Thirdly, the figures (4 & 5) of the tripolar concept were for diagrammatic purposes only and were not meant to be optimizations.

Lastly, and most importantly, was Dr. Cuddy's concern about our using low impedance (1000 ohms) in determining the R-wave potentials of various cardiac pacemaker electrodes. As previously stated in response to Dr. Furman's letter, we were not concerned with how well a new pacer receives its signals, but rather how a pacer that has been implanted in the hostile environment of the body detects these signals. We went under the assumption that all pacer recalls have been related to moisture absorption by the pacer, even those which are hermetically sealed. These leakage paths, especially if they are between terminals, will be in parallel with the input impedance. We assumed that a moderate leakage path of 1500 ohms or less would result from the moisture absorption.

Using the resistance of conductors formula for resistance in parallel:

\[
\frac{1}{R} = \frac{1}{r_1} + \frac{1}{r_2} \quad \text{or} \quad R = \frac{r_1 r_2}{r_1 + r_2}
\]

with \( r_1 = 20,000 \) ohms, the pacer's input impedance and \( r_2 = 1,500 \) ohms, the leakage path's impedance, the resultant input impedance of a wet pacer would be 1,400 ohms. This, then, is a far cry from the input impedance of new pacers. We used 1,000 ohms to simulate a worst-case condition, in which leakage had occurred and fibrous tissue ingrowth around the electrode had further reduced the sensitivity.

Once this low impedance pathway develops, the detected R-wave potential of small surface area electrodes is decreased by 75% or more; however, with large area electrodes, the diminution may be only 40 or 50% of the original levels. Since the original R-waves detected with large surface area electrodes are 50% larger than the small area electrodes at 10–30,000 ohms, it would be possible that the R-waves detected with a wet shorted-out pacer, using a large area electrode, will be as great as the R-waves detected using a small area electrode in a brand new dry pacer.

This, to us, clearly demonstrates the superiority of large area electrodes over small area electrodes for sensing cardiac signals. At present, a dichotomy of choice exists: Do we use larger area electrodes for superior sensing or small area electrodes for lower energy pacing? The answer to both is yes. By having the "tripolar" concept that we described in the paper, we can have the best of both possible worlds. A large area electrode would be used only for sensing and a small area electrode only for pacing.

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Double-blind Referees

To the Editor:

As you know, the fate of a paper submitted to medical journals for publication is largely decided by two or more reviewers who independently evaluate its scientific merit while aware of both the institution from which the paper was released and the investigators involved. This is also the case with abstracts considered for presentation in scientific assemblies of various medical organizations. While prominent investigators working in major institutions are statistically more likely to produce high quality work than others employed in institutions of average caliber, this need not necessarily be always true. Human nature being what it is, it seems difficult to exclude the possibility that the reputation of either the institution or the investigators introduces an at least subconscious bias in the process of evaluation of a paper or an abstract by the reviewer. Although such bias could theoretically be avoided by positive, conscious effort on behalf of the reviewer trying to guard against it, there is no reason to believe that such effort would be more effective than that of, say, an investigator who is required to use double-blind methods to eliminate bias from his experiments or conclusions.

I therefore propose that information concerning authors, institutions, supporting grants, etc., be withheld from reviewers considering papers or abstracts for publication in journals or presentation in meetings, respectively. Even if reviewers were assumed to be absolutely immune to bias, which I doubt, authors of rejected papers may be biased in their own evaluation of the reasons for rejection of their work, unfairly attributing it to the reviewer's bias.

I plead ignorance of the merits of the existing policy and would welcome any enlightenment volunteered by its proponents. Until this happens, I believe that adopting the proposed policy would eliminate both biases and protect both parties from each other's unfairness, to their mutual benefit.

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The First Heart Sound

To the Editor:

I read with great interest the article by Mills et al. (Circulation 54: 944, 1976) on the contribution of the atriointricular valves to the first heart sound by a new simultaneous echophonocardiographic technique in nine patients. We generally agree with their statement that the two major high frequency components of S1 are intimately related to mitral and tricuspid valve closure respectively. However, we would like to present some additional data to further elucidate this controversial subject.

We performed a study to evaluate by echocardiography the relationship of mitral, tricuspid and aortic valve motion with the simultaneously recorded S1, with particular emphasis to the role of aortic valve in the production of the second major component of S1. There were 20 subjects, 16 with no valvular or congenital heart disease, and four with mitral valve disease. All 20 subjects had normal PR intervals. The mean interval between the onset of the Q wave of the electrocardiogram to mitral valve closure was 56.8 ± 3.7 m/sec, to tricuspid valve closure was 70.0 ± 6.1 m/sec, and to aortic valve opening was 96.0 ± 4.1 m/sec. The mitral and tricuspid valves closed simultaneously in five of twenty patients (25%), tricuspid valve closure preceded that of mitral valve in three of twenty patients (15%), and tricuspid valve closure followed mitral valve in 12 of 20 patients (60%). The first major component of S1 coincided with mitral valve closure in all (100%), and also with tricuspid valve closure in 14 (70%) patients. Piemme et al. reported that "although there may be asynchronism of mitral and tricuspid valve closure, the time difference is probably so slight that both contribute to the first major component" of S1. The second major component of S1 coincided with aortic valve opening in all (100%) and also with tricuspid valve closure in six (30%) patients, supporting the observations that aortic valve opening is associated with the second major component of S1.

Our data suggest that the first major component of S1 coincides with mitral valve closure in all patients but may also coincide with tricuspid valve closure in many patients. Also, the second major...
The first heart sound.
R Prakash

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