Fatal Congestive Heart Failure Associated with Cardiac Enlargement of Unexplained Origin

By Richard France, M.D., Clifford W. Atherton, M.D., and William L. Alsobrook, M.D.

A case of progressive cardiac enlargement of unknown cause in a 22-year-old man is reported. Death from congestive failure occurred 18 months after the onset of symptoms. Postmortem examination showed only cardiac hypertrophy and dilatation as an explanation for the congestive failure.

When a young, adult male with normal blood pressure dies from congestive heart failure, it is only natural to expect the autopsy to show one of the established forms of heart disease. In the present case no explanation for the illness could be found. The clinical course and post-mortem findings are reported in the hope that the information may be of aid in the ultimate solution of the syndrome currently known as idiopathic cardiac enlargement.

Case Report

A 22-year-old Caucasian male entered the hospital for his second admission on January 30, 1955, because of severe shortness of breath and died 10 days later from congestive heart failure. The family history was negative for cardiovascular disease except that his 40-year-old mother was said to have had an enlarged heart associated with episodes of shaking, tension, and weakness. There was nothing in the patient's history to suggest syphilis, rheumatic fever, diphtheria, congenital heart disease, hypertension, alcoholism, or malnutrition. In high school he had played both basketball and football as a member of the first team.

On November 4, 1951, at the age of 18, he enlisted in the United States Navy. Roentgenogram of the chest (fig. 1) showed a normal cardiothoracic ratio of 0.50 but what, in retrospect, is considered to be an abnormal prominence of the left ventricle. Because of frequent attacks of tonsillitis, his tonsils and adenoids were removed on May 21, 1953, at the U. S. Naval Hospital, San Diego, California. The heart was considered normal on physical examination at that time. However, an X-ray film of the chest taken several days before operation was, at a later date, compared with the induction film. This comparison was made on August 28, 1953, by F. H. Holmes, Lt. Cdr. M.C., U.S.N., Roentgenologist, U. S. Naval Hospital, Oakland, California. He stated that study of the 2 photofluorograms showed a progressive increase in the size of the heart and that the film of May 21, 1953, taken at the time of tonsillec-tomy, showed cardiac enlargement. The operation was without complication and the patient was returned to duty aboard a destroyer.

For the next 7 weeks he considered himself in excellent health. However, on July 6, 1953, he fell a distance of 2 decks, striking his left shoulder and back and suffering a momentary loss of consciousness. From that time on he noticed increasing shortness of breath on exertion and, on August 10, 1953, was admitted to the U. S. Naval Hospital, Oakland, California, in acute left ventricular failure. On examination, orthopnea, pulmonary congestion, cardiac enlargement, gallop rhythm, and slight tenderness in the right hypochondrium were present, but peripheral edema and engorgement of neck veins were not seen. He responded satisfactorily to bedrest, oxygen, digitalis, and mercurial diuretics, so that at the end of a month he was symptom-free on quiet activity about the ward. During his 4 months of hospitalization the blood pressure varied between 90 and 120 systolic and between 70 and 78 diastolic. Except for a single recording of 99.2 F. by mouth on the first day, there was no fever. The pulse rate decreased from 130 to 80/min. by the end of the second day. No leukocytosis or anemia was noted and the corrected erythrocyte sedimentation rate varied between 8 and 18 mm./hr. Antistreptolysin-0 titers were 125 and 160 Todd units. The electrocardiogram showed a QS of 40 mm. in lead V4 and a sharply inverted T wave in lead V4 suggesting left ventricular "strain." An x-ray film of the chest (fig. 2) showed pulmonary artery engorgement and an increase in the transverse diameter of the heart. The cardiothoracic ratio by x-ray decreased from 0.63 to 0.55 with clinical improvement.

From the Medical and Laboratory Services, Thayer Veterans Administration Hospital and the Departments of Medicine and Pathology, Vanderbilt University School of Medicine, Nashville, Tenn.
At the time of discharge the venous pressure and circulation time were at the upper limit of normal. The x-ray evidence of pulmonary congestion had disappeared (fig. 3). Although on admission the diagnoses considered most likely were rheumatic myocarditis and pericardial effusion, the impression at discharge, after extensive clinical, bacteriologic, hematologic, and serologic examinations, remained "Heart disease of unknown type."

After discharge from the Navy in December 1953, the patient maintained a fair state of health. However, he never regained a normal cardiac reserve and, due to excessive fatigue and exertional dyspnea, was unable to work for more than a few days at a time. No fever or joint pains were noted at any time. On October 2, 1954, he was admitted to Thayer Veterans Administration Hospital, Nashville, Tennessee, for diagnosis and evaluation of his heart disease. Normal blood pressure (108/70), a large left ventricle, a faint, apical systolic murmur, and diastolic gallop rhythm were present on admission. There was no peripheral edema. Both the venous pressure and the arm-to-tongue circulation time were at the upper limit of normal. Except for a single leukocyte count of 16,000 on admission, there was no leukocytosis. However, a light growth of \( \beta \)-hemolytic streptococci was obtained on throat culture and the antistreptolysin-O titer was 250 Todd units. The sedimentation rate was elevated, but dropped to normal following the eradication from the throat of \( \beta \)-hemolytic streptococci by penicillin. The serologic test for syphilis was negative. The electrocardiogram showed the changes suggestive of left ventricular disease as previously noted. Cardiac fluoroscopy suggested...
great enlargement of the left ventricle and slight enlargement of the right ventricle and the atra. X-ray films of the chest showed marked prominence of the left ventricle (fig. 4). The cardiothoracic ratio was 0.58. He was discharged from the hospital for a period of 2 months with instructions to take 0.1 mg. of digitoxin and 1.0 Gm. of sulfadiazine daily.

He did rather well on restricted activity for some 7 weeks. One day, however, while "on his way downtown," he had a sudden sensation of impending disaster, felt weak, broke out in a sweat, and had to be carried home. The next morning he felt better, but in the afternoon developed weakness, dyspnea, and vomiting. He was at once readmitted to the hospital, where a physical examination showed a rectal temperature of 100 F., a heart rate of 130, and a blood pressure of 94/70. There was marked apprehension, cyanosis, orthopnea, and engorgement of the neck veins. A loud, rough apical systolic murmur transmitted to the posterior axillary line was now present; no other murmurs were noted. The mid-diastolic gallop previously heard over the left ventricle was very prominent. X-ray of the chest showed further cardiac enlargement involving both ventricles. Pulmonary congestion was now evident (fig. 5). There was a slight irregular fever. The leukocyte count increased gradually to 16,000, but the sedimentation rate remained within normal limits. A preparation for L.E. Cells was negative. The antistreptolysin-0 titer was 125 Todd units. The electrocardiogram (fig. 6) showed increased T-wave inversion; however, the patient was receiving digitalis. He failed to improve on a regimen of bed rest, oxygen, digitalis, and mercurial diuretics. On the chance that his heart disease might be the result of rheumatic fever or disseminated arteritis, he was given 300 mg. of hydrocortisone in divided doses with, perhaps, slight improvement for 24 hours. The intensity of the heart failure rapidly increased, however, and he died 10 days after admission. The clinical impression at the time of death was cardiac enlargement due to unknown cause with secondary cardiac insufficiency and congestive failure.

Necropsy

The examination was begun within an hour after death. There was no peripheral edema, and only a negligible amount of free fluid was present in the peritoneal and pleural cavities.

The pericardial sac was greatly enlarged to contain the heart, but the quantity of serous fluid was only slightly in excess of the usual. The heart weighed 640 gm. The serosa was smooth and glistening. There were a number of petechial and ecchymotic hemorrhages in the epicardium, and the subserous fat was rather depleted. All chambers were markedly dilated with fluid blood and postmortem clots. The myocardium was diffusely hypertrophied and of firm consistency. No gross evidence of scarring and no alteration in color were noted. The degree of hypertrophy, somewhat masked by the tremendous dilatation, was suggested by coarseness of the trabeculae carneae and pectinate muscles (fig. 7). The width of the left ventricular wall was not increased; in fact, the apical portion was very thin, as if overstretched.

The mural endocardium was uniformly thin and transparent. The valvular endocardium was delicate and pliable. The mitral ring was dilated to 11.5 cm. and was regarded as relatively insufficient. Other orifices were less dilated and the valves were competent.

The coronary ostia were widely patent. The arteries were balanced and patent throughout, with no appreciable sclerosis. The aorta and its branches showed no constrictions, and there was no gross arteriosclerosis.

Multiple sections representing all areas of the

---

Fig. 5. Chest x-ray on 1/31/55, 9 days before death, Thayer V. A. Hospital, Nashville, Tenn.

Fig. 6. Electrocardiogram on 2/3/55, 6 days before death, QRS and T-wave changes suggesting left ventricular enlargement and disease.
Fig. 7. General topography of the opened left ventricle illustrating its massive dilatation and relative hypertrophy.

Fig. 8. The ventricular myocardium is hypertrophied but there is no other lesion of note. Hematoxylin and eosin stain. X 100.
heart presented general myocardial hypertrophy. The nuclei were large and frequently angulated (fig. 8). Striations were faint. Some fibers appeared narrow in longitudinal section but the impression was that they were overstretched. There was no necrosis and no scarring. Mild interstitial edema was apparent in some areas and a few lymphocytes and monocytes were encountered near the small vessels. The fibers of the subendocardial layers of the left ventricle often showed unusual parannular rarefaction. Glycogen stains (carmine and periodic acid-Schiff) failed to show any excess of carbohydrate.

The major coronary arteries and the aorta presented only slight intimal fibrosis. There was slight epicardial hemorrhage in the areas noted grossly. The venae cavae were normal.

The right lung weighed 830 Gm., and the left weighed 470 Gm. The lower lobes were firm and cyanotic and were of somewhat diminished volume. The upper lobes were reddish-brown in color and of firm consistency. Microscopic sections showed some widening of the alveolar septa and general engorgement of capillaries. In some lobules the alveolar sacs contained protein coagulum and erythrocytes and phagocytes were numerous. Capillary thrombosis and early septal necrosis were evident to some degree in all sections and were very extensive (lobular) in one.

The liver weighed 1770 Gm. and showed passive congestion with central necrosis.

The cortex of the adrenal glands was very narrow and the glomerular zone was severely depleted of lipid. The bone marrow was hyperplastic and the erythrocyte series was predominant. The kidneys showed no lesion of importance.

The principal anatomic diagnoses were idiopathic cardiac hypertrophy and dilatation and acute and chronic passive congestion of the viscera.

### Discussion

At the present time one can only speculate whether this type of cardiac enlargement, characterized by progressive congestive failure in the absence of any clearly discernible cause, is the result of a single disease entity. For a discussion of the possibilities, reference is made to the reports on idiopathic cardiac enlargement by Levy,1,2 Elster,3 Norris,4 Kaplan,5 and Simkins.6 In our case the cardiac lesions at postmortem examination, aside from hypertrophy and dilatation, were vacuolization of the subendocardial muscle fibers and dilatation of the mitral valve ring. Both these findings seem best explained as the result, rather than the cause, of the heart disease. The patient’s fall on board ship may have accelerated his illness, but there was x-ray evidence of increasing left ventricular enlargement prior to his accident. Once present, the relative mitral insufficiency and the cardiac enlargement probably hastened the progress of the congestive failure. The course of the illness suggested a persistent strain upon the left ventricle, but aside from the left ventricular enlargement itself, no clue to the nature of any such burden was evident.

### Summary

A case of progressive cardiac enlargement of unknown cause in a 22-year-old man is reported. The patient survived one major bout of congestive failure, but succumbed to a second, 18 months later. Postmortem examination showed only cardiac hypertrophy and dilatation as an explanation for the congestive failure. The difficulty of fitting the facts into the pattern of a single disease entity is discussed and reference made to various earlier studies dealing with the problem.

### Acknowledgment

The authors are indebted to Drs. Hugh J. Morgan and Stewart H. Auerbach for criticism of the manuscript and to Mr. Homer Jones and Mrs. Ann Rees for preparation of the illustrations.

### Summario in Interlingua

Es reportate un caso de progressive allargamento cardiac in un masculo de 22 annos. Le causa esseva incognoscite. Le patiente superviveva a un major attacco de disfallimento congestive sed succumbeva a un secunde que occurreva 18 menses plus tarde. Le examine post morte revelava solmente hypertrophia e dilatation cardiac como explication possibile del disfallimento congestive. Es discutite le difficultate de combinar le factors in le schema de un specific entitate pathologic. Es citate varie previe studios tractante del mesme problema.

### REFERENCES

2. —, and von Glahn, W. C.: Cardiac hypertrophy of unknown cause; a study of the clinical and


My truly valuable and respectable friend, Dr. Ash, informed me that Dr. Cawley, then principal of Brazen Nose College, Oxford, has been cured of a Hydrops Pectoris, by an empirical exhibition of the root of the Foxglove, after some of the first physicians of the age had declared they could do no more for him. I was now determined to pursue my former ideas more vigorously than before, but was too well aware of the uncertainty which must attend on the exhibition of the root of a biennial plant, and therefore continued to use the leaves. These I had found to vary much as to dose, at different seasons of the year; but I expected, if gathered always in one condition of the plant, viz, when it was in its flowering state, and carefully dried, that the dose might be ascertained as exactly as that of any other medicine; nor have I been disappointed in this expectation. The more I saw of the great powers of this plant, the more it seemed necessary to bring the doses of it to the greatest possible accuracy. I suspected that this degree of accuracy was not reconcilable with the use of a decoction, as it depended not only upon the care of those who had the preparation of it, but it was easy to conceive from the analogy of another plant of the same natural order, the tobacco, that its active properties might be impaired by long boiling. The decoction was therefore discarded, and the infusion substituted in its place. After this I began to use the leaves in powder, but I still very often prescribe the infusion.—William Withering. An Account of the Foxglove, and Some of Its Medical Uses. Birmingham, 1785.
Fatal Congestive Heart Failure Associated with Cardiac Enlargement of Unexplained Origin
RICHARD FRANCE, CLIFFORD W. ATHERTON and WILLIAM L. ALSOBROOK

Circulation. 1956;14:373-378
doi: 10.1161/01.CIR.14.3.373
Circulation is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231
Copyright © 1956 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/14/3/373

Permissions: Requests for permissions to reproduce figures, tables, or portions of articles originally published in Circulation can be obtained via RightsLink, a service of the Copyright Clearance Center, not the Editorial Office. Once the online version of the published article for which permission is being requested is located, click Request Permissions in the middle column of the Web page under Services. Further information about this process is available in the Permissions and Rights Question and Answer document.

Reprints: Information about reprints can be found online at:
http://www.lww.com/reprints

Subscriptions: Information about subscribing to Circulation is online at:
http://circ.ahajournals.org//subscriptions/