CASE REPORTS

Concealed Sinus Rhythm

A Cause of Misdiagnosis of Digitalis Intoxication

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SUMMARY

A 47-year-old man with a long history of atrial fibrillation presented with a regular rhythm and absent P waves on the surface electrocardiogram. When this rhythm persisted after digitalis withdrawal His bundle electrocardiography demonstrated sinus rhythm. Recognition of concealed sinus rhythm prevents misdiagnosis of digitalis intoxication and inappropriate withdrawal of digitalis therapy.

A TRIOVENTRICULAR (A-V) block with junctional escape in a patient receiving digitalis for atrial fibrillation is considered a reliable sign of digitalis intoxication. This report demonstrates a rhythm which may erroneously be interpreted as A-V block with junctional escape. The rhythm originated in the sinus node but this was not apparent on the surface electrocardiogram (ECG). Therefore, we have called it concealed sinus rhythm. This rhythm should not be confused with concealed conduction.

**Case Report**

A 47-year-old man, who first presented in 1960 with mitral stenosis, atrial fibrillation and congestive heart failure, underwent mitral commissurotomy in 1962. Mitral valve replacements with Starr-Edwards prostheses were performed in 1968 because of recurrent congestive heart failure and in 1970 because of prosthetic endocarditis. Atrial fibrillation was present during each of 11 hospital admissions and at each regular outpatient visit during the 13-year period of observation. Digoxin (0.25 mg/day) was given throughout the 13-year period and furosemide (40 to 80 mg/day) was given for the past three years. In 1973, he presented with a regular pulse at a rate of 60, distended neck veins, normal prosthetic sounds and pretibial edema. The electrocardiogram showed a regular rhythm (.92 sec < R-R < .98 sec), a narrow QRS complex, and no evidence of atrial activity. The serum digoxin level was 1.0 ng/ml and the serum K was 4.2 mEq/L.

Because of apparent A-V nodal block with junctional escape, digoxin was withheld. At the end of one week, the serum digoxin level was 0.3 ng/ml and the rhythm unchanged. A His bundle electrogram showed atrial depolarizations preceding each His and ventricular potential (fig. 1). Conduction intervals were constant and prolonged (A-H was 150 msec and H-V was 70 msec). The atrium was paced with a second catheter at progressively faster rates until Mobitz type I exit block appeared from the pacing electrode at a rate of 85 per minute. Small 'a' waves coincided with each atrial depolarization (fig. 2). The mean right atrial pressure was 12 mm Hg. The surface ECG during the study was similar to the admission ECG.

**Discussion**

Right atrial depolarizations followed by His and ventricular potentials establishes the presence of sinus rhythm in our patient. A more definitive demonstration of sinus rhythm by the direct recording of sinus node potentials is not yet possible in man. Because no evidence of atrial activity was present on the surface ECG, this rhythm may appropriately be called concealed sinus rhythm.

Two mechanisms may produce concealed sinus rhythm. Sinoventricular conduction, in which impulses proceed only through specialized internodal pathways, is always associated with concealed sinus
rhythm because atrial depolarization does not occur. Normal conduction (sino-atrial-ventricular conduction), which proceeds through both atrial fibers and specialized internodal pathways, usually produces a P wave on the surface ECG but, as we have shown, may also be associated with concealed sinus rhythm. Khan et al.7 have suggested that extensive destruction of atrial myocardium in advanced rheumatic heart disease may result in failure to record P waves on the surface ECG. The small size of the ‘a’ waves in the face of an elevated right atrial pressure in our patient is consistent with substantial loss of atrial “contractility.”

Continuing atrial fibrillation with superimposed A-V block and junctional escape, sinus arrest with junctional escape, and concealed sinus rhythm may be indistinguishable on the surface ECG, each producing a regular rhythm without P waves. A presumptive diagnosis of digitalis intoxication must be made whenever A-V block is suspected in a patient receiving digitalis. However, when the atrial rhythm is not clearly defined, the ventricular rhythm is regular and the serum level of digitalis is not in the toxic range, right atrial electrocardiography is indicated. Inappropriate withdrawal of digitalis can be avoided in those instances when a concealed sinus rhythm is demonstrated.

Addendum

Since submission of this manuscript we have examined another patient with a similar presentation in whom His bundle electrocar-

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**Figure 1**

The His bundle electrogram (HBE) shows atrial depolarization (A) preceding each His potential (H) and ventricular depolarization (V). The A-H interval is 150 msec and the H-V interval 70 msec.

**Figure 2**

A small ‘a’ wave coincides with each atrial depolarization. Low atrial depolarizations (A) precede each His bundle potential (H) and ventricular depolarization (V). The ventricular rate is regular.

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**References**

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Circulation. 1974;50:632-633
doi: 10.1161/01.CIR.50.3.632

Circulation is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231
Copyright © 1974 American Heart Association, Inc. All rights reserved.
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:
http://circ.ahajournals.org/content/50/3/632

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