A new Method of Assessing BV/CO Ratio in RCG

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BV/CO (circulating blood volume/cardiac output) ratio in RCG (radiocardiogram) is calculated from values determined by Stewart-Hamilton's dilution method.

Since this procedure is complicated and time consuming, an attempt was made to establish a simpler formula by which BV/CO ratio can be easily calculated.

BV/CO ratio is expressed as transit time. Therefore, in the RCG curve, an interval ($T_{CF\,1.5}$), between the time when the ratio activity rose to 1.5 times as high as concentration in the steady state and the time when it reduced to 1.5 times the concentration was measured.

Correlation between BV/CO ratio and $T_{CF\,1.5}$ was studied. In 367 cases of nonvalvular diseases, regression coefficient was 0.973,

$$\text{BV/CO ratio} = 0.058\ T_{CF\,1.5} - 0.016 \cdots\cdots (1)$$

In 243 cases of valvular diseases, regression coefficient was 0.982. Consequently,

$$\text{BV/CO ratio} = 0.067\ T_{CF\,1.5} - 0.184 \cdots\cdots (2)$$

And two regression lines crossed each other at the point of 20 seconds of $T_{CF\,1.5}$. Thus, by measuring $T_{CF\,1.5}$, BV/CO ratio was easily estimated using formula (1), when $T_{CF\,1.5}$ was less than 20 seconds, of formula (2), when $T_{CF\,1.5}$ was more than 20 seconds.

Correlations between BV/CO ratio and peak to peak interval as well as full width of half maximum value were also analyzed. However, they were not so close as that between BV/CO ratio and $T_{CF\,1.5}$.

Our analysis indicates $T_{CF\,1.5}$ measurement was very feasible for the calculation of BV/CO ratio in RCG.

An Automated Detection of Abnormal Left Ventricular Wall Motion from RI-angiocardiograms

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ECG-gated RI-angiocardiography can be non-invasively performed to obtain a left ventricular volume and wall motion In general RI-images are obscure because of the statistical fluctuation of radioisotope and the poor resolution of RI-imaging devices. Computer-based methods for detecting left ventricular edge are proposed.

ECG-gated images of left ventricle were digitized by a image processing system consisting of a flying-spot-scanner and a mini-computer system. A nonlinear filter was designed for smoothing and enhancing the digitized RI-angiocardiographic image. Four rectangular filters were set up around the point of observation and means and variances of the density of the image were calculated. Among the nighbors one which has the smallest variance can be considered as the region in which a boundary is not contained, because the existence of boundary makes the variance of the image in this region increase. An edge was obtained from the left ventricular image which was extracted by nonlinear filter smoothing method. The edge for enddiastolic images was superimposed on the one for endsystolic image with two reference points outside the cardiac images. In order to quantify regional shortening the method employed a radial

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coordinate system which had its origin at the endsystolic center of axes.

Nine patients with old myocardial infarction were analyzed by this computerized method. The results thus obtained were consistent with those obtained by manual tracing of left ventricular images. However, there were some cases in which it was difficult to delineate the posterobasal portion of left ventricular image because of the presence of left atrium. In conclusion this computerbased edge detection appears very useful to quanttify segmental shortening of left ventricle without interobserver variation.

Study of Left Ventricular Function by the High Temporal Resolution Analysis Method

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Functional parameters of left ventricle estimated as follows; a) Ejection fraction (EF) b) Maximum systolic volume velocity (MSVV): maximum value of (dV/dt)/V in the systolic phase. c) Maximum diastolic volume velocity (MDVV): maximum value of (dV/dt)/V in the diastolic phase. d) Time of end-systole (T_E): times between end-diastole & end-systole. e) Time of MSVV (T_S): times between end-diastole & MSVV. f) Time of MDVV (T_D) g) T_D-T_{sh}) T_D-T_E and i) T_E-T_S.

Subjects: Normal 27 cases, 13 myocardial infarction, 5 angina pectoris, 7 valvular diseases, 7 other cardiac diseases and 3 other diseases.

Results: 1) EF was independent on R-R interval. 2) MSVV & MDVV depend on R-R intervals respectively. 3) T_D depends on R-R interval, but Ts slightly depends on it. The regression curve of T_D in normal case was obtained. T_D values of myocardial infarction localized on the upper side of this curve, while T_D values of valvular diseases localized on the lower side. 4) (T_D-T_S) shortened in MR, while it prolonged in AR. 5) In various diseases (T_D-T_E) was plotted along Y-axis and (T_E-T_S) was plotted along X-axis. These parameters distributed around Y=X line in normal case, above its line in the cases of myocardial infarction, angina pectoris and aortic valvular disease and under it in mitral valvular diseases.

Conclusion: 1) MSVV, MDVV & other time parameters except EF are dependent on R-R interval, suggesting physiological function of the heart. 2) Two dimensional expression of these parameters is useful to diagnose cardiac diseases.

Detection of Aortic and Arterial Disorders with Radionuclide (RN) Angiography and Blood Pool Image

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Because of easy to perfome, safe and noninvasive nature of RN angiography, it has been widely used for screening and follow-up of various vascular disorders. Purpose of this study is evaluation of diagnostic efficiency and limitation of RN angiography and blood pool image of various aortic and arterial disorders.

RN angiography was taken immediately after intravenous injection of 10–20 mCi of ^{99m}Tc-human serum albumin with imaging time of 1–2 sec/frame up to 25 or 42 frames. Imaging device was Toshiba GCA-401 large field of view gamma camera with high resolution collimator and gamma imager. Ninety-three patients were grouped into

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