THE SOUND OF THE HEART

Phonocardiographic Findings in Anemia*

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It has long been known that patients with anemia often have cardiac murmurs, especially "innocent" or "flow" systolic murmurs. These murmurs are not related to valvular disease; they are, however, related to alterations of cardiac dynamics. Tachycardia, increased cardiac output, and dilatation of the heart result from a significant drop of the hemoglobin level. Thus, the myocardium is stressed by an increased work load while its oxygen supply may be decreased. Diffuse areas of myocardial necrosis (mainly in the subendocardial myocardium of the left ventricle and of the papillary muscles) in young patients who had suffered from severe GI bleeding, have been reported. This points out that, in addition to dynamic phenomena, myocardial lesions may be responsible for murmurs.

Two types of murmurs have been reported in anemia. The most common is an ejection systolic murmur but a pansystolic murmur, not influenced by posture, was also found in 21.1 percent of a series of 46 anemic patients.

We have reviewed the documents of anemic patients with significant murmurs, referred to us over the past ten years. These patients had all been studied phonocardiographically and found not to have rheumatic heart disease or any other valvular heart disease on followup. Their ages ranged from 22 months to 54 years. Two were males. The phonocardiographic characteristics were:

First heart sound. The first heart sound appeared to be normal in all patients.

Second heart sound. The second heart sound was evaluated in terms of amplitude (relative to the first) and of splitting. The amplitude was normal, and respiratory splitting was found to occur in all cases except two, ages 54 and 64. In one of these, a positive history of hypertension was obtained, al-

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Figure 1. Tracings of a 36-year-old anemic woman. The upper tracing is a phonocardiogram recorded over the second left ics with a high pass filter at 100 hz having a 12 dh/oct slope. The center tracing is a low frequency tracing of the precordium. The lower tracing is an ECG. Large, low frequency and high frequency fourth sound. Nondescript, possibly diamond-shaped systolic murmur.
though blood pressure levels were normal. The splitting was always of the normal type and no reverse or wide splitting was found.

Third heart sound. A third heart sound was present in 9 of 20 cases. It was always recorded at the apex.

Fourth heart sound. The fourth heart sound was present in 10 of 20 cases. Of these, in two (ages 23 and 28; Hb 6.3 and 9, respectively), it was present with filter at 100 hz, ie, it was of abnormally high frequency. In two more cases, it assumed a prolonged configuration causing a presystolic rumble.

Systolic murmurs. A systolic murmur was present in 19 of 20 cases. Its configuration was crescendo-decrescendo (ejection-type) in all cases. The best recording was at the base (second left intercostal space) in the medium-high frequency range. Inhalation of amyl nitrite constantly increased the amplitude of the systolic murmur suggesting a pulmonary artery origin. In one case, a pansystolic murmur was recorded at the apex. This, however, markedly decreased after amyl nitrite inhalation suggesting a tricuspid origin.

Diastolic murmurs. A high-pitched, decrescendo, early-diastolic murmur was recorded in 4 of 20 cases while a diastolic or a mid-diastolic, low or high-frequency murmur was recorded in two cases.

Sickle Cell Disease

A review of ten cases of sickle cell disease showed normal amplitude of the first heart sound and physiologic splitting of the second heart sound.

A third heart sound was present in nine of the ten cases and assumed a prolonged configuration (mid-diastolic rumble) in six. Inhalation of amyl nitrite markedly increased the amplitude of the third sound. A diamond shaped murmur, best recorded at the base, was present in nine of ten cases, and a pansystolic apical murmur in one of ten. Five cases showed a fourth heart sound, which in three cases became significantly increased (giant IV) after amyl nitrite inhalation.

Discussion

This survey suggests the following considerations:

1. The most common finding in anemia unassociated with other diseases is a crescendo-decrescendo murmur, best recorded at the second left interspace.

2. The occurrence of either a pansystolic murmur or of a diastolic murmur is suggestive of the presence of either other associated conditions or myocardial damage, such as that oc-
currying more commonly in cases of sickle cell anemia.

(3) A large third heart sound was more commonly found in sickle cell anemia while a fourth heart sound was only found in the other types of anemia.

When confronted with the clinical case of a febrile young patient with tachycardia, anemia and heart murmurs, the major differential diagnostic problem is between rheumatic fever and anemia. This problem is further compounded in cases of patients with sickle cell anemia. Coexistence of sickle cell anemia and rheumatic heart disease was reported by Lisker et al in one case, although others considered that such a combined possibility could not occur.

Graphic tracings are of little help in such an acute and complex situation. However, repeated tracings along the course of the disease are of some help in differentiating "functional" murmurs from those caused by valvular damage. Moreover, treatment of the anemia may significantly decrease the murmurs, thus helping in their interpretation.

REFERENCES
1 Friedberg CK, Horn H: Acute myocardial infarction not due to coronary artery occlusion. JAMA 112:1675-1679, 1939

Pharmacologic Action and the Universal Popularity of Caffeine

Caffeine (trimethylxanthine), an alkaloid, is found in coffee beans in about 1 percent concentration. It is rapidly metabolized in the body, excreted and has no cumulative effect. It is best known as a psychotropic agent of stimulant action. It enhances alertness, intensifies mental function, association of ideas, reasoning and discriminating judgment, neutralizes the sense of fatigue and elevates the spirit: bona fide vindication of coffee-breaks and the worldwide popularity of caffeine-containing soft drinks. In some instances, mental sluggishness may be alleviated by moderate doses of caffeine in patients with chronic heart failure. It is of historic interest that caffeine had been used, with rather dubious justification, for rousing a moribund man so as to enable him to sign a legal document. On the other hand, in the aged coffee is a favorite means to counteract somnolence. Through the medullary vasomotor center, small doses of caffeine may exert vasopressor or vasodilator effect. Through its action upon the peripheral vascular musculature, caffeine is a vasodilator. Consequently, there is slight, transient fall in blood pressure. This has been recorded in patients with hypertension (Seboek, I, Deutsch med Wehnschr 75:1067, 1950). Direct stimulation of the myocardial results in tachycardia and slight increase in cardiac output. Other well known biologic actions of caffeine are: stimulation of the respiratory center, diuresis, stimulation of metabolism, increase in gastric secretions, vascular dilatation of striated muscles, which may impart a sense of vigor. According to Feinberg et al (Metabolism 17:916, 1968), caffeine lowers blood sugar in normal individuals following a test dose of glucose. The opposite influence was reported by others in patients with diabetes mellitus. Increased release of catecholamine was observed by others. Bellet et al (Arch Int Med 116:750, 1965) reported significant serum free fatty acids resulting from caffeine. The latter is often used as one of the components of remedies for headache. Its merit in this regard is attributable to the fact that it decreases cerebral arterial distention and thus it reduces cerebral blood flow. Moyer et al (Am J Med Sci 224:377, 1952) confirmed its therapeutic efficacy in hypertensive headache. The so-called withdrawal headache may be due to rebound dilatation of intracranial blood vessels. The average cup of brewed coffee contains about 100-150 mg of caffeine. Overindulgence is likely to cause palpitation, arrhythmia, particularly ventricular premature contractions, flushing, irritability, tremor, anorexia, epigastric pain, vomiting, diarrhea, insomnia and fever. Reimann (JAMA 202:1105, 1967) recorded a case of caffeineism in a 39-year-old woman. She was habitually drinking from 15 to 18 cups of coffee between 8:00 A M and 4:00 P M. Consequently, she had low-grade fever (99-100.4°F), occasional chilliness, flushing, anorexia and loss of 20 lb in weight. Workers handling green coffee beans may develop bronchial asthma. According to Kaye et al (Canad M A J 84:469, 1961), of 400 employees of a coffee processing plant about 10 percent had allergic symptoms due to inhalation of vegetable dust. Of these subjects, 40 percent had positive skin test to extract of raw coffee bean and 69 percent to raw chaff. Common source of coffee is the evergreen shrub Coffea arabica. Roasting of coffee beans produces aromatic oils and adds aroma to the flavorless beans. Over three billion pounds of coffee are consumed in the United States annually. Apropos of coffee drinking, the common goat should be given some credit. According to legend, in ancient Arabia shepherds noticed that goats browsing on the berries of certain bushes acted rather unusually, excitedly jumping, frolicking, gambolling around. Thus chewing of coffee beans by humans started. Their use for a beverage began in the twelfth century. Brewing and drinking coffee spread rapidly in Europe and the Western Hemisphere, despite attempted prohibitions, in the sixteenth and seventeenth centuries.

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