0.613 \), \( DML > 53 \text{ ms} \), \( RSTI < 420 \text{ ms} \) and \( RMST < 356 \text{ ms} \). The use of these parameters for the early diagnosis of cor pulmonale is more significant than conventional criteria. A combined use of these parameters with the conventional criteria may improve further the use of echocardiogram for the early diagnosis of cor pulmonale.

Key words: tricuspid valve echocardiogram, chronic cor pulmonale

The usefulness of echocardiography in the diagnosis of cor pulmonale has been affirmed by many clinical studies. Echocardiography is not only simple and convenient but also non-invasive. The criteria used recently by the majority of research workers for echographic diagnosis of cor pulmonale are based on the pathoanatomical changes of the right heart, pulmonary artery and its main branches. In order to improve the rate of conformity in the early diagnosis of cor pulmonale, on the basis of assessing cor pulmonale by conventional echocardiography, we have observed some parameters of the right ventricular time intervals of patients with cor pulmonale by tricuspid valve (TV) echocardiogram. The changes of several time intervals and related parameters of the right heart in a cardiac cycle were measured for the purpose of exploring some new parameters for early diagnosis of cor pulmonale by echocardiography.

MATERIALS AND METHODS

73 adults were studied, of which 36 (27 males and 9 females) normal persons with a mean age of 44 years served as control; 37 cases (28 males and 9 females) were patients with cor pulmonale with a mean age of 59 years. They were assessed by detailed history taking, general physical examination and special examinations, i.e., routine ECG, vectorcardiogram, plain X-ray chest film and conventional echocardiography. In the control group, the findings of cli-
nical and special examinations were negative (according to the criteria of the 3rd National Conference on Cor Pulmonale, 1980\textsuperscript{[13]}): the cases that have been assessed clinically and had the findings of more than one special examination in conformity with the criteria of cor pulmonale were classified in the cor pulmonale group.

These cases that were suspicious clinically to have some valvular functional or organic defects, cardiac arrhythmia or complicated right heart failure were excluded from the study.

Using the China-made type XJY-6 cardiac function assessing apparatus, the echocardiogram, ECG and sonocardiogram can be displayed simultaneously. The apparatus has a working frequency of 2.5 MHz, with an unfocused transducer 12 mm in diameter and a scanning velocity of 50 mm/sec. The transducer was placed in three positions, namely the third intercostal space along the left sternal border (for control group); or placed in the lower intercostal space or at the base of the xiphoid (for cor pulmonale group); or placed just below the xiphoid (for both groups). Three routine maneuvers\textsuperscript{[7]} were adopted in the examination and photography was used to record TV echocardiogram in which point C of TV closure and point D of TV opening can be accurately identified.

The rates of identification of the TV-echo were 80\% (36 of 45 persons) in control and 90\% (37 of 41 patients) in patients with cor pulmonale respectively. The photographed TV-echo was read under microreader and the following eight parameters were measured according to fig.1.

(1) Right ventricular electro-mechanical latency (REML), from the beginning of wave Q in ECG to point C of TV closure in echocardiogram, i.e., Q-C interval. (2) Right ventricular isovolumetric relaxation time (RIRT), from pulmonary valve closure (\(P_v\)), i.e., the pulmonary second heart sound (\(P_2\)) in sonocardiogram to point D of TV opening in echocardiogram (\(T_o\)), i.e., \(P_2-D\) interval. (3) C-D segment, from point C of TV closure to point D of TV opening. (4) The ratio of right ventricular isovolumetric relaxation time to C-D segment, i.e., RIRT/C-D ratio. (5) The ratio of right ventricular isovolumetric relaxation time to right ventricular electro-mechanical latency, i.e., RIRT/REML ratio. (6) Q-D interval, from the beginning of wave Q in ECG to point D of TV opening. (7) Right ventricular mechanical systolic time (RMST), from point C of TV closure to the pulmonary second heart sound, i.e., C-P\(_2\) interval. (8) Right ventricular systolic time interval (RSTI), from the beginning of wave Q of the ECG to pulmonary second heart sound, i.e., Q-P\(_2\) interval.

In order to minimize the effect of respiration and other errors made during