Clinical Note

A Reappraisal of Ventriculophasic Sinus Arrhythmia

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Complete (third degree) A-V block is characterized by independent atrial and ventricular activities resulting in complete A-V dissociation. In spite of the independent electrical activities of the P wave and QRS complex in complete A-V block, it is not uncommon to observe that the P-P interval which includes the QRS complex is shorter than the P-P interval without a QRS complex (Fig. 1). This phenomenon is termed ventriculophasic sinus arrhythmia. It has been shown that approximately 30 per cent of cases with complete A-V block have an associated ventriculophasic sinus arrhythmia.

Fig. 1. Leads II-a, b, c, d, and e are continuous. Arrows indicate P waves of sinus origin. This tracing shows sinus rhythm (atrial rate: 66/min.) with complete A-V block producing A-V nodal escape rhythm (37/min.). Note that the P-P interval containing the QRS complex (0.82 sec.) is shorter than the P-P interval without the QRS complex (0.94 sec.) due to ventriculophasic sinus arrhythmia.

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In addition, the same electrocardiographic phenomenon occasionally occurs in second degree A-V block (Fig. 2). Furthermore, ventriculophasic sinus arrhythmia may occur occasionally in the presence of ventricular premature contraction with a full compensatory pause. That is, the P-P interval which includes the ventricular premature contraction is shorter than the P-P interval without a ventricular premature contraction (Fig. 3). It is extremely interesting to note that ventriculophasic sinus arrhythmia can occur in the presence of artificial pacemaker-induced ventricular rhythm (Fig. 4). Namely, the P-P interval which includes the artificial pacemaker-induced QRS complex is shorter than the P-P interval without the QRS complex. A very rare case of ventriculophasic sinus arrhythmia in the presence of A-V nodal parasystole has been observed recently. That is, the P-P interval which includes the A-V

Fig. 2. Arrows indicate P waves of sinus origin. The rhythm is sinus mechanism with 2:1 A-V block. Note that the P-P interval containing the QRS complex (0.64 sec.) is shorter than the P-P interval without the QRS complex (0.74 sec.).

Fig. 3. Sinus bradycardia and sinus arrhythmia. Note that the P-P interval containing the ventricular premature contraction (1.06 sec.) is shorter than the P-P interval without a ventricular premature contraction (1.46 sec.) indicating ventriculophasic sinus arrhythmia. In addition, the QRS complex is widened due to Wolff-Parkinson-White syndrome, type A.

Fig. 4. This tracing shows sinus rhythm (indicated by arrows) with independent artificial pacemaker-induced ventricular rhythm (rate: 58/min.). Note that the P-P interval containing the QRS complex (0.64 sec.) is shorter than the P-P interval without a QRS complex (0.70 sec.) because of ventriculophasic sinus arrhythmia.

Fig. 5. This tracing shows sinus rhythm with A-V nodal parasystole (rate: 40/min.). Note that the P-P interval containing the parasystolic beat (0.74 sec.) is shorter than the P-P interval without it (0.78 sec.) because of ventriculophasic sinus arrhythmia. (The numbers in this figure represent 100th of 1 sec.)

nodal parasystolic beat is shorter than the P-P interval without the parasystolic beat (Fig. 5). It should be noted that ventriculophasic sinus arrhythmia may appear only intermittently even on the same electrocardiographic tracing. The diagnosis of ventriculophasic sinus arrhythmia can be made even when the P-P cycles alter only 0.02 sec. if the above mentioned criteria exist.

The exact mechanism responsible for the development of ventriculophasic sinus arrhythmia is not clearly understood. Nevertheless, the following explanations have been postulated:

(1) A slight increase in intra-atrial pressure following ventricular contraction excites the Bainbridge reflex. Thus, the resulting vagal inhibition

accelerates the discharge of the sinus impulse.

(2) The ventricular contraction produces an improvement in the blood supply to the sinus node and this accelerates the discharge of the sinus impulse.

(3) Ventricular contraction produces traction on the atria which stimulates the sinus node mechanically. As a result, the discharge of the sinus impulse is accelerated.

It is possible that all of the above, a combination, or none is the correct answer, but the ventriculophasic sinus arrhythmia seems to be due to some mechanical or hemodynamic mechanism.

The clinical significance of ventriculophasic sinus arrhythmia depends largely upon the underlying cardiac status and rhythm disorder. Ventriculophasic sinus arrhythmia *per se* is insignificant clinically.

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