Permanent Pacing of the Left Atrium for Treatment of WPW Tachycardia

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SUMMARY
A patient with WPW paroxysmal tachycardia was treated with a permanent artificial pacemaker, with the electrodes attached to the left atrium. The pacemaker is turned off at all times except when the patient activates it by holding a magnet over the implanted power unit. Random atrial pacing at a rate of 108/min has always terminated the tachycardia within 1 min, and usually within 10 sec.

Left atrial pacing produced WPW type A QRS complexes, whereas regular sinus rhythm and right atrial pacing resulted in more normal QRS complexes. The distinct difference in the QRS complexes suggests preferential conduction through an abnormal pathway during left atrial pacing.

Additional Indexing Words:
Circus movement On-call pacemaker

This is a report of treatment of WPW paroxysmal arrhythmia by electrical stimulation of the left atrium, using a new type of implanted pacemaker which operates only when externally activated by a magnet. The case is of further interest in that left atrial pacing always results in a marked electrocardiographic evidence of WPW type A tachycardia, whereas right atrial pacing or normal sinus rhythm always results in a more normal electrocardiogram.

Report of Case
A 47-year-old man first became aware of transient palpitation and fast heart rate in 1943. Originally episodes were infrequent and lasted 2 to 3 min, but, but 1967, he noticed as many as 20 attacks per month, lasting as long as 5 hours. He was treated with digitalis, quinidine (Quinidex, 600 mg every 12 hours), and propranolol (60 mg every 6 hours) in combination, and diphenylhydantoin. Although some of these agents appeared to have some benefit, all failed to reduce the frequency or duration of his attacks which progressively became more severe. On November 5, 1968, a permanent pacemaker (General Electric; fixed rate) was implanted with the electrodes attached to the left atrial appendage via thoracotomy. The electrodes were well spaced from the left ventricle. On January 23, 1970, the power unit was replaced with a new type of unit which is inoperative at all times except when activated by holding a magnet over the implanted unit (General Electric; fixed rate, 108/min). Subsequently, the patient has required no medication and has had an average of one episode of tachycardia per week. On every occasion, the patient activated the pacemaker with a magnet, terminating the tachycardia within 60 sec of activation of the pacemaker, and usually within 10 sec.

Discussion
Massumi,1 Durrer2 and their associates showed that properly timed, electrically induced atrial premature beats are effective in stopping some arrhythmias. However, random pacing is the only logical approach to treatment on a permanent basis, as sooner or later a random electrical discharge will be properly timed to terminate the arrhythmia, presumably by interrupting a circus movement.

Although use of permanent ventricular pacing has been reported for supraventricular tachycardia,3,4 we chose to use left atrial pacing for the benefit of atrioventricular synchro-
Figure 1

Standard electrocardiogram, showing an abnormality in the right chest leads. Right atrial pacing produced an identical electrocardiogram.
Figure 2

Electrocardiogram with left atrial pacing.
Figure 3
Esophageal leads with left atrial pacing. The upper strip is with the electrode well below the level of the heart. In the lower strip (% standard), the electrode is at the level of the left atrium. Distinct P waves precede the QRS complexes.

Figure 4
Termination of tachycardia by left atrial pacing. S = pacemaker stimulus. The tachycardia ends after the last stimulus which immediately precedes a QRS complex. The pacemaker was fortuitously turned off following the stimulus which terminated the tachycardia.

Ornization and also because excitation of the left side of the heart seemed to offer a better chance of interrupting a circus movement, if this is in fact the mechanism of the arrhythmia.

Right atrial pacing resulted in QRS complexes identical to the patient’s “normal” complexes in the electrocardiogram (fig. 1), but with left atrial pacing the QRS complexes are much more abnormal and more like those in the WPW type A syndrome (figs. 2 and 3). This seems to indicate a preferential excitation via the abnormal pathway during left atrial pacing and is perhaps some indirect evidence that the abnormal pathway arises from the left atrium.

The new power unit paces at a fixed rate of 108/min only so long as the magnet is held over it, and turns off when the magnet is withdrawn. We chose the rate of 108/min as one which is not too fast for short-term atrial pacing, but is fast enough to minimize the time required to terminate the arrhythmia by random pacing. Our patient knows immediately when his heart rate becomes abnormally fast and can activate his pacemaker when necessary, terminating the tachycardia usually within 10 sec. As shown in figure 4, the tachycardia is terminated by a pacemaker stimulus which falls immediately preceding the last QRS complex of the tachycardia. This has been the timing in every observed pacemaker-induced termination of the tachycardia.

References

Circulation, Volume XLII, December 1970


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Circulation. 1970;42:1073-1077
doi: 10.1161/01.CIR.42.6.1073

Circulation is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231
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Print ISSN: 0009-7322. Online ISSN: 1524-4539

The online version of this article, along with updated information and services, is located on the World Wide Web at:
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