valve enter this segment. Using these definitions, our cases do not have two ventricles. The chambers with the morphology similar to a left ventricle do not possess one-half of an AV valve and thus we do not consider them ventricles.

In defining AV valves, we cannot examine these valves as the morphologist can, and so we must use angiographic criteria in naming them. To us a mitral valve is a valve that enters a left ventricle and a tricuspid valve is a valve that enters the right ventricle. When both valves enter the same ventricle, we do not consider them to be either tricuspid or mitral, but as undifferentiated AV valves. The concepts referred to are not originally ours but are held, and have been reported, by others.8,9

Our terminology is not that used by Dr. Van Praagh. Our points of view differ, as morphologists and angiographers differ, our definitions differ, and therefore the division of the continuum into segments will differ. We greatly respect Dr. Van Praagh's opinions and we understand his terminology, but until a worldwide consensus as to nomenclature evolves, we, as clinicians and angiographers, will continue to use that terminology we believe suited to our needs.

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Low-level ECG Potentials from Body Surface Maps

To the Editor:

Spach and co-workers1–2 recently published two very extensive reports on low-level ECG potentials from body surface maps. The first paper dealt primarily with methods and the well-known problems of establishing an appropriate baseline for taking ECG measurements. In the second report, ST-amplitude changes with increasing age were described. Records from 66 normal subjects between the ages of 1–60 years were selected from 400, accumulated over a 4-year period.

The main finding in this 31-page report was an increase in ST amplitudes up to the third decade of life, followed by a decrease in subsequent years. The latter finding is important because limits of normal need to be known if abnormal conditions such as ischemia, pericarditis and others are to be recognized. Since record samples in some decades of Spach's report were as small as 10, it was probably wise to abstain from precise demarcations of normal ranges for the various age groups and the authors limit themselves to rather general, qualitative descriptions of findings.

What appears most remarkable in this paper is the fact that the described trend of ST-amplitude changes with age agrees rather well with much more detailed studies that were published in Circulation as early as 19677 and as recently as 1977.1 Based on almost 1000 normal adults a gradual decrease in ST-T amplitudes was found in males from the third decade up to old age. In females, however, this decrease leveled off somewhat in the fifth decade, which coincides with the time of menopause. The latter observation was not made by Spach who had only seven records from women available in his study.

In electrocardiography it is the exception rather than the rule that results from small-sample studies agree with those from studies of larger scale. This phenomenon has been the source of most controversies in this field, which led one of the former editors of this journal in 1968 to request an editorial on this subject.4 Spach and his co-workers were very fortunate in obtaining results that are mostly in agreement with larger studies. They should not be too confident, however, in expecting this to happen again in future investigations based on small samples. The latter type of report might preferably be labeled “preliminary” to alert the reader. In addition, they should search for previous publications by others on the subject.

In the discussion of results, much emphasis is placed on low-level ST-amplitude changes observed in areas distant from the heart. These observations are to justify the use of total body surface maps rather than smaller sets of leads. One should be very careful in not overinterpreting these small changes for several reasons. Repeat variability of ECG findings has been studied extensively for conventional and orthogonal leads, but not for body surface maps. To be significant, the observed ST changes would have to exceed such variability in recording. Furthermore, it is well known that ST and T changes can be induced by any number of extraneous factors, such as meals, temperature and others. There is no indication in Spach's report how these factors were controlled. Interpretation of small ST changes will remain, therefore mainly speculative, until we have better controls.

There are a few disturbing technical points in Spach's reports which need clarification. The frequency response of the amplifiers is described as being flat from 0.1–30,000 Hz. The slope of the response curve at the lower end is not indicated. Such information should have been given because an inadequate response leads to recording errors in the ST segment, which was the main subject of the report.4 The analog-to-digital conversion rate is indicated as 1,000/sec for wide-band data up to 30,000 Hz. In this combination a low-pass analog filter of approximately 500 Hz would be desirable in order to avoid aliasing of frequency components above this level. These aliasing errors occur regardless of the fact that the aliasing frequencies may be of no particular interest in the analysis of the signal. Berson et al.6 have discussed these problems in more detail.

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