Interesting Electrocardiogram

ATRIAL FIBRILLATION AND SYNCOPE

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This 27-year-old man gave a history of palpitations since an early age, but these episodes were no problem for him until November 1982, when he felt weak and went to an Emergency Room. Atrial fibrillation with a wide QRS was found and he was given Verapamil, which resulted in ventricular fibrillation and loss of consciousness. He was electrocardioverted back to sinus rhythm (see Figure 1). The physical examination was negative.

The interpretation of this post conversion record (Figure 1) is crucial to the solution of the problem and its prognosis. It is of note that the initial reading of the electrocardiogram (by a cardiologist) was "old inferior myocardial infarction." The initial and negative waves of the QRS in leads ii, iii, and AVF were erroneously called Q waves (hence the reading of myocardial infarction). However, these are delta waves, as is confirmed by noting the positive delta waves in V2-V6 where the short PR and long QRS of the WPW pattern are best measured. The electrocardiogram during the episode of atrial fibrillation revealed the presence of very rapid ventricular rates well in excess of 300/min.

After cardioversion he was given disopyramide as a preventive measure but the doses used failed to eliminate the recurring palpitations and he had extensive electrophysiologic studies.

The special studies, done because of the life-threatening possibilities of the atrial fibrillation, included a treadmill exercise test, a technetium 99m gated pool study at rest and exercise, Holter monitoring for 24 hours, and the electrophysiologic evaluation of induced atrial arrhythmias before and after disopyramide administration.

The treadmill exercise test (which cannot be read for ST abnormalities in the WPW syndrome) revealed his ability to increase sinus rhythm to 189 beats/min. with a normal blood pressure response. No arrhythmia occurred. Of interest was some narrowing of the QRS during the exercise, although the delta wave and overall wide complex of the WPW form persisted, indicating sympathetic tone increase and better AV node conduction (i.e., more passage of the excitation to the ventricles through the AV node and less through the bypass tract during exercise). In the WPW syndrome, of course, there are two potential routes to the ventricles, the AV node and the bypass tract, and the percentage capture of the ventricles from each is often quite variable. The bypass tract may even be shut off completely and thus the WPW features disappear.

The gated pool study (MUGA) revealed the earliest onset of ventricular systole (pre-excitation) occurred in the upper IV septum and inflow portions of the right ventricle. The ejection fraction at rest and exercise was normal. Thus a right sided anterior accessory AV connection was found. The Holter monitoring revealed rare atrial premature contractions but no tachyarrhythmias.

The electrophysiologic studies revealed the ability to induce and evaluate two rhythms, a reciprocating (circus movement) tachycardia and atrial fibrillation. The tachycardia had a rate of 160/min. and the ventricular rate during the atrial fibrillation was 350/min. After two days on disopyramide a second study was done and the rate of the induced tachycardia fell to 130/min. and the ventricular rate during induced atrial fibrillation averaged 170/min. with rare short bursts to 200/min. He has had no syncope on this new dosage of disopyramide but is being followed very closely as a possible candidate for surgical section of his bypass tract.

There are a few clinical points to be made. It is still somewhat of a mystery as to why subjects with the WPW syndrome and arrhythmias tolerate them for years and then suddenly (as in this man) get into serious trouble. The interaction of sympathetic and vagal tone on the AV node plays a large role. In this man the use of Verapamil was not warranted since the drug increases AV node blocking and allows more atrial fibrillation waves to reach the ventricles over the bypass and thus raises the ventricular rate to life-threatening levels. Verapamil is used for reciprocating tachycardias and not for atrial fibrillation in the WPW syndrome. Digitalis has the same effects as Verapamil. The studies in this man showed he has two arrhythmias. Perhaps the fibrillation is a new event for him and previous palpitations (well tolerated) were due to the reciprocating tachycardia only.

The insurance aspects of this unusual case are clear cut, namely, a denial, since he shows the features of the very small number of persons with pre-excitation of the WPW type who are at serious risk of sudden death. If he were to have a surgically successful section of his anomalous AV connection (thus eliminating the dangerous short circuit path to the ventricles) he could then be considered for insurance.

Figure 1