NEWMAN recently has had this to say about the interpretation of the scalar electrocardiogram: "... (part) of the process involves quite a remarkable mental accomplishment. It involves an estimate of the magnitude and direction of the QRS deflections relative to that of the T waves, and then a comparison of the estimates with normal experience." It is familiarization with the normal that is perhaps the most difficult task in electrocardiography. We have found a composite electrocardiogram (fig. 1) useful in this regard. It is made from the range of normal values to be found in the appendix of the American Heart Association's Electrocardiographic Test Book. As can be seen, the normal ranges of the P, Q, R, S, and T deflections are depicted. The range of normality of S-T elevation is also shown. In the interest of simplicity, the various time intervals and the intrinsicoid deflection have not been included.

![The normal composite electrocardiogram.](http://circ.ahajournals.org/)

**Figure 1**
Even a casual study of the composite electrocardiogram recalls some of the classical empirical electrocardiographic observations: a flat or inverted T in lead I or II is not normal; the normal range of S-T elevation in the middle chest leads and lead II is quite labile; an inverted T in lead III is not necessarily pathologic, especially as an isolated finding, etc.

Such composite electrocardiograms might prove useful in pediatric cardiology, where the amount of any individual experience with specific ages is less than in the broad age spectrum of adult cardiology.

The same word of caution found in the preface to the Electrocardiographic Test Book² concerning the size of the sample from which some of the ranges were drawn also applies, of course, to the composite electrocardiogram. Also, certain combinations of borderline values probably do not occur except pathologically. For instance, the range of values for the heart’s electric axis as calculated from the extremes of the QRS complexes in leads I and III of the composite electrocardiogram is −3 to 107 degrees, whereas the range of normality given by Jackson and Winsor³ is −30 to 102 degrees.

With awareness of the limitations of the composite electrocardiogram it has been found to be a useful tool in the understanding of electrocardiography.

References


The Early History of Instrumental Precision in Medicine

An astronomer gave us the first rude thermometer, and it seems to have been another, Herman Kepler, who first, and certainly before 1600, counted the human pulse, or at least left a record of having done this memorable thing. The publications in which he mentions the pulse date from 1604 to 1618. Does it not seem incredible that of the numberless physicians who sat by bedsides, thoughtful, with fingers laid upon that bounding artery, none should have had the idea of counting it? I quote in English what Kepler says. This great but fanciful man seems to have believed the pulse to have some relation to the heavenly motions, and used the time of the pulse in connection with arguments in favor of the Copernican system of astronomy. He says: “In a healthy man, robust and of full age, in one of melancholic complexion, or in a feeble man, generally for each second there is a pulsation of the artery, with no discrimination between systole and diastole; thus there should be in one minute sixty pulsations, but this slowness is rare, commonly 70 may be counted, and in the full-blooded and in women 80, four to each three seconds. Briefly, in one hour 4,000, more or less.” The clock with which Kepler counted the pulse must have been such a “balance” clock as his master Tycho Brahe used.—S. Weir Mitchell, M.D. Transactions of the Congress of American Physicians and Surgeons, Second Triennial Session held at Washington, D.C., 1891. New Haven, The Congress, 1892, p. 173.
The Normal Composite Electrocardiogram
PAUL S. EZRA

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