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COMPUTER SIMULATION OF VENTRICULAR WALL MOTION BY FINITE ELEMENT METHOD. T.Watanabe, K.Nishizawa, Y.Nakamura and T.Shinozaki. Hirosaki University, Hirosaki.

A new computer program to simulate the ventricular wall motion by finite element method was developed. A simple finite element model of the left ventricle was made with each element idealized tension-length curve was applied to. Then, force balance of internal pressure and tension of the elements was established at each node, which several elements were connected to, by Newton's method earning the ventricular profile. Pathological change of ischemic process was induced at a certain portion of the model to make it possible to evaluate semiquantitatively the relationship between the type, degree of the change and the abnormal ventricular wall motion (i.e. hypokinesis, akinesis and dyskinesis). Assumption of plastic deformation at the affected site of the model reproduced the genesis of the ventricular aneurysm. The more precise finite element model will make the more quantitative evaluation possible.

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FACTOR ANALYSIS FOR THE CALCULATION OF LEFT VENTRICULAR EJECTION FRACTION IN FIRST-PASS RADIONUCLIDE ANGIOGRAPHY. J.C.Maublant.Centre Jean Perrin, Clermont-Ferrand,France. I.Mena.UCLA School of Medicine,Torrance,California,U.S.A.

Factor Analysis(FA) was utilized to calculate automatically the left ventricular(LV) ejection fraction(EF) in first-pass radionuclide angiography (FPRA). The accuracy and reproducibility of the results were assessed in a series of 49 patients(PTS). Following injection of a bous bolus of Tc-99m or Au-195m(T1/2=30sec) and a 30sec list mode acquisition,a composite cardiac cycle of 16 frames corresponding to the LV time activity curve(TAC) was reconstructed from a list mode acquisition data and processed with FA. LVEF was directly derived from TAC of the LV factor. It was also calculated with a routine ROI method(ROIM). In a group of 32 PTS the value of LVEF obtained by contrast ventriculography (V) was also available. In these PTS the coefficient of correlation was the same between V and FA, and between V and ROIM(R=0.83). A group of 10 PTS were injected with Au-195m two times at three minutes apart. The reproducibility of LVEF between these two injections was 0.78 for FA and 0.81 for ROIM. In another group of 7 PTS injections of Au-195m were successively performed in LAO and RAO projections. The reproducibility was 0.71 for LVEF calculated by FA. However the absolute values were significantly lower in the LAO projection . It is concluded that although the results are not independant of the projection, FA allows a reliable and enterely automatic calculation of LVEF in FPRA.

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PATTERNS OF PROPAGATION OF CONTRACTION IN PATIENTS WITH EPICARDIAL PACING USING TOMOGRAPHIC PHASE ANALYSIS. K.Nakajima, H.Bunko,J.Taki,Y.Shiire,N.Tonami, K.Hisada,T.Misaki*,and T.Iwa*. Department of Nuclear Medicine and (*)First Department of Surgery, Kanazawa University Hospital, Kanazawa.

Phase analysis of gated blood-pool study has been applied to evaluate conduction anomalies; however, there was a limitation to estimate the initial site of conduction even by multiple projections. On the other hand, tomographic phase analysis has advantage to obtain the three-dimensional informations of conduction patterns. In this study, we performed pacing study in patients with Wolff-Parkinson-White syndrome after surgery using pacing wire placed on the epicardium. Gated blood-pool study using single-photon emission computed tomography(SPECT) was performed. Both of length-based and count-based phase analysis were applied to tomographic short-axial images. Estimation of conduction patterns by tomographic phase analysis had good correlation with the site of pacing. When the degree of pre-excitation was changed by pacing, the phase patterns were apparently changed. Tomographic phase analysis provided three-dimensional informations of phase and was effective method for the analysis of conduction patterns.

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ESTIMATION OF STROKE VOLUME DURING EXCERCISE WITH RN-ANGIOGRAPHY.
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Cardiac output at rest (CO_R) was measured with first pass method using Tc-99m-RBC and stroke volume at rest (SV_R) was obtained from the equation of $SV_R=CO_R/HR_R$. When the counts of radioactivity from ventricular ROI at rest is $C_{ed}(R)$ (enddiastole) and $C_{es}(R)$ (endsystole), and the counts of radioactivity in 1 ml blood is Ar,

$$C_{ed}(R)= EDV(R)\times Ar\times\alpha+R_w\times\beta \quad (1)$$
$$C_{es}(R)= ESV(R)\times Ar\times\alpha+R_w\times\beta \quad (2)$$

Where α represents the attenuation factor of radio activity from ventricle, β is attenuation factor of radioactivity from the tissue other than ventricle and R_w is the counts of radioactivity per minute from the tissue other than ventricle.
Therefore,

$$C_{ed}(R)-C_{es}(R)=Ar\times\alpha\times(EDV(R)-ESV(R)) \quad (3)$$

When the counts of radioactivity in 1 ml blood during excercise is Ae,

$$C_{ed}(E)-C_{es}(E)=Ae\times\alpha\times(EDV(E)-ESV(E)) \quad (4)$$

From (3) and (4),

$$SV_E = \frac{C_{ed}(E)-C_{es}(E)}{C_{ed}(R)-C_{es}(R)}\times\frac{A_r}{Ae}\times SV_R \quad (5)$$

In the present study, cardiac output was compared between that obtained with thermodilution method and that obtained with equation (5), and it was found that there was a good correlation between these 2 methods.