Interesting Electrocardiogram

DISTURBANCES IN SINUS RHYTHM: SINUS ARREST, SINO-ATRIAL EXIT BLOCK

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Since one-half of the electronic pacemakers implanted in the USA are installed for the treatment of the Sick Sinus Syndrome and the other half for treatment of third degree, or complete, AV block, a review of some features of disturbed sinus rhythm is pertinent¹. The three major manifestations of abnormal behavior of the SA node are severe sinus bradycardia, sinus arrest and sino-atrial exit block. The second and third manifestations are illustrated here.

SINUS ARREST

This occurs when during sinus rhythm there is periodic failure of impulse formation within the SA node due to intrinsic disease of this pacemaker. A P wave and its accompanying QRS-T complex fail to appear at the expected time interval (Fig. 1).

The resulting pause is slightly shorter than two normal cardiac cycles and is not an exact multiple of the P to P cycle length, in contrast to sino-atrial exit block. If the pause is long, some rescue rhythm in the form of escape beats from other supraventricular sites (atrial or junctional) may appear. If the pause is long and no escape rhythm takes over, the symptoms of hypoperfusion of vital organs occur. These symptoms include dizziness, syncope congestive failure, oliguria and fatigue.

SINO-ATRIAL EXIT BLOCK

This occurs where during sinus rhythm and despite normal impulse formation within the SA node there is periodic failure of the sinus impulse to reach the right atrium and initiate atrial excitation and eventually ventricular excitation. This results from disease of the tissues at the nodal-atrial border. Thus a sinus beat (P, QRS and T) fails to appear at the expected time (Fig. 2), and a pause occurs. The dropped beats may occur sporadically or in regularly recurring patterns after every second, third, or fourth normal beat. The pause resulting from the dropped beat is an exact multiple of the P to P cycle length– it has the precise duration of two normal cycles– which identifies it as a 2:1 sinus exit block (Fig. 2). Occasionally more than one sinus impulse in succession fails to reach the atrium and two or three successive P waves are dropped, giving a 3:1 or 4:1 exit block and a long pause. This pause may be closed by escape beats.

There is an incomplete form of sinus exit block where there is gradual slowing of conduction from the SA node to the surrounding atrium until finally one sinus impulse is totally blocked from reaching the atrium and a P wave drops out. This is called sino-atrial exit block with the Wenckebach phenomenon and is illustrated in Fig. 3.

The P to P intervals preceding the pause progressively shorten, the pause is less than a multiple of the basic sinus rate (P to P interval) and the P to P interval following the pause is longer than the preceding P to P interval. If pauses are long, symptoms of hypoperfusion of vital organs appear.

Obviously the detection of these dysfunctions of the SA node and its surrounding tissues are made on the electrocardiogram and probably today on a Holter monitor tracing. If not induced by drugs (digitalis, quinidine, reserpine) excess potassium or severe vagotonia, the prognosis is serious and often a pacemaker is indicated.

Reference

1. Nomenclature and Criteria for Diagnosis of Diseases of the Heart and Great Vessels. Criteria Committee, MI Ferrer, Chairman, 8th ed. Little Brown & Co., Boston. Sinus Mechanisms, pages 192-8, 1979

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Figure 1. Sinus Arrest. Lead II is shown. An absent sinus beat is seen after the third P-QRS-T. The small positive deflection following the third T wave is a U wave, a normal finding obscured by the onset of the P wave in other beats.



Figure 2. Sino-Atrial Exit Block (2:1). A dropped beat occurs after the second sinus beat, and the pause equals two cycle lengths, identifying this rhythm as 2:1 exit block. The P-R interval is prolonged (0.26 sec). (Figure is recorded on lead II.)



Figure 3. Sino-Atrial Exit Block With Wenckebach Phenomenon. The P to P intervals preceding the pause (which occurs after the fourth beat) progressively shorten. The pause is less than a multiple of the basic P to P interval, and the P to P cycle time following the pause is longer than the P to P interval immediately preceding the pause. (Figure is recorded on lead II.)