Echocardiography and phonocardiography are becoming increasingly popular noninvasive techniques in evaluating patients with heart disease. Carotid pulse tracings and systolic time intervals obtained with phonocardiograms have proven helpful as noninvasive techniques in estimating the severity of aortic valve disease. The case presented herein demonstrates the value of obtaining bilateral carotid pulse tracings in evaluating patients with aortic valve disease when the standard right carotid pulse tracing demonstrates a markedly delayed carotid upstroke.

**CASE REPORT**

A 54-year-old woman had developed an abscessed tooth and had undergone root-canal work in December 1974. In January 1975, she began noting night sweats and hot flashes. One evening the patient noted the sudden onset of transient heaviness in the anterior chest, with pain radiating into both arms and associated with diaphoresis and blurred vision. She was admitted to her local hospital, and on the third day of hospitalization, when she was mildly febrile, a murmur of aortic insufficiency was first heard. Blood cultures were negative, but with the recent history of dental surgery, the patient was treated for bacterial endocarditis with appropriate doses of penicillin. She did well until March 1975, when she noted exertional dyspnea and fatigue, culminating in acute pulmonary edema requiring a second hospitalization. The patient was treated with digitalis and diuretics and improved; however, over the next month, she noted dull exertional substernal pressure-pain with dyspnea that was relieved by rest.

Physical examination on April 26, 1975 disclosed a blood pressure of 170/70 mm Hg. Thrills were palpable over both carotid vessels, but the right carotid seemed to rise more slowly in early systole. The cardiac apical impulse was located in the left fifth intercostal space at the anterior axillary line. There was a palpable and audible protodiastolic gallop at the left sternal border and a diastolic decrescendo high-pitched blowing murmur at that location. A grade 2/6 systolic ejection murmur was noted at the base, and a middiastolic rumbling murmur was heard at the apex in the left lateral position. There was a slight delay between the right and the left radial pulses, but the leg pulses appeared normal.

The electrocardiogram demonstrated nonspecific abnormalities of the ST-T wave. The chest film showed minimal compression of right innominate artery by false channel is noted, demonstrating significant aortic insufficiency. Compression of right innominate artery by false channel is demonstrated; and innominate, left common carotid, coronary, and left subclavian arteries are all noted to arise from true lumen.

*From the Krannert Institute of Cardiology, the Department of Medicine, Indiana University School of Medicine, Indianapolis. Supported in part by the Herman C. Krannert Fund; by grants HL-06308, HL-05383 and HL-05749 from the National Heart and Lung Institute; and by the American Heart Association, Indiana Affiliate, Inc.
cardiac enlargement and minimal dilatation of the ascending aorta without evidence of overt heart failure. An echocardiogram revealed a moderate pericardial effusion, fluttering of the mitral valve indicative of aortic insufficiency, and dilatation of the aorta just past the aortic valve.

Cardiac catheterization was performed on April 29, 1975. Injection of radiopaque dye into the aorta revealed a dissection of the aorta extending around the arch of the aorta with the catheter actually being in the false lumen. On May 1, 1975, a thoracic and abdominal aortogram (Fig 1) was performed, which revealed an extensive type-I aortic dissection extending back to the aortic valve with moderate aortic insufficiency. The innominate, left carotid, left subclavian, coronary, celiac, and superior mesenteric arteries arose from the true lumen. There was dissection into the proximal portion of the innominate artery with approximately 50 percent narrowing.

METHODS

The phonocardiogram was performed using a high-impedance microphone (Leatham 53618F38) and medium-frequency filter bands at 100 to 200 cycles per second combined with a recorder (Electronics for Medicine). The carotid pulse tracings were taken with an air-coupled pulse amplifier (Siemens EMT 30) and a funnel-shaped pulse transducer with a 2.5-cm diameter. The time constant of this transducer is four seconds.

DISCUSSION

The right (Fig 2) and left (Fig 3) carotid pulse tracings presented herein show a marked discrepancy between them. The right carotid pulse tracing (Fig 2) shows a delay in upstroke and a late peak reached around the time of the second heart sound, with apparent damping of the dicrotic notch. This amount of delay in the carotid upstroke is even greater than that seen with severe valvular and subvalvular aortic stenosis. This feature has not previously been reported and alone is suggested as a possible sign of extracardiac vascular obstruction. When viewed with the angiograms, the slow upstroke and late peak to the right carotid pulse would suggest compression of the right innominate artery by the false channel, causing a damping effect on the pulse contour. The value of bilateral carotid pulse tracings is demonstrated in this patient, since valuable diagnostic information would have been lost if only one carotid pulse had been checked. Should bilateral carotid pulse tracings demonstrate a unilateral slow upstroke with a late peak when compared to the opposite side, a vascular obstructive lesion should be considered.

REFERENCES

1 Tavel ME: Clinical Phonocardiography and External Pulse Recordings (2nd ed.). Chicago, Year Book Medical Publishers Inc, 1972
4 Benchimol A, Matsuo S: Ejection time before and after aortic valve replacement. Am J Cardiol 27:244-249, 1971
5 Benchimol A, Dimond EC, Shen Y: Ejection time in aortic stenosis and mitral stenosis. Am J Cardiol 5:728-743, 1960