Case Report

Atrio-Ventricular Dissociation with Accrochage

Toshio Akiyama, M.D.*

Summary

A 63-year-old male, who had systemic arterial hypertension, left ventricular hypertrophy and probable atherosclerotic heart disease, was admitted with dizziness and an episode of syncope. It was revealed that the patient had accrochage at a rate of 41 per minute. There were occasional sinus premature beats, which were all conducted to the ventricles. This arrhythmia was promptly abolished by the administration of atropine, which increased sinus rate. During the 8 months follow-up after discharge from the hospital the patient has remained asymptomatic with normal sinus rhythm.

Additional Indexing Words:
Accrochage Isorhythmic dissociation Atrioventricular dissociation Atropine Cardiac arrhythmia

During atrioventricular dissociation, contraction of atria and ventricles may on occasion remain in close proximity for short periods of several consecutive beats. This phenomenon has been given a variety of names in the past, such as atrioventricular dissociation with accrochage, accrochage, atrioventricular synchronization, and isorhythmic dissociation. In view of the classical electrocardiographic manifestations of this condition and its rather interesting physiological and therapeutic implications, the following case is reported.

Case Report

A 63-year-old negro male was admitted to the Grady Memorial Hospital on October 10, 1971 with the chief complaint of dizziness. He had felt well until the morning of admission when he became lightheaded while walking to the kitchen.
and sustained a fall to the floor. He was able to stand up and walk with the help of his wife. At the age of 40, he was refused induction into the Army because of hypertension. In the several months preceding his admission he had been treated with Chlorthalidone 50 mg daily and Reserpine 0.25 mg orally 3 times a day. At the age of 53, he was noted to have a heart murmur.

Physical examination on admission revealed a thin and very lethargic negro male who responded appropriately to stimuli, but quickly lapsed into sleep. Blood pressure was 200/120 mmHg in the left arm in the supine position and pulse rate was 46 per minute. Funduscopic examination showed marked arterio-venous nicking. The carotid pulse was very prominent bilaterally with a rapid upstroke and a normal downstroke. The apex of heart was located at the left anterior axillary line in the sixth intercostal space. At the right and left second parasternal spaces there was a grade 2/6 early diastolic decrescendo murmur of high frequency, which

![Fig. 1. An admission rhythm strip, continuous (PP, PR, and RR intervals in msec).](image-url)
radiated along the lower left sternal border. Neurological examination revealed a slight left facial paresis.

Fig. 1 reveals the cardiac rhythm recorded at the time of admission. Therapy consisted of 2 intravenous doses of atropine (1.0 mg per injection) during the initial hours of his hospitalization. Normal sinus rhythm ensued and the patient remained in this rhythm at a rate of 60 to 75 beats per minute throughout the remainder of his hospitalization. Blood pressure dropped and stayed in the range of 160/100 mmHg. His lethargy abated. The early diastolic murmur heard on admission disappeared by the second hospital day. For the last 8 months he has been asymptomatic and his heart rhythm has been normal sinus.

Electrocardiographic findings:

(A) An admission rhythm strip (Fig. 1)

A long admission strip with V̂ revealed (1) a ratio of P waves to QRS complexes of 1:1, (2) P always preceding QRS, (3) constantly changing PP interval with a range of 1,230 to 1,600 msec, (4) regular ventricular beats at the rate of 41 per minute (i.e., SS interval of 1,440 msec) except for 4 beats (i.e., Nos. 8, 13, 22, and 30), and (5) PR interval constantly changing from beat to beat with a range of 30 to 190 msec. An analysis of beats Nos. 8, 13, 22, and 30 compared with the remaining beats revealed that these (1) were preceded by a definitely shorter RR interval, (2) were preceded by a definitely shorter PP interval (i.e., 1,270, 1,270, 1,260, and 1,230 msec), (3) were accompanied by a definitely longer and constant PR interval of 180 to 190 msec, and (4) had a deeper QRS complex. Beat Nos. 2, 16, 18, 19, and 27 have a slightly shorter PP interval of around 1,320 msec, a RR interval of around 1,420-1,430 msec, and a longer PR interval of around 180 msec, which was same as the afore-mentioned 4 beats, and a deeper QRS complex. It is hard to determine if this sinus wave of beat Nos. 2, 16, 18, 19, and 27 were conducted into the ventricle or not.

P wave configuration on the admission rhythm strip was identical to those at a later time when the patient was in normal sinus rhythm. From these analyses, the following conclusions may be made pertaining to the rhythm disturbance on ad-
mission; (1) atrio-ventricular junctional escape rhythm with occasional sinus capture and (2) an evidence of 1:1 accrochage.

(B) Response to atropine (Fig. 2)
After beat 8, which was about 41 sec following the administration of atropine, all of the sinus waves became conducted to the ventricles. Within approximately 26 sec after restoration of 1:1 AV conduction the rhythm became quite stable in terms of constant sinus rhythm and constant AV conduction time. Atropine gradually shortened AV conduction time from 180 to 160 msec over the initial 2 min period (not shown in Fig. 2).

(C) Follow-up
During the 8 months following discharge, multiple 12 lead EKGs, rhythm strips, and Holter monitor recordings were obtained. They revealed (1) a stable normal sinus rhythm, accompanied by rare AV junctional escape beats, and (2) stable and normal AV conduction with PR interval of approximately 160 msec.

DISCUSSION
As early as 1910, Erlanger and Blackman1) had shown what we may today call atrioventricular dissociation with 1:1, 2:1, and 3:1 accrochage in artificially created complete atrioventricular block in the dog's heart.

In 1946 Segers2) reported that if 2 frog hearts were placed in contact there might occur a synchronization of their rhythm. However, this phenomenon only occurred when the 2 hearts beat at almost the same rate. He concluded that interactions might be developed between neighboring tissues when no anatomic connections could be traced between them. Segers in 19473) called the close association of a P wave and R wave over very long periods “synchronization” and over a brief period “accrochage” (phénomène d’accrochage, hook together).

Published records regarding atrioventricular dissociation with accrochage are few after Segers (Marriott in 19564) and Fletcher in 19715)). Fletcher5) reported 7 cases from the Belfast City Hospital, Northern Ireland; all were men aged 57 to 61 years, who had ischemic heart disease.

During the last few years there have been 3 studies6)–8) which have greatly contributed to delineation of the mechanisms involved in the genesis of this arrhythmia. Hashimoto et al, in 19676) reported that a reciprocal relationship was observed between changes of blood pressure in the sinus node artery and the sinus rate. In 1970, Levy and Zieske7) showed that during synchronization in isorhythmic dissociation in anesthetized dogs with induced third degree heart block, the P wave oscillated rhythmically around the QRS. When the P preceded the QRS, the arterial blood pressure increased, whereas when the P wave followed the QRS, the blood pressure fell. They suggested that a biological control system operates in such a way that (1) the PR interval
affects blood pressure by virtue of changes in the atrial contribution to ventricular filling, (2) the blood pressure has an inverse effect on atrial frequency through the baroreceptor reflex and perhaps other mechanisms, and (3) changes in atrial frequency alter the PR interval, to complete the control loop. This study of Levy and Zieske was duplicated by Paulay et al in 1971. Paulay et al in addition suggested that right atrial stretch might be an additional factor, since atrial pressure changes always preceded sinus rate changes and occurred simultaneously with changes in arterial pressure. They proposed that the salient features of isorhythmic dissociation were (1) the similarity in atrial and ventricular rates, and (2) P waves which at times may precede or follow the QRS, but remain in close proximity to it. They further stated that whether the AV dissociation is complete or incomplete does not significantly alter this pattern.

In the present case, the patient, who had left ventricular hypertrophy, essential arterial hypertension and probably coronary atherosclerotic heart disease, was admitted with a near-syncope. The admission rhythm strip showed sinus bradycardia with AV junctional escape beats and 1:1 accrochage, which was occasionally interrupted by a QRS complex activated by a sinus impulse. It was postulated that the atrioventricular dissociation with accrochage in this patient had probably been due to slowing of the sinus rate, which happened to be almost identical to the rate of AV node. This was supported by (1) a few premature sinus beats (Nos. 8, 13, 22, and 30), which were conducted into the ventricles, (2) prompt restoration of normal sinus rhythm when sinus rate was accelerated by intravenous administration of atropine, and (3) no recurrence of atrioventricular dissociation with accrochage during the 8 months follow-up when sinus rate was constantly above 60 per minute.

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