10. RADIONUCLIDE INDICES OF CARDIAC FUNCTION RELATED TO STRUCTURAL VENTRICULAR DISORDERS

10.1. INTRODUCTION

The purpose of this study is to define indices of cardiac function which should allow a quantification of structural ventricular disturbances, such as regional wall motion disturbances (RWMD), in terms of magnitude and timing of regional volume changes (1,2).

Parametric images of the first harmonic amplitude and phase of the volume changes have proven their clinical applicability for the evaluation of RWMD and for the visualisation of the hemodynamic effect of disturbances in electrical activation. The chief limitation of visual assessment of amplitude/phase images is its subjectivity. Statistical analysis of phase distribution is currently under investigation as an objective technique for detecting the presence and/or severity of RWMD (3,4,5). A binary decision whether RWM is normal or abnormal may probably be achieved by analysis of amplitude weighted phase distribution functions or by evaluation of the clustering properties of the amplitude/phase distribution in the complex plane (6). Obtaining a set of quantitative indices should however be the goal of a diagnostic measuring technique performed at rest and during physiologic or therapeutic interventions. With respect to this,
amplitude/phase imaging is hampered by the fact that only the basic frequency component of the activity changes is analysed (7).

In this study we quantified regional ventricular function in terms of magnitude and timing of motion by means of parameters which take into account all the Fourier frequencies of an averaged cardiac cycle except the zero frequency component (which bears no dynamic information).

10.2. MATERIALS AND METHODS

10.2.1. Definition of the indices.

Using the original (preprocessed) data of an EGNA study, a time/activity curve is calculated for each pixel. Two images representing the minima and the maxima of each pixel's time/activity curve are reconstructed (MAX image, MIN image). The original images representing the activity distribution at end diastole and at end systole are used as such (ED image, ES image). Within a region of interest (ROI) over the left ventricle the counts in MAX, MIN, ED and ES images are calculated. We define:

\[ CI = \frac{ED-ES}{ED-MIN} \]

\[ FI = \frac{ED-ES}{MAX-ES} \]

\[ EFF = \frac{ED-ES}{MAX-MIN} \]