1. INTRODUCTION

Because the functional and structural hallmarks of ischemic heart disease are abnormal regional wall motion and shape, two-dimensional echocardiography seems ideally suited for the noninvasive evaluation of this entity. It should be possible with this technique to assess the extent and location, as well as the presence, of regional left ventricular dysfunction. The purpose of this presentation is twofold. First, the utility of quantitative two-dimensional echocardiography in acute myocardial infarction will be exemplified by examining regional cardiac dilatation in acute myocardial infarction. Second, we will address the accuracy of quantitative two-dimensional echocardiography in identifying, localizing, and sizing myocardial infarction in patients and in the intact canine heart.

2. QUANTITATIVE TWO-DIMENSIONAL ECHOCARDIOGRAPHY IN ACUTE MYOCARDIAL INFARCTION: THE IDENTIFICATION OF REGIONAL CARDIAC DILATATION

Perhaps the commonest example of the structural change in ventricular shape is the infarcted left ventricle. Studies in patients with chronic ischemic heart disease have demonstrated a good correlation between cross-sectional echocardiographic and cineangiographic detection of both ventricular aneurysm and areas of regional asynergy [1, 2, 3]. The importance of acute changes in topography has recently been illustrated. In its capability for repeated noninvasive examination, two-dimensional echocardiography raised the attractive possibility of serial evaluation of the left ventricle in acute myocardial infarction. The initial impetus for using two-dimensional echocardiography in this way was provided by the pathologists. Post-mortem studies of patients dying within 30 days after acute myocardial infarction had shown that up to two-thirds of such patients had some thinning and dilatation of the infarcted area within one week of acute infarction [4] and that in approximately one-third of patients’ hearts with transmural infarcts there was marked expansion of the infarcted zone, resulting in obvious
cardiac dilatation. This process occurred with little or no histologic evidence of infarct extension or further necrosis after the initial acute event.

Two-dimensional echocardiography made it feasible to look for such acute alterations in cardiac topography by serial examination of patients with acute myocardial infarction, and make the ante-mortem diagnosis noninvasively [5]. For quantitative evaluation of these serial echocardiograms, we utilized a computer-aided system for contouring myocardial borders and evaluating regional wall thickness and segment lengths (Figure 1) [6]. This

![Figure 1](image1)

*Figure 1. Computer-aided contouring system for echocardiographic analysis. A) Cross-sectional image at level of papillary muscles. B) Process for dividing same image into 16 equally spaced myocardial segments. Each of two sets of 16 points is superimposed on the endocardial and epicardial margins. C) Points are smoothed by the computer and are repositioned every 16–32 ms.*

![Figure 2](image2)

*Figure 2. Computer-generated contours of transverse end-diastolic views of the left ventricle from serial echocardiographic studies of a patient with infarct expansion, who had an anterior transmural infarction on day 1 with serial studies through day 21. Papillary muscle locations are represented here by dotted lines. Progressive development of regional dilatation and thinning in the infarcted area is apparent by day 7.*