Primary Myocardial Disease and Alcoholism

The Clinical Manifestations and Course of the Disease in a Selected Population of Patients Observed for Three or More Years

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SUMMARY

The course of primary myocardial disease (PMD) was observed in 39 alcoholics. After initial examination 3 years or more before this report, we classified the severity of each patient's illness as stage I, II, or III. Stage I patients had minimal symptoms and normal-sized hearts. Stage II patients had evidence of concentric left ventricular hypertrophy and clinical manifestations like those of hypertensive heart disease. Stage III patients had left, and frequently right, ventricular hypertrophy and dilatation associated with persistent congestive heart failure, and clinical manifestations typical of patients with PMD. Only the duration of congestive heart failure differed significantly between stages II and III. Eight patients had exploratory mediastinotomy and myocardial biopsy. Gross and microscopic findings supported the diagnosis of PMD and our classification of severity and revealed diffuse interstitial fibrosis. Fifteen patients have been observed for 3 or more years; 10 have died and 14 have disappeared. These studies emphasize alcoholism's importance in the genesis of this form of PMD. Correlations were positive between abstention from alcohol and waning of clinical severity, and between persistent drinking and waxing of clinical severity.

Additional Indexing Words:
Heart failure
Exploratory mediastinotomy
Ventricular hypertrophy

Although primary myocardial disease (PMD)\(^1\) includes diseases of the myocardium with recognized etiologies, such as, infectious, nutritional, metabolic and infiltrative diseases, it also encompasses diseases of the myocardium whose etiologies are obscure, that is, idiopathic PMD.\(^2\)\(^-\)\(^7\) Many individuals with idiopathic PMD are poorly nourished.\(^8\)\(^-\)\(^10\) or addicted to alcohol, or both, an observation repeatedly recorded for more than 100 years.\(^11\)\(^-\)\(^19\)

In 1962, a prospective study was initiated to ascertain the frequency with which PMD is associated with alcoholism and to describe the clinical manifestations and course of PMD in the alcoholic.

Thirty-nine alcoholic patients with the presumptive diagnosis of idiopathic PMD have been observed more than 3 years. Eight of these patients have had exploratory mediastinotomy and myocardial biopsy.

Methods

Of 200 patients with PMD evaluated, 119 fulfilled the criteria for idiopathic PMD. They had unequivocal heart disease of undefined etiology and were less than 50 years of age. Of the 119 patients with idiopathic PMD, 39 who...
were addicted to alcohol comprise the study population.

Guidelines for exclusion of more common forms of heart disease included:

Arteriosclerotic Heart Disease (ASHD). Distinction between PMD and ASHD in the alcoholic patient may be impossible. A history suggestive of myocardial infarction or the presence of angina pectoris excluded patients from the study group. No patient had serum lactescence, hypercholesterolemia, or xanthelasma. One patient had mild diabetes mellitus (patient 8, see table 4). Restriction of the study population to patients less than 50 years of age undoubtedly resulted in exclusion of patients with idiopathic PMD. However, the age restriction had two favorable results: (1) Since there are an inordinate number of patients in our institution who are alcoholic and are in congestive heart failure, the number of patients qualifying for the study was manageable and (2) since ASHD is more common in older patients, the number of patients with mixed etiologies for their heart disease was probably reduced.

Hypertensive Heart Disease. All patients with sustained systolic (exceeding 160 mm Hg) or diastolic (exceeding 90 mm Hg) hypertension, retinal vascular abnormalities (exceeding Keith-Wagner, grade II), or evidence of chronic renal disease were excluded from the study.

Pericardial Effusion. A few patients with advanced PMD had clinical features which suggested pericardial effusion, that is, small, rapid pulses, distended neck veins with prominent Y descent, percussible evidence of gross cardiomegaly, and ventricular gallop sounds. The roentgenologist’s report usually terminated with “rule out pericardial effusion.” However, such PMD patients usually had palpatory evidence of both left and right ventricular enlargement, the percussible left heart border was not left of the palpable point of maximum impulse (PMI), and the second heart sound, particularly the pulmonic component, was increased in intensity. When necessary for diagnosis, pericardiocentesis and angiography have been used.

Other Types of Heart Disease. These were excluded by history and physical examination. In five patients, a significant mitral insufficiency murmur was audible initially, but in all, the murmur decreased in intensity or disappeared after compensation—the opposite of organic mitral valve disease. “Pseudo mid-diastolic rumbles” were encountered occasionally in individuals with tachycardia and prominent atrial and ventricular gallop sounds, but slowing of the heart rate or a phonocardiogram, or both, resolved the difficulties of interpretation. Anemic or thyrotoxic heart disease, when considered, were excluded by appropriate laboratory tests. Each patient had evidence of predominant left ventricular disease and none had isolated right heart failure. Multiple pulmonary emboli, idiopathic pulmonary hypertension, and cor pulmonale were thus unlikely as primary etiological factors.

When reasonably compensated (edema-free, clear lungs, and mild or no tachycardia), patients presumed to have PMD were studied in detail. Qualitative estimates of average daily consumption of protein, green vegetables, and fruit were obtained. Alcohol intake was estimated with

### Table 1

<table>
<thead>
<tr>
<th>Attribute</th>
<th>I, Normal heart size</th>
<th>II, Lt. ventricular hypertrophy</th>
<th>III, Lt. ventricular dilatation</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of patients</td>
<td>4</td>
<td>22</td>
<td>13</td>
</tr>
<tr>
<td>Mean duration of congestive heart failure (mo.)</td>
<td>5.0 ± 8.8</td>
<td>*4.4 ± 4.7</td>
<td>*16.5 ± 19.4</td>
</tr>
<tr>
<td>Admission</td>
<td>Systolic &gt; 160</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>blood pressures</td>
<td>Diastolic &gt; 90</td>
<td>2</td>
<td>*17 (77%)</td>
</tr>
<tr>
<td>Parasternal lift pressure &lt; 30</td>
<td>1</td>
<td>13</td>
<td>7</td>
</tr>
<tr>
<td>Atrial gallop (S1)</td>
<td>0</td>
<td>*5 (23%)</td>
<td>*9 (69%)</td>
</tr>
<tr>
<td>Ventricular gallop (S3)</td>
<td>1</td>
<td>14</td>
<td>9</td>
</tr>
<tr>
<td>Audible heart murmur Ejection 2nd and 3rd</td>
<td>1</td>
<td>13</td>
<td>8</td>
</tr>
<tr>
<td>Holosystolic apical</td>
<td>0</td>
<td>2</td>
<td>5</td>
</tr>
</tbody>
</table>

± = Standard deviation.
* = Difference between stages II and III (P < 0.05).
† = Murmurs disappeared in four patients after therapy.
attention to type, quantity, duration, and variability. The diagnosis of alcoholism was presumed if alcoholic beverages had been used for 5 or more years in a manner or amounts, or both, considered abnormal, that is, a daily intake in excess of 8 ounces of whiskey or gin, 1 quart of wine, or 2 quarts of beer. The alcohol consumption by 95% of our patients greatly exceeded these minimum quantities.

Physical examination was performed by two or more senior examiners. Impressions of heart size and shape were verified by roentgenograms of the chest with a barium-filled esophagus. Auscultatory findings were confirmed by phonocardiography. Scalar electrocardiograms (ECG) were recorded using standard techniques. Blood samples were drawn for complete blood count, fasting and postprandial blood sugar, cholesterol, urea nitrogen, serology, hemoglobin electrophoresis, antistreptolysin-0 titer, serum transaminase, and glucose-6-phosphate dehydrogenase activity. Screening tests to detect hepatic disease included estimation of cephalin flocculation, thymol turbidity, alkaline phosphatase, total protein, albumin, globulin, gamma globulin, and icteric index. Additional studies included urinalysis, venous pressure, circulation time (Decholin), and a search for L.E. cells by the plasma clot method.

Eight patients had had exploratory mediastinotomy and myocardial biopsy. The indications, contraindications, methods, and results of this procedure in PMD have been reported. The core of tissue obtained by biopsy customarily weighs 50 mg and includes epicardium, myocardium, and endocardium. Specimens for light microscopy were fixed in Bouin’s solution prior to being embedded and subserially cut. Sections were stained with hematoxylin and eosin, Mallory’s aniline blue, Gomori’s modification of trichrome stain, and van Gieson’s elastica.

Upon hospital dismissal, each patient was referred to a “special” clinic. Return visits were routinely scheduled four times per year, but all patients were encouraged to visit more frequently, if there was need. When necessary, transportation and meals have been provided, and all available facilities of the Board of Health and Department of Welfare have been used to ensure regular attendance.

Data analysis was by the t-test and the chi-square test with the Yates correction factor.21

Results

Clinical Studies

Our patients did not resemble the “well-nourished” alcoholics described by Evans whose patients were typically white, ruddy-faced, high-living, hard-drinking salesmen or businessmen. Our patients were from a different racial and socio-economic group. The average patient age was 36.7 years. The oldest patient was 49 years of age and the youngest was 19. There were 29 Negro males, five Negro females, four white males, and one white female. Family histories revealed no patterns of “heart trouble,” “stroke,” hypertension, diabetes, or even alcoholism. Dietary histories suggested poor nutrition in 30 patients, but 10 patients apparently had adequate diets when sober, and 10 patients customarily had adequate diets. Each individual had been addicted to alcohol for a minimum of 5 years, and 29 individuals had been addicted for more than 10 years. Major complications of alcoholism had been present in 22 patients, including delirium tremens in 12, alcoholic gastritis in 10, and peripheral neuropathy in two. Despite prolonged alcoholism and inadequate diets, the majority of our patients did not appear to be malnourished and had no tongue, skin, or neurological manifestations of vitamin deficiency. Historical evidence of liver disease, jaundice, or gastrointestinal bleeding was not obtained.

The presenting complaints suggested left and right ventricular failure in 31 patients. Initial symptoms were insidious. Typically, exertional cough, nocturia, and reduced exercise tolerance were experienced long before overt symptoms of congestive heart failure developed. None of these patients had hyperkinetic circulatory states, and thiamine chloride, exhibited as the sole initial therapy in six patients, did not relieve congestive heart failure. On the basis of physical findings described below, patients with PMD associated with alcoholism were separated into three categories or stages (table 1): stage I—heart size considered to be normal; stage II—cardiac enlargement consistent with concentric left ventricular hypertrophy; and stage III—cardiac enlargement consistent with left ventricular hypertrophy and dilatation. While in congestive heart failure, two patients in stage I, 17 in stage II, and four in stage III had mild diastolic hypertension. Small pulse pressures (30 mm Hg or less) were common, being
found in 21 of 39 patients. All patients were normotensive after therapy.

Physical evidence of cardiomegaly was present in 35 patients: in stage I (four patients) the impulse at the PMI was normal and tapping in character; in stage II (22 patients), a sustained left ventricular heave was present at the PMI suggesting predominant left ventricular hypertrophy. This form of precordial impulse was accompanied frequently by a palpable systolic impulse; in stage III (13 patients) an active but diffuse left ventricular heave was present at the PMI which was displaced laterally suggesting cardiac hypertrophy and dilatation. This form of apical impulse was accompanied frequently by a palpable diastolic filling impulse. A parasternal lift was palpable in five patients in stage II and nine patients in stage III.

As determined by auscultation, the heart sounds were abnormal in all patients; the most common abnormalities were gallop sounds. An atrial gallop sound ($S_4$) was present in 17 patients in stage II and four patients in stage III. A ventricular gallop sound ($S_3$) was present in one patient in stage I, 14 patients in stage II, and nine patients in stage III. In figure 1 (upper panel) a representative phonocardiogram is correlated with a simultaneously recorded apical impulse and
illuminates these sounds to be loud and palpable frequently. In the predominantly hypertrophied heart (stage II), the S4 tended to persist longer than the S3; with continued improvement, the S4 approached and eventually fused with the first sound as illustrated in figure 1 (lower panel). In the predominantly dilated heart (stage III), the S3 tended to decrease in intensity and frequently became inaudible as cardiac compensation occurred. A systolic ejection murmur of I/VI or II/VI intensity along the left sternal border was heard in one patient in stage I, 13 patients in stage II, and eight patients in stage III. Holosystolic murmurs suggesting atrio-ventricular valvular incompetence were heard in two patients in stage II and five patients in stage III.

In retrospect, certain data were analyzed in attempt to explain observed differences between the stages of PMD and alcoholism (table 2). The age, sex, and race of the patients in the three stages were similar and no significant differences were noted when correlated with diet, duration of alcoholism, or symptoms of biventricular failure. However, congestive heart failure had been present for an average of 4.4 months in stage II patients and 16.5 months in stage III patients, a significant difference ($P < 0.05$).

### Laboratory Studies

Each patient had one electrocardiogram (ECG) and most had serial recordings. They were abnormal in 37 patients (table 2). Thirty-two patients had commonly accepted criteria for left ventricular hypertrophy and 16 for left atrial hypertrophy. None of the ECGs were diagnostic of myocardial infarction. Whether the heart was primarily hypertrophied (stage II) or dilated (stage III) did not correlate with ECG findings. All instances of atrial fibrillation, left bundle-branch block, right ventricular hypertrophy,
and right atrial hypertrophy occurred in dilated hearts (stage III).

Roentgenograms of the chest with a barium-filled esophagus (table 3) confirmed clinical impressions of the type of cardiomegaly. Figure 2 (left) illustrates concentric left ventricular enlargement in a patient with no historical or physical evidence of hypertension (stage II). Figure 2 (right) illustrates the “flabby” or dilated type of heart (stage III). One patient in stage I, 18 patients in stage II, and 12 patients in stage III had cardiothoracic ratios greater than 0.5. Right ventricular, right atrial, and left atrial enlargement were recognizable in seven stage III patients. Three patients in stage III had roentgenographic evidence of pulmonary infarction during episodes of congestive heart failure.

Hemoglobin concentrations less than 12.0 gm% were common in these patients, but only three patients had values less than 10.0 gm%. Serological tests for syphilis were positive in two patients. Neither had syphilitic heart disease and both had received therapy for syphilis. Antistreptolysin-O titers exceeded 1:250 in two of 36 patients. Serum transaminase levels exceeded normal values slightly in four patients. Hemoglobin electrophoresis and glucose-6-phosphate dehydrogenase studies were done with blood from 17 of the Negro patients. Each test revealed a genetic abnormality in one patient. Screening tests for hepatic disease were done in 28 patients. The results were within normal limits in 19, and mild abnormalities which regressed with the relief of congestive heart failure were detected in nine patients. Venous pressures and circulation times were recorded shortly following hospital admission in 22 patients. All venous pressures exceeded 15 cm H$_2$O and circulation times exceeded 18 sec. I.E. preparations were negative in 24 patients.

Eight patients have had exploratory mediastinotomy with myocardial and pericardial biopsy (table 4). Gross inspection did not define any significant pericardial disease. Upon opening the pericardium, observation of the heart defined three types of cardiac contraction which correlated with the physical examination and roentgenograms. Two hearts were normal in appearance. Three were quiet, hypertrophied, and contracting in a forceful manner suggestive of pressure overload.
Three hearts were dilated, contracted weakly, and appeared to be diffusely fibrotic. Palpation of cardiac chambers revealed all chamber involvement in both dilated and hypertrophied hearts. The coronary arteries were uniformly smooth and pulsatile in all eight patients.

The grading of myocardial hypertrophy, on a 1 to 3 scale, was based on estimation of enlargement of nuclei in myocardial fibers and the ratio of bulky to normal-sized nuclei (fig. 3). Inflammatory changes were minimal and characterized by the presence of a few polymorphonuclear leukocytes and lymphocytes. In the two hearts which were grossly normal, edema was noted and hypertrophy was absent. Myocardial fat infiltration was described in one heart (the 29-year-old diabetic). Diffuse interstitial fibrosis was uniformly present (fig. 4).

**Subsequent Course**

Of the original 39 patients, 15 are alive and have been observed for more than 3 years,

*Figure 3*

Hypertrophied myocardial fibers with bulky nuclei (hematoxylin and eosin stain; × 300).

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10 are dead, and 14 have disappeared after observation for 1 year or less (table 5). Of 15 patients who are alive and attending the clinic, the clinical status (stage of PMD) is unchanged in five, improved in seven, and has deteriorated in three. All seven patients who have improved and three patients whose status is unchanged have abstained from alcohol. All patients whose status has deteriorated and two patients whose status is unchanged have continued to drink. Of the seven patients whose clinical status has improved, four previously classified as in stage II are now classified as in stage I and three patients previously classified as in stage III are now in stage I or II. Of the 10 patients who died, eight never abstained from alcohol, drinking heavily whenever the opportunity arose, and two claimed abstention, but one of these two (a patient in stage I) was stabbed to death in a tavern. Four patients died of congestive heart failure, one of congestive heart failure terminated by pulmonary embolus, and four died suddenly of unknown causes. Thus, of the 22 patients in stage II, 12 are accounted for and three are dead; of the 13 patients in stage III, 11 are accounted for and six are dead.

Discussion

Elevated diastolic blood pressures and narrow pulse pressures are common in PMD.2, 7, 14, 15, 24, 25 Such blood pressure alterations are not stable, and customarily patients become normotensive with narrow pulse pressures when compensated. Various explanations for this phenomenon have been proposed,26–28 and the most plausible one27 postulates negative feedback by arterial receptors, whereby inadequate myocardial contraction alters the pulsatile waveform and results in a sympathetic-mediated peripheral vasoconstriction. This phenomenon was common in patients in stage II whose examinations customarily disclosed other features suggestive of hypertensive heart disease, such as a sustained left ventricular impulse at the PMI, atrial gallop sounds,29, 30 and ECGs and roentgenograms suggestive of left ventricular hypertrophy. Yet, hypertensive heart disease is an unlikely possibility since: (1) blood pressures in stage II patients were normal when cardiac compensation was restored; (2) their retinal vessels were unaffected; (3) their renal functions were normal; and (4) upon auscultation, the pulmonic component of the second heart sound was accentuated and the aortic

Table 5

<table>
<thead>
<tr>
<th>Patient population after &gt; 3 yr</th>
<th>I</th>
<th>Stages II</th>
<th>III</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. admitted to study</td>
<td>4</td>
<td>22</td>
<td>13</td>
</tr>
<tr>
<td>Current status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deceased</td>
<td>1</td>
<td>9</td>
<td>5</td>
</tr>
<tr>
<td>Missing</td>
<td>2</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>Clinical condition</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unchanged</td>
<td>1</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Worse</td>
<td>—</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Cause of death</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Congestive heart failure</td>
<td>—</td>
<td>—</td>
<td>4</td>
</tr>
<tr>
<td>Pulmonary embolus</td>
<td>—</td>
<td>—</td>
<td>1</td>
</tr>
<tr>
<td>Unknown</td>
<td>—</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Other</td>
<td>1*</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

* = stabbed.
component was not. In the absence of other precipitating factors, such as coronary artery disease, anemia, thyrotoxicosis, malignant hypertension, azotemia, or pulmonary disease, it is unusual for hypertensive patients 30 to 49 years of age, with mild hypertension, to have congestive heart failure.\textsuperscript{25} The congestive heart failure of patients in stage II responded rapidly to simple therapy (digitalis, diuretics, and bed rest). The composite description of patients in stage II resembles descriptions of patients designated by Sackner and associates\textsuperscript{31} as idiopathic myocardial hypertrophy—group I, by Brigen\textsuperscript{14} as non-coronary cardiomyopathies, by Goodwin and associates\textsuperscript{4} as cardiomyopathy, type 1, by Spodik and Littman\textsuperscript{36} as idiopathic myocardial hypertrophy, and by several authors\textsuperscript{6, 13, 16} as primary myocardial disease. Authors who have reported specifically upon alcoholism and heart disease have also described patients whose clinical characteristics closely resemble the patients in stage III.\textsuperscript{17-19}

Although the clinical manifestations described for each stage of PMD and alcoholism seem distinct, many patients with combined clinical manifestations were seen who were finally classified only after a period of observation. Thus, our experience with patients who have PMD and alcoholism is similar to that of Harvey and co-workers\textsuperscript{3} with PMD in general. They also found a spectrum of illness, mild to moderate to severe, but did not describe corresponding clinical manifestations.

Upon exploratory mediastinotomy, gross appearance of the hearts confirmed clinical impressions, but despite variability in gross appearance, histological examination of all biopsy specimens of myocardium disclosed diffuse interstitial fibrosis.\textsuperscript{20} Since these biopsy specimens were obtained from the outflow tract of the right ventricle, data derived from their study may not be considered applicable to the entire myocardium. However, PMD associated with alcoholism is characterized by biventricular failure and the histological appearance of biopsy specimens from the outflow tract of the right ventricle was found to be identical with the histological appearance of postmortem specimens of myocardium from both ventricles of patients with alcoholism.\textsuperscript{37}

The areas of interstitial myocardial fibrosis are small (less than 1 cm in greatest diameter) and are diffusely distributed in the perivascular and interstitial spaces. Similar lesions have been described by Schwartz and Mitchell\textsuperscript{38} who found them to be unrelated to vascular disease and to correlate best with the age of the heart. The myocardial cells of these
patients with PMD presumably have been injured by alcohol, malnutrition, infectious agents, or a combination of insults leading to progressive fibrous replacement of myocardium and to variable degrees of compensatory myocardial hypertrophy.

Twenty-five of the 39 patients in the study group were accounted for after 3 years of observation. The difficulties of differentiating between ASHD and PMD in alcoholic patients is illustrated by a stage II patient, whose ECG showed a 0.04 sec R wave in V2 and whose vectorcardiogram showed 50% of the QRS loop to be anterior to the E point in the horizontal and sagittal planes. These abnormalities suggested a true posterior infarction, but coronary arteriograms were normal and the patient remains a member of the study group. The importance of alcohol in the pathogenesis of this form of PMD is emphasized by the subsequent course of the 26 patients accounted for after 3 years’ observation. An unequivocal relationship was found between abstinence from alcohol and improvement in clinical status, and an equally direct relationship was demonstrated between continued alcoholism and deterioration of clinical status. Although these observations do not clarify the precise role of alcohol, support is given to the premise that alcoholism is a primary etiological factor. The decision to separate patients with PMD and alcoholism into three stages, descriptive of the course of the disease, seems justified by subsequent observations: (1) when a patient’s heart disease improved or deteriorated, the clinical manifestations, indicating the stage of PMD, changed concomitantly; and (2) 46% of stage III patients, who had been presumed to have the most serious heart disease, were dead after 3 years’ observation.

Acknowledgment

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References


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S. Weir Mitchell on The Physician, 1887

We have a certain gentle disrespect among us for the doctor who is described as, oh! so sympathetic,—the man who goes about his work with a pocket-full of banal phrases calculated to soothe and comfort the cravings of the wretched. The sick and feeble take gladly these imitation crumbs cast from the full table of the strong. But sometimes people of firm character revolt at such petty and economical charity. I heard a vigorous old Quaker lady say once, after a consultation, "Thee will do me a kindness not to ask me to see that man again. Thee knows that I don’t like my feelings pouliticed."—S. WEIR MITCHELL: Doctor and Patient, ed. 4. Philadelphia and London, J. B. Lippincott Company, 1904, p. 46.
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