Coronary Heart Disease in Chronic Schizophrenic Patients

A Clinicopathologic Study

By ALLEN E. HUSSAR, M.D.

HEART disease in mental patients has received little attention in the medical literature. Malzberg reported that in the New York State Hospitals over 50 per cent of the deaths were attributed to diseases of the heart. Alstrom compared the causes of deaths in the mentally diseased population and the Stockholm population during the years of 1924-1936. “Diseases of circulatory system” was the most frequent cause of death in both populations. Among the selected group of schizophrenic patients, tuberculosis was the most common cause of death during those years; death rates from diseases of the circulatory organs were found to be equal in the schizophrenic patients and the general population.

More recently, Tokuhata and Stehman compared mortality rates in Michigan State mental hospitals with those of the general population in Michigan and found “arteriosclerotic and degenerative heart disease” to be the most frequent cause of death in both populations. The ratio of the hospital death rate to general death rate from this disease was 2.7. In the study of autopsy material, Gould and Cawley found identical total incidence of fresh and old infarcts in psychiatric and nonpsychiatric patients. Hollister et al. analyzed the causes of death in a Veterans Administration neuropsychiatric hospital and showed that one third of all psychotic patients and one third of patients with functional psychosis (86 per cent of them were schizophrenic) died in heart disease. Abraham reported from another Veterans Administration neuropsychiatric hospital that clinically, arteriosclerotic and hypertensive cardiovascular diseases were more prevalent in hospitalized schizophrenic subjects than in the general population. According to Ødegard, in the Norwegian mental hospitals “arteriosclerotic and degenerative heart disease” were the most prominent causes of death among males over the age of 40 during 1954-1959.

Several reports appeared on the increased frequency of painless myocardial infarction in psychotic patients. A few early reports also appeared on the increased incidence of myocardial rupture in mental institutions.

In a recent analysis of 1,275 autopsy protocols of schizophrenic patients, we found that coronary heart disease was the most frequent cause of death. From this finding, together with the fact that schizophrenic patients make up from one half to two thirds of the patient population in mental hospitals, it becomes evident that coronary heart disease deserves as much attention inside as outside psychiatric institutions.

Material and Method

In order to eliminate as many variables as possible, we have selected for study the 1,275 autopsy protocols of white, male, chronic schizophrenic patients who died from any cause at the age of 40 or over during 1954-1959 in the 29 Veterans Administration neuropsychiat-
ric hospitals where the autopsy rates were 60 per cent or higher. The mean age at death was 62.8 years, the average duration of schizophrenic illness 24 years, and most of these years were spent in mental hospitals.

Three hundred ninety-four of the 1,275 patients died in coronary heart disease, defined as death from fresh myocardial infarction, fresh coronary occlusion without demonstrable infarction, or, acute coronary insufficiency. Criteria of acute coronary insufficiency were sudden or near-sudden death and autopsy findings of severe narrowing or old occlusion of one or more major coronary arteries, absence of fresh infarction, fresh occlusion, and the absence of other causes of death. An additional 126 patients who died from causes other than coronary heart disease showed old myocardial infarcts larger than 0.5 cm. in diameter, or old occlusion of major coronary arteries without infarcts. In our terminology "fresh coronary occlusion" means occlusion by fresh thrombus; "old occlusion" means old thrombus or atherosclerotic occlusion.

This total of 520 protocols was analyzed. The findings were compared with those of a group of the general population, matched to the group of schizophrenic patients as closely as possible.

We did not include in this investigation the 75 patients who died of arteriosclerotic heart disease in failure that was not due to acute myocardial infarction or fresh coronary thrombosis. Postmortem examination showed various degrees of coronary atherosclerosis, myocardial fibrosis, cardiac enlargement, and absence of other heart disease. Thirty-five of these 75 patients were included in the group of "old infarcts and old occlusions" because they showed such lesions at autopsy.

Similarly, we did not attempt to investigate the extent and severity of atherosclerosis of the coronary arteries beyond the presence or absence of occlusion, because neither the gross nor the microscopic anatomic descriptions in the protocols was detailed enough to allow such investigation.

### Results

**The Prevalence of Coronary Heart Disease as a Cause of Death in Chronic Schizophrenic Patients**

As shown in table 1, 394, or 31 per cent of the 1,275 patients, died either from acute myocardial infarction with or without fresh coronary occlusion, fresh coronary occlusion without demonstrable infarction, or from acute coronary insufficiency. How does this compare to the prevalence of coronary death in a similar but nonpsychotic group of the general population?

The Vital Statistics of the United States recorded 3,775,921 deaths of white men 40 years of age or more during the period 1954–1959, and in 941,686, or 25.3 per cent of them, coronary heart disease was given as the cause of death. The known errors in death-certificate diagnosis prompted us to take a more conservative position by assuming a 20-per cent error in the figures of the Vital Statistics, this error being in the direction of increasing differences between schizophrenic and nonpsychotic subjects. Therefore, we applied a 20-per cent correction to decrease differences and found that the prevalence of death from coronary heart disease was similar in the two populations.

Biorck and associates studied the autopsy material of the entire town of Malmo (about 200,000 population) in Sweden and found 772 acute myocardial infarcts (the authors' criteria for the diagnosis of myocardial infarction was comparable with our criteria for coronary heart disease) representing an

<table>
<thead>
<tr>
<th></th>
<th>No.</th>
<th>Deaths from CHD</th>
<th>%</th>
<th>% of total deaths</th>
</tr>
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<tbody>
<tr>
<td>Fresh infarct</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>with fresh occlusion</td>
<td>118</td>
<td>212</td>
<td>53.8</td>
<td>16.6</td>
</tr>
<tr>
<td>without fresh occlusion</td>
<td>94</td>
<td></td>
<td>30.0</td>
<td></td>
</tr>
<tr>
<td>Fresh occlusion without fresh infarct</td>
<td>79</td>
<td>20.0</td>
<td>6.2</td>
<td></td>
</tr>
<tr>
<td>Acute coronary insufficiency</td>
<td>103</td>
<td>100.0</td>
<td>26.2</td>
<td>8.1</td>
</tr>
<tr>
<td>Total deaths from CHD</td>
<td>394</td>
<td></td>
<td>100.0</td>
<td>30.9</td>
</tr>
</tbody>
</table>
incidence of 13.5 per cent in 5,735 autopsies on patients over 30 years of age (both sexes) during the years 1944-1954, when the total autopsy rate was about 34 per cent of all people over 30 years who died in the town.

In the community study carried out in Rochester, Minnesota, by the Mayo Clinic during 1947 to 1952, with 73 per cent of all deaths in the town autopsied, coronary heart disease was the cause of death in 34 per cent of 373 autopsied men of 20 years of age or older.

In Stamler's table on mortality rates per 100,000 United States population for the year of 1959, 34.8 per cent of all deaths among white men aged 35 years or older died in arteriosclerotic heart disease.

The figures of Blomquist and Biorck relating coronary to total mortality for the year of 1955 in various parts of the world showed that in the United States of America 42.1 per cent of all deaths among white men between the ages of 55 and 64 years resulted from coronary heart disease.

Gould and Cawley reviewed a series of 5,000 consecutive autopsies from 1945 to 1955, performed in a county hospital consisting of a psychiatric institution, infirmary for indigents, and a general hospital. The incidence of myocardial infarcts was approximately the same in psychiatric and nonpsychiatric patients of both sexes.

In our hospital, a total of 97 male schizophrenic patients died during the 10-year period of 1952-1961. Forty patients, or 41 per cent, died from coronary heart disease and 57 patients, or 59 per cent, from other causes. The autopsy rate for the entire group of 97 was 70 per cent and among the 40 coronary deaths, 90 per cent.

Finally, it was interesting to note that 197, or 50 per cent, of our 394 deaths from coronary heart disease showed fresh thrombotic occlusion at autopsy. In a recent study, Spain and Bradess found 53 per cent fresh coronary thrombi in 100 consecutive necropsies in men who died from recent myocardial infarcts during the years 1955 to 1958.

**Distribution of Coronary Deaths by Age Groups and Types of Schizophrenia**

Mean age for the entire group of 394 schizophrenic deaths from coronary heart disease was 62 years, ranging from 40 to 83 years. Table 2 shows that the number of deaths from coronary heart disease increased with each decade of life until it reached a peak in the seventh decade, after which it declined. This is in line with figures for the general population as shown by U.S. Vital Statistics, in the Rochester, Minnesota, Community Study, and the Seattle, Washington, Community Study. The same was true for male psychiatric patients in Norway, according to Ødegaard's tabulation of deaths during 1954-1959.

Table 2 also shows that distribution of coronary death by types of schizophrenia showed no difference among the four major diagnostic groups.

**Table 2**

<table>
<thead>
<tr>
<th>Age groups</th>
<th>Total no. patients</th>
<th>No. Died from CHD</th>
<th>% of the group</th>
</tr>
</thead>
<tbody>
<tr>
<td>40-49</td>
<td>112</td>
<td>31</td>
<td>27.7</td>
</tr>
<tr>
<td>50-59</td>
<td>228</td>
<td>89</td>
<td>39.0</td>
</tr>
<tr>
<td>60-69</td>
<td>785</td>
<td>234</td>
<td>30.0</td>
</tr>
<tr>
<td>70-85</td>
<td>150</td>
<td>40</td>
<td>26.6</td>
</tr>
<tr>
<td>Total</td>
<td>1275</td>
<td>394</td>
<td></td>
</tr>
</tbody>
</table>

Types of schizophrenia:
- Hebephrenic: 558 patients, 183 died, 32.8% of the group
- Catatonic: 122 patients, 38 died, 31.1% of the group
- Paranoid: 404 patients, 122 died, 30.2% of the group
- Undifferentiated: 131 patients, 31 died, 23.7% of the group

*Circulation, Volume XXXI, June 1965*
Table 3

Incidence of Old Infarcts and Old Occlusions

<table>
<thead>
<tr>
<th></th>
<th>Among 394 patients who died in CHD</th>
<th>Among 881 patients who died from causes other than CHD</th>
<th>Among the total of 1,275 patients studied</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. % of 394</td>
<td>No. % of 881</td>
<td>No. % of 1,275</td>
</tr>
<tr>
<td>Old infarct with old occlusion</td>
<td>125 31.7</td>
<td>31 3.5</td>
<td>156 12.2</td>
</tr>
<tr>
<td>Old infarct without occlusion</td>
<td>91 23.1</td>
<td>65 7.4</td>
<td>156 12.2</td>
</tr>
<tr>
<td>Old occlusion without infarct</td>
<td>42 10.6</td>
<td>30 3.4</td>
<td>72 5.6</td>
</tr>
<tr>
<td></td>
<td>258* 65.4</td>
<td>126† 14.3</td>
<td>384 30.0</td>
</tr>
</tbody>
</table>

*171 among the 291 patients who died from acute myocardial infarction or coronary occlusion without infarction, and 87 among the 103 patients who died from acute coronary insufficiency.

+Of these 126 patients, 32, or 25.4 per cent, died in heart failure.

Incidence of Old Infarcts and Old Coronary Occlusion

Table 3 shows that 30 per cent of the 1,275 patients had at the postmortem examination either old myocardial infarction or old coronary occlusion, or both. These old lesions were present in about two thirds of patients who died in coronary heart disease, and only in 14.3 per cent of the patients who died from causes other than coronary heart disease. Adding up the patients who died in acute myocardial infarction (212), fresh coronary occlusion without infarction (79), the 87 patients who died from acute coronary insufficiency and showed old infarct or occlusion, and the 126 patients who died from other causes but nevertheless had old infarct or occlusion, we may conclude that 39.5 per cent of the 1,275 patients had either acute or old myocardial infarction, coronary occlusion, or their combination.

Since we could not measure exactly the severity of atherosclerosis of the coronary arteries from routine autopsy protocols except for the presence or absence of complete—fresh or old—occlusion of a major artery, we arbitrarily counted only the latter. Therefore, the actual incidence of significant degree of coronary atherosclerosis was substantially higher than as expressed by the figures of tables 1 and 3. The group of deaths from coronary heart disease (394) and deaths from causes other than coronary heart disease, but showing old infarct or occlusion (126), add up to 520, or 41 per cent of the entire group of 1,275. Had we included the cases that had an important degree of atherosclerosis but were omitted because of absence of occlusion or infarction, they would probably have brought the figure way over 41 per cent; this is in accord with a recent report by the American Heart Association21 that an important degree of coronary atherosclerosis is present in approximately 50 per cent of all men over the age of 45 in the United States.

For the comparison of incidence of old infarction in the general population with our findings in schizophrenic patients, we quote a few reports. Maher and associates22 found old infarcts in 66 of 183 acute infarctions, an incidence of 36 per cent versus our 106 old infarcts in 212 patients with acute infarctions, an incidence of 50 per cent. Biorck et al.15 analyzed 3,038 autopsies performed on men 30 years of age or older in the city of Malmo, Sweden, during 1944-1954. Infarct scars (not diffuse myocardial fibrosis) were found in 483, or 15.9 per cent. We have found old infarcts in 312 of the total of 1,275 autopsy protocols, an incidence of 24.5 per cent. Morris23 quoted from the National Necropsy Survey, Great Britain, the incidence of old infarct in deaths from other causes than ischemic heart disease in men, ages 45 to 64, during the years 1954-1956. In 9.5 per cent of the 1,549 autopsies, "ischemic myocardial fibrosis" was recorded. In a series of consecutive autopsies performed on male
patients aged 45 and over in the Albany Medical Center Hospital during 1955-1957, old myocardial infarct was found in 33, or 13.6 per cent, of the 243 patients who died from causes other than coronary heart disease.\textsuperscript{24} In our series, there were 96 old infarcts among 881 who died from causes other than coronary heart disease, an incidence of 10.9 per cent.

**Location of Coronary Arterial Occlusion**

A total of 488 fresh and old occlusions were analyzed for anatomic sites. Table 4 shows that occlusions were found in the various locations in the following order of decreasing frequency: anterior descending branch of the left coronary, right coronary, left coronary, left circumflex branch of the left coronary, right circumflex, and posterior descending branch of the right coronary artery. The order of frequency by which the coronary arteries are usually affected in the general population, quoted from various sources in table 4, shows a close correspondence with our findings.

**Rupture of the Myocardium**

In our series, 46 cases of cardiac rupture were found among the 212 schizophrenic patients who had fresh myocardial infarction, an incidence of 21.7 per cent.

The incidence of cardiac rupture through recent myocardial infarctions is extensively reported in the medical literature. A comprehensive review of this literature appeared as early as 1925 by Krumbhaar and Crowell\textsuperscript{28} and more recently by Wessler et al.\textsuperscript{29} in 1952, by Maher and associates\textsuperscript{22} in 1956, and Kamil et al.\textsuperscript{30} in 1962.

The Maher group tabulated the autopsy material from 19 reports that appeared during 1928-1954 and counted a total of 419 ruptures among 4,732 acute myocardial infarcts in patients from the general population, an incidence of 8.9 per cent. To this they added their own 21 cases of rupture in 183 acute myocardial infarctions, an incidence of 11.5 per cent. Recently, Griffith and associates\textsuperscript{31} reported from a general hospital, 52 ruptures among 1,212 acute infarcts, an incidence of 4.3 per cent. Sievers and Blomquist\textsuperscript{32} found ruptures in 10.1 per cent of the 2,888 autopsied myocardial infarction deaths in Malmo, Sweden, during 1935-1959.

Increased incidence of cardiac rupture from acute myocardial infarction in mental patients has been previously observed by others. Both, Wessler et al.\textsuperscript{29} and Maher and associates\textsuperscript{22} listed in their review of literature six case reports on cardiac rupture in mental patients. They amounted to a total of 55 ruptures in 4,981 autopsies, an average incidence of 1.1 per cent. The comparable figures from general hospitals were 181 cardiac ruptures in 68,716 autopsies, an incidence of 0.26 per cent. Jetter and White\textsuperscript{33} reported 16 ruptured hearts among 22 autopsied cases of acute myocardial infarction, an incidence of 73 per cent. Kavelman's\textsuperscript{34} 16 cases of cardiac ruptures in 105 autopsied patients with recent myocardial infarction were percentage-wise about evenly distributed between psychotic and nonpsychotic patients.

As for anatomic location, we have found

<table>
<thead>
<tr>
<th>Anatomic Sites of Coronary Occlusion</th>
<th>Our series</th>
<th>Bailey\textsuperscript{25}</th>
<th>Schlesinger and Zoll\textsuperscript{*}</th>
<th>Pitt et al.\textsuperscript{17}</th>
<th>Jetter et al.\textsuperscript{21}</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anterior descending</td>
<td>215 (44%)</td>
<td>60-80%</td>
<td>38%</td>
<td>39%</td>
<td>66%</td>
</tr>
<tr>
<td>Right coronary</td>
<td>112 (23%)</td>
<td>15-25%</td>
<td>35%</td>
<td>37.5%</td>
<td>30%</td>
</tr>
<tr>
<td>Left coronary</td>
<td>72 (15%)</td>
<td>15%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Left circumflex</td>
<td>57 (12%)</td>
<td>5-10%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Right circumflex</td>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Posterior descending</td>
<td>17</td>
<td>(6%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>488 (100%)</td>
<td></td>
<td></td>
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</tbody>
</table>

* Circulation, Volume XXXI, June 1965
42 ruptures of the left ventricle (anterior 18, posterior 12, lateral three, anterolateral four, posterolateral three, papillary muscle two), three of the right ventricle (posterior two, apex one), and one of the interventricular septum.

The involvement of the left ventricle in over 90 per cent of the cases is in accordance with the general figures.28, 31, 35

Finally, we examined the incidence of old infarctions in the group of fresh infarctions with and without rupture. In the group of 46 cardiac ruptures, old infarction was present in nine (about 5 per cent), and among the 166 fresh infarctions without rupture, there were 97 (58 per cent) hearts showing old infarcts. This was in line with the observations of others22, 29, 36 that a considerably lower incidence of scars of old infarcts could be noted in ruptured than in unruptured hearts.

Sudden Deaths

Of the 394 deaths from coronary heart disease in schizophrenic patients, clinical information as to the circumstances of death was available in 343 cases. Two hundred twenty, or 64.1 per cent of the 343, died suddenly (our criterion of sudden death was if a patient died unexpectedly in a matter of minutes or was found dead). The final diagnoses in these 220 deaths were fresh myocardial infarction in 97 (44 per cent), of which 50 were and 47 were not associated with fresh coronary occlusion, fresh coronary occlusion without infarct in 42 (20 per cent), and acute coronary insufficiency in 81 (36 per cent) cases.

In the Framingham study,37 sudden and unexpected deaths were recorded in 58 per cent of all deaths from coronary heart disease. In the Rochester study,16 slightly more than half of all deaths occurred suddenly.

In a survey of cardiovascular diseases in the United States, Stamler17 estimates that about 50 per cent of the fatalities are sudden deaths.

In Adelson's38 study of 500 consecutive sudden deaths due to coronary heart disease, approximately one third had recent coronary thrombosis or acute myocardial infarct, or both. In our series, these findings were present in two thirds of the 220 cases.

In our material, sudden death from all causes was evident in 330, or 31 per cent, of the 1,063 protocols that contained clinical information. In 220 cases, or 67 per cent, coronary heart disease was the cause of sudden death.

Painless Myocardial Infarction and Coronary Occlusion

Of the 343 schizophrenic patients with coronary deaths whose clinical abstracts were available, 220 died suddenly and were therefore omitted from this analysis. Of the remaining 123 who did not die suddenly, 60 per cent experienced no pain in the chest or neighboring areas. These figures are similar to our own hospital experience where 45 per cent of the 22 schizophrenic patients who suffered fatal fresh myocardial infarction but did not die suddenly, and 50 per cent of the 20 patients who survived an attack, had painless infarctions.

Since Herrick's39 paper in 1912, which was the first comprehensive work on the subject of painless infarction, the incidence of painless coronary attacks was the subject of numerous reports in the literature. Roseman40 reviewed the literature on this subject and quoted 23 series in which the incidence of painless myocardial infarction in the general population varied from 0 to 61 per cent. He ascribed this great variation to different anatomic interpretations, to the care with which the history is taken, the definition of pain, the state of the sensorium of the patient, and the sensitivity of the person to pain. He added his own investigation of pain in a group of 220 cases of myocardial infarction. There were 10 patients with painless infarcts but of these only five (2.3 per cent) had reliable histories.

Johnson and associates41 reported from the autopsy material of the Mayo Clinic that of 63 patients who died during acute myocardial infarction 26, or 41 per cent, experienced no thoracic pain.

In the Framingham Heart Program, the
clinical manifestations of 73 middle-aged patients who suffered acute myocardial infarction were studied by Stokes and Dawber. Eight, or 11 per cent, of these 73 patients had no precordial pain or discomfort whatsoever.

Lindberg and associates studied the incidence of coronary heart disease and totally asymptomatic myocardial infarction in a nearly all-white middle-aged male population during 1954-1957. Forty-one new cases of coronary heart disease developed during this period, with 20 cases of definite myocardial infarction. Three, or 15 per cent, of these 20 cases were totally asymptomatic.

The high incidence of painless myocardial infarction in mental patients has been previously reported. Marchand found that pain was absent in 67.5 per cent of 52 episodes of acute myocardial infarction in mental patients. Lieberman reported that of the 56 mental patients who suffered a coronary attack 49, or 87 per cent, experienced no pain. In Sanen's series of 50 psychotic patients who died of acute myocardial infarction only four, or 8 per cent, complained of chest pain and two, or 4 per cent, of abdominal pain.

Anginal Syndrome

In our series, pre-infarction anginal syndrome was recorded only in a single case of the 343 autopsy protocols containing clinical summaries of patients who died in coronary heart disease. In our own hospital cases, only two of the 56 schizophrenic patients complained of angina prior to an acute coronary attack, and none of the 20 patients who survived the attack had postinfarction anginal syndrome.

The paucity of angina in mental patients has also been observed by others. Jetter and White, reporting on 16 cases of cardiac rupture due to acute myocardial infarction, noted that in only one case was there a history of angina pectoris. Sanen found no history of an anginal syndrome in 22 patients who died from acute myocardial infarction, and autopsy showed old, recent, and acute multiple infarcts.

To illustrate the significant incidence of angina in the nonpsychotic population, we quote here a few reports. In a review of 15 papers, Doscher and Poindexter found that 44 per cent of a total of 3,315 patients have suffered of angina prior to the initial myocardial infarction. Johnson and associates reported that 41, or 65 per cent, of their 63 patients with acute infarction had previous angina. In the series of Francis and co-workers pre-infarction angina pectoris was present in 72, or 48 per cent, of the total of 150 patients.

In the Framingham Heart Program, Stokes and Dawber reported that of the 64 middle-aged persons who suffered an initial myocardial infarction, 26 per cent had angina pectoris before, and 62 per cent after the infarctions. In a subsequent report on the same program, Kannel and associates tabulated the clinical manifestations of newly developed coronary heart disease in a 6-year follow-up. Definite angina pectoris was present in 37, or 29.6 per cent, of the 125 men. In the Rochester study, angina pectoris was present during life in one third of the patients who died of coronary disease.

Fatality Rate

The fatality rate of coronary heart disease in schizophrenic patients could not be determined from autopsy material alone, since the number of patients who survived the coronary attack was unknown. Therefore, to make this report as complete as possible, we turned to our own hospital material. During the 10-year period of 1952-1961, 56 schizophrenic patients suffered a total of 60 heart attacks. Forty of the 60 attacks ended in death (sudden death 18, nonsudden death 22), a fatality rate of 66 per cent. Of these 40 patients, 36 died in their first, and four died in their second attack. Sixteen patients survived (all, except one who showed an old infarct on the admission electrocardiogram, had a first attack of myocardial infarction). All patients except one (a Negro) were white men with a mean age of 61 years (two below 40). The autopsy rate in this group of fatalities was 90 per cent.

Fatality rate of acute myocardial infarction.
in a mental hospital was reported by Lieberman. Of the 56 psychiatric patients in whom the diagnosis of acute coronary thrombosis was made 31, or 55 per cent, died.

Fatality rate of coronary heart disease in the general population is illustrated by the following reports. In the Framingham study, 33.6 per cent of the 229 persons (men and women) died suddenly or shortly after the initial episode of coronary heart disease. In the general hospital material of Sievers and Blomquist, 31.3 per cent of the 1,067 patients who suffered acute myocardial infarction during 1955-1959 died within 4 weeks of the onset of their illness. Stamler, in his review of coronary heart disease in the United States, estimates that 30 to 40 per cent of first attacks of myocardial infarction are fatal during the initial 6 weeks after onset. Russek and Zohman analyzed 1,318 consecutive admissions for acute myocardial infarction to three New York hospitals and found a mortality of 33.8 per cent. In a study of a large industrial population, Pell and D’Alonzo reported a fatality rate of 30 per cent in a series of 1,356 cases (all but 25 were males, 94 per cent were over the age of 40) who had acute myocardial infarction during 1956-1961.

Myocardial Aneurysm

Since the most common cause of myocardial aneurysm is the site of previous myocardial infarction, we are recording here the incidence of aneurysm in our 520 patients who either died of coronary heart disease, or died of other causes, but showed old infarct or old occlusion. There was a total of 25 myocardial aneurysms, an incidence of 4.8 per cent, with location described in the autopsy protocols as “left ventricle” in six, posterior left ventricle seven, anterior left ventricle one, septal two, anterior-septal five, posterior-septal one, and apical three. Six patients died in heart failure, 14 in acute coronary heart disease, and five from miscellaneous diseases. Not a single aneurysm ruptured—an observation shared by others.

Wiebe and associates quoted the incidence of myocardial aneurysm as occurring in 10 to 38 per cent of patients with myocardial infarction. Abrams and co-workers from Michael Reese Hospital found an autopsy incidence of myocardial aneurysm of 12.4 per cent in 508 patients with myocardial infarction. Spiekerman et al. found ventricular aneurysm in 7 per cent of the patients dying of coronary disease. He quotes from other reports an incidence of 3 to 20 per cent.

Discussion

To our knowledge this is the first detailed investigation of coronary heart disease in an institutionalized chronic schizophrenic population.

One cannot be too careful when trying to draw conclusions from an investigation of this type. In order to obtain the meaning of our figures, we needed comparable controls from the general population. This was difficult to find. We tried to compensate for this difficulty by quoting more than one comparison, and considering differences between our schizophrenic group and the general population significant only if they were of considerable magnitude.

If we accept the finding that the prevalence of coronary heart disease does not distinguish between the chronic institutionalized schizophrenic and the general population, one may make a case out of this observation, pro or con, in the running argument over the role of stress—physical or mental—in the causation of coronary heart disease; or, even in the argument over the role of the many other factors cited in the etiology of coronary heart disease, as for example, diet, occupation, and environment. It is beyond the scope of this paper to examine and discuss all these factors in a schizophrenic population, but suffice it to point out that very little, if anything, could be expected to be common in the life and habits of a population with schizophrenic illness of an average of 24 years’ duration with most of these years spent in a mental hospital, and the general population. The most heated arguments are around the role of emotional stress in the production of coronary heart disease. To those who deny its etiologic significance, we offer as arguments in their favor that overprotection in the
psychiatric hospital is a well-known fact, protecting the mentally ill person from the stresses of life outside.\textsuperscript{50} Furthermore, in an investigation of the somatic response system in chronic schizophrenia, Reynolds\textsuperscript{50} found that chronic schizophrenic patients are withdrawn, less anxious, and show a small somatic change under various physical and mental stress stimuli. Smith and associates\textsuperscript{61} reported on 47 psychiatric patients who spent 50 years in a mental hospital. In 17, or 36 per cent, of the 47 patients "hypertensive and arteriosclerotic vascular disease" developed.

The frequent absence of pain in coronary heart disease reported by others for the entire group of psychotic patients was also found to be true for the homogeneous group of schizophrenic patients. The reason why these patients do not complain of pain of myocardial infarction or angina pectoris has been a matter of speculation. Inability or refusal to complain, high pain threshold,\textsuperscript{62} true absence of pain, lack of appreciation of pain sensation,\textsuperscript{8} or any combination of these are the various possibilities. Well known to all of us who work in mental hospitals are the patients who walk around with a ruptured viscus, intestinal obstruction, fractures, or other acute surgical disorders.\textsuperscript{63}

This absence of pain or complaint of pain may explain our additional findings, namely, high fatality rate of coronary attacks, high incidence of sudden deaths, and rupture of the myocardium. Since the patient fails to complain of pain, diagnosis and proper medical care are consequently delayed. The role of physical activity during the first few days of acute myocardial infarction as one of the causes of myocardial rupture has been repeatedly emphasized.\textsuperscript{22, 81, 83}

In absence of pain, acute episodes of coronary heart disease are discovered—sooner or later—by other symptomatology. Dyspnea is the most common manifestation followed in various frequency by others, namely, a change in the patient's mental behavior, weakness, vomiting, cyanosis, syncope, shock, or heart failure. Wendkos\textsuperscript{81} emphasized fever as an important initial sign of infarction in elderly psychotic patients.

The very low incidence of myocardial aneurysm in our series may be explained by the generally limited physical activities of the institutionalized schizophrenic patients.

In a previous investigation, we found that large-scale use of tranquilizers had no effect on the incidence or fatality rate of myocardial infarction in a mental hospital.\textsuperscript{64}

**Summary**

An investigation of 1,275 autopsy protocols and available clinical records of white, male, chronic schizophrenic patients, 40 years or older, with an average length of hospitalization of over 20 years, showed that (a) the prevalence of coronary heart disease as a cause of death was as high in this group of schizophrenic subjects (31 per cent) as in the comparable section of the general population; (b) the fatality rate (66 per cent) of coronary heart disease, (c) the incidence of sudden death (64 per cent of all deaths from coronary heart disease), (d) the incidence of myocardial rupture (21.7 per cent of all fresh myocardial infarctions) and (e) the incidence of painless heart attacks were higher in schizophrenic patients (60 per cent) than in the general population; (f) myocardial aneurysm was found less commonly in schizophrenic patients (2 per cent of all patients who either died of coronary heart disease or other causes but showed old infarct or old occlusion), and (g) there was an almost complete absence of anginal syndrome preceding or following myocardial infarction.

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