Two-to-One Sinoatrial Block*
Normalization by Carotid Massage

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In a clinical case of 2:1 sinoatrial block, carotid massage, paradoxically, released the sinoatrial block and doubled the manifest sinus rate. This resulted from a deceleration of the sinus discharge rate which allowed consecutive sinus impulses to traverse the sinoatrial junction. (Chest 1988; 94:650-52)

Two-to-one sinoatrial block is a rare disorder characterized by marked sinus bradycardia interrupted by occasional doubling of the manifest sinus rate.² Since sinoatrial block is a manifestation of the sick sinus syndrome, its diagnosis usually dictates that all interventions with a potential to depress the sinus node or the sinoatrial conduction be withheld.² In the following report, we present a unique case of 2:1 sinoatrial block where carotid massage, paradoxically, resulted in temporary normalization of the sinus rhythm.

CASE REPORT

A 74-year-old woman first noted a slow pulse rate 12 years ago. Besides that, she was asymptomatic, was a regular skier and swimmer, and never had dizzy spells, weakness, or syncope. She was not receiving cardioactive medication. Physical examination was

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**Figure 1.** A 12-lead ECG recorded at a paper speed of 10 mm/s. Each lead was mounted to show marked sinus bradycardia with occasional doubling of the manifest sinus rate.
1,780 to 1,840 ms. At this point, the heart rate doubled. Thereafter, the "short" P-P intervals also increased from 920 to 1,060 ms; termination of the massage resulted in gradual decrease to 1,000 ms. At this point, the manifest sinus rate again halved, and duration of the long P-P intervals decreased from 1,980 to 1,760 ms.

**DISCUSSION**

This study demonstrates the interesting, hitherto undescribed phenomenon of 2:1 sinoatrial block released by carotid massage. Mobitz type 2 sinoatrial block was diagnosed by observing first, two sets of sinus P-P intervals with the long ones being double of the short ones; second, equal duration of the long P-P intervals preceding and following the short ones; and third, absence of a "Wenckebach structure" in spacing of the P waves.1-3

Mobitz type 2 block is a manifestation of all-or-none conduction; in other words, it requires a prolonged refractory period within a conducting structure which prevents consecutive impulses to be transmitted from a proximal to a distal site. In type 2 block, decreasing the discharge rate at a proximal level may theoretically help to overcome the refractory period of the depressed conducting pathway, and thus, improve the conduction ratio. This phenomenon was shown to be operative in type 2 block of atrioventricular conduction,6 and was actually included in the ECG differential diagnosis of type 1 and type 2 atrioventricular block.6

Carotid massage, by decreasing the sinus rate, may help to overcome Mobitz type 2 His-Purkinje block, whereas, by also depressing atrioventricular nodal conduction, it usually worsens type 1 block.5

Vagal maneuvers, including carotid massage, may have dual effects on sinoatrial conduction.7 First, they may exert a direct depressive effect on the sinoatrial junction, and thereby, worsen transmission of the sinus impulses.6,7 This is usually the case with sinoatrial Wenckebach. The second effect of vagal maneuvers is to decelerate the sinus firing rate. The net product of these two influences depends on which effects of the vagal maneuvers are stronger: those that

![Figure 2](image1.png)

**FIGURE 2.** Mobitz type 2 sinoatrial block (25 mm/s). Numbers above lead V3 indicate P-P intervals in hundredths of a second.

![Figure 3](image2.png)

**FIGURE 3.** Carotid massage (CM, heavy line) results in temporary normalization of sinoatrial conduction (10 mm/s).
directly inhibit sinoatrial conduction, or those that depress sinus automaticity, and thus, promote sinoatrial conduction. The first effect may be stronger in sinoatrial Wenckebach, while the second one, as in our case, may prevail in type 2 second-degree sinoatrial block.

Despite the intermittent low heart rate, our patient was asymptomatic and physically active. The explanation for this is simple and was confirmed by electrocardiographic monitoring. Whenever the sinus discharge rate dropped (as during sleep), sinoatrial conduction normalized because of the slow sinus firing rate. Physical activity, on the other hand, as well as administration of atropine and sympathomimetic agents, improved sinoatrial conduction directly, and thus, also normalized the sinus rate. Based on these observations and the long history of asymptomatic bradycardia, a conservative approach was chosen with check-up at regular intervals and no immediate pacemaker implantation.*

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Magnetic Resonance Imaging of Mediastinal Paraganglioma*

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MRI of Mediastinal Paraganglioma (Flickinger, Yuh, Behrendt)