ON THE CAUSES OF SUDDEN DEATH IN PUERTO RICO

AN ANALYSIS OF 61 CASES STUDIED POSTMORTEM *

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Although the general causes of morbidity and mortality in Puerto Rico and other subtropical regions are quite similar to those in temperate climates, there are differences in the relative incidence of various diseases, in the evolution of some of these, and in the occurrence of others, that are not usually found in more northerly latitudes. One might therefore expect to encounter interesting differences in the relative incidence of the conditions that may lead to a sudden termination of life.

By sudden death we understand the abrupt ending of life in individuals who have been previously well to all external appearances, or in those who have been ill, but in whom death occurs quite unexpectedly. No case is included in which the fatal issue took place later than four hours after being smitten, nor have we attempted to analyze cases of accident, suicide or homicide.

General incidence: Seven hundred consecutive autopsies have been studied. Among these, 61 cases of sudden death as above defined have been found—a general incidence of 8.7 per cent. The high incidence is due to inclusion of autopsies upon medicolegal cases that are part of the routine activity of the Department of Pathology of this School.

Age, sex and race: Table I shows the grouping of cases by age in decades and according to sex and race. Although the total number is perhaps too small for analysis by statistical methods, it is worthy of comment that the greatest number falls in the 5th decade (for both males and females), followed closely by the 4th. The relatively large incidence of sudden deaths in the second and third decades of life is also to be noted, but it must be pointed out, however, that in the total series of 700 autopsies the majority of individuals belonged to the first three decades of life.

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The ratio between the various races in the group of sudden deaths is approximately 5 whites to 1 negro to 2 mulattoes, and that for the total 700 autopsies is 3:1:2, which perhaps points to a slightly greater liability of the whites to sudden death.

TABLE I

INCIDENCE ACCORDING TO AGE, SEX AND RACE

Ages	Total number of cases	Sex		Race			
		Male	Female	White	Negro	Mulatto	Unknown
0–10	9	3	6	7	0	0	2
11–20	6	3	3	2	0	3	1
21–30	7	5	2	3	0	4	0
31–40	9	8	1	6	1	2	0
41–50	12	9	3	4	4	3	1
51–60	7	5	2	4	1	2	0
61–70	1	1	0	1	0	0	0
71–80	0	0	0	0	0	0	0
81–90	1	0	1	0	0	0	1
Unknown	9	7	2	5	0	3	1
All ages	61	41	20	32	6	17	6

Seasonal incidence: This is shown in Table II and discloses no notable features, as might perhaps be expected from the general equability of the climate throughout the year.

TABLE II

SEASONAL INCIDENCE

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Number of cases	6	6	7	10	4	3	6	5	4	3	4	3

Grouping by yearly incidence to show possible trends is not attempted since the period of observation includes only eight years, during which the autopsy service had not yet become stabilized.

Causes of sudden death: The following is a list of the conditions found to be responsible for the sudden death of the cases under discussion, so far as could be determined at

autopsy, with the number of instances grouped under each heading.

Vascular syphilis		16
Arteriosclerosis		9
Acute infections:		7
Diphtheria	1	
Influenza	1	
Acute rheumatic fever	1	
Lobular pneumonia	1	
Septicemia	1	
Peritonitis	1	
Acute interstitial myocarditis	1	
Embolism or thrombosis of pulmonary arteries		6
Tumor of the brain		3
Massive hemorrhage (not including ruptured aneurism)		3
Asphyxia		2
Oil of chenopodium poisoning		2
Acute Ethyl alcohol intoxication		1
Acute suppurative mesaortitis		1
Catheterization of urinary bladder		1
Operative shock		1
Severe anemia		1
Status thymico-lymphaticus		1
Chronic glomerulo-nephritis		1
Cause unknown		6
		61

Vascular Syphilis (16)

Among 16 cases were 13 males and 3 females; 9 whites, 2 negroes and 5 mulattoes. The grouping by decades was as follows: 1 in the third decade, 4 in the fourth, 4 in the fifth, 2 in the sixth, and 5 of unknown age. The youngest was 30, and the oldest 60 years.

There were 9 instances of aneurism of the aorta:

Ascending aorta	2
Arch	3
Ascending and arch	2
Abdominal aorta	1
Thoracic aorta	1

In eight of these, death was caused by the sudden rupture of the aneurism: two into the pericardial sac; one into the left primary bronchus; one into the mediastinal tissues; one into the left pleural cavity; two into the œsophagus, and one into the retroperitoneal tissues. In the ninth case death was

apparently induced by aortic stenosis and insufficiency with moderately marked cardiac hypertrophy.

Stenosis of the origin of the coronary arteries due to syphilis was noted four times, twice involving both main branches, and twice the right coronary arteries. In two of these cases the arteries took a high origin, 2 to 3 mm. above the free border of the corresponding aortic valve segment. Death was apparently the result of the bilateral stenosis in two of the cases, one of which had a history of repeated severe attacks of *angina pectoris* during the last two weeks of life; in another case with unilateral involvement it was probably due to advanced aortic stenosis and insufficiency; and in the fourth instance the actual cause of death was obscure.

Insufficiency of the aortic valve opening was found in five cases, once together with distinct stenosis. In four, the valves were thickened and more or less distorted, while in one, the insufficiency was secondary to dilatation of the ascending aorta, which was the seat of an aneurism. Death was supposedly the result of the valvular changes and consequent myocardial hypertrophy and insufficiency in three of these cases.

One case of syphilitic aortitis without aneurism and valvular alterations presented changes in the myocardium suggestive of syphilitic myocarditis, and an area of not very recent infarction in the wall of the left ventricle. Thrombosis of the coronary arteries could not be demonstrated. Death was probably the result of myocardial insufficiency dependent on the infarction. Another case of aortitis had a moderately large heart showing patches of fibrosis and round cell infiltration; the sudden death was not clearly explained.

To sum up, the cause of death could be ascribed to aneurismal rupture in eight cases; to stenosis of the origin of the coronary arteries in two; to aortic insufficiency in three; to infarction of the myocardium in one; and to syphilis of the aorta in two.

Although the number of sudden deaths under discussion is not large enough to warrant drawing final conclusions, it is interesting to note that in 16 of them death was the result of syphilis—an incidence of 26.2 per cent—while arteriosclerosis was the underlying pathologic factor in only 9 instances or 14.7 per cent.

The view has been long held that syphilis is very preva-

lent in Puerto Rico, Vedder [1] having reported in 1915 an incidence of 55.93 per cent among soldiers in a Puerto Rican regiment. The group could not, of course, be held representative of the general population, and subsequent estimates seem nearer the actual truth. Thus, Serra [2] obtained 12.65 per cent of positive results to the blood Wassermann test performed on 6,074 inhabitants of the southern part of the Island, and Costa-Mandry [3], after an extensive, more general survey and a careful analysis of the available data, arrives at the conclusion that 5 per cent represents "about as accurate a figure as can be determined at present".

In 700 autopsies, anatomic evidence of syphilis was found in only 8.5 per cent. The relatively high incidence of 26.2 per cent in the cases of sudden death is therefore not to be ascribed to a high incidence of syphilis amongst the general population.

Arteriosclerosis (9)

Six were male and 3 female; 2 white, 1 negro, 4 mulatto, and 2 of unspecified race. The ages varied from 40 to 70. There was 1 in the fourth decade, 4 in the fifth, 2 in the sixth and 1 in the seventh.

There were 3 cases of thrombosis of the coronary arteries: in one, of the anterior descending branch of the left coronary; in another, of the circumflex branch of this artery, and in a third, of both the beginning portion of the right coronary and the anterior descending branch of the left. In only one of these cases was infarction of the myocardium noted, but there was an infarct in another case, in the region of distribution of the anterior descending branch of the left coronary artery, in which however, obstruction by a thrombus could not be demonstrated, though there were advanced sclerotic changes with considerable narrowing of the lumen of this vessel.

Four cases showed cardiac hypertrophy and dilatation, the weight of this organ ranging from 510 to 600 grams, with varying degree—mostly advanced—of fibrotic changes in the myocardium. One of these cases had scarred kidneys with thickening of medium-sized renal vessels and arterioles. Another presented advanced renal changes with distinct arteriolar sclerosis. In a third case a congenital stenotic defect at the junction of the urinary bladder with the urethra had

led to marked hypertrophy and dilatation of the urinary bladder, bilateral hydro-ureter and hydronephrosis, and advanced hydronephrotic atrophy of the kidneys. The fourth case had extensive arterial and arteriolar sclerosis with advanced changes in the kidneys. It is thus seen that these four instances of cardiac hypertrophy and dilatation fall in the hypertonic or hypertensive group, in which sudden death is of frequent occurrence.

A single case is listed of intracranial hemorrhage due to arteriosclerosis. The hemorrhage took place into the *pons* and cerebral peduncles in a negress 43 years old.

Summary of arteriosclerotic cases:

Thrombosis of coronary arteries	3
With myocardial infarction	1
Fibrosis of myocardium and cardiac hypertrophy	4
Infarct of heart	1
Hemorrhage in *pons* and peduncles	1

The relatively minor part played by arteriosclerosis in the causation of sudden death in our series is a notable finding that stands out in contrast with the data given by others observers in more northerly climates. This finding must however be interpreted with caution, for our series includes a relatively high proportion of individuals of the first three decades of life, there being only twice as many cases over 30 years of age, as there are below. From experience gathered in performing autopsies in Puerto Rico and in the city of New York it is our general impression that fatal complications of arteriosclerosis such as coronary thrombosis are less frequent in this Island. Should this prove to be so, it would explain the relative predominance of syphilis as a cause of sudden death.

Sudden Unexplained Death in Acute Infections (7)

Diphtheria: A 6-year old female child was brought to the hospital on the eleventh day of her illness. A smear of the throat was negative for diphtheria, but 5,000 units of antitoxin were administered. On the 12th day a culture of *B. diphtheriæ* was obtained and 10,000 additional units of antitoxin were then given. On the 13th day after illness the pharynx was clean of exudate and the child was looking bright and comfortable, but early in the afternoon she sud-

denly died. At autopsy the heart was found slightly enlarged, with a distinctly dilated left ventricle; microscopically there was edema of the interstitial tissues of the myocardium. In the kidneys was a diffuse acute glomerulonephritis. Death was probably cardiac, but the renal changes may have played a part.

Influenza: A boy, 14 years of age, was bathing in the sea. On leaving the beach he walked approximately 200 yards, then suddenly threw up his arms and dropped dead.

The heart presented slight hypertrophy of the wall of the right ventricle. The lungs showed widespread edema, small foci of exudation of polymorphonuclear leukocytes and large mononuclear cells into groups of alveoli, and perhaps some peribronchial thickening. In at least one microscopic field "the picture suggested an organizing pneumonia such as is often associated with influenza". In the words of the pathologist who performed the autopsy: "The right-sided cardiac hypertrophy, the edema of the lungs and the several inflammatory foci in the lungs suggests that there may have been an influenza from which the patient had just recovered, and that some unusual exertion caused a collapse from cardiac decompensation".

Acute rheumatic fever: A Puertorican girl of 13 who had always been frail, but not definitely sick, had an attack of epistaxis four months before admission. One month later she had the grippe and sore throat. One and a half months after this, migrating polyarthritis had its onset accompanied by fever. She later developed pain in the precordium, subcutaneous nodules in the fingers and evidence of mild cardiac decompensation. Physical examination demonstrated cardiac involvement with mitral and aortic valve disease. Improvement was marked during the first two days in the hospital, but there was sudden collapse followed by death in less than one hour.

Rheumatic pancarditis with acute fibrinous pericarditis, subcutaneous nodules and passive congestion of organs was found at autopsy.

Lobular pneumonia: A female child, 2 years old, came to the hospital with a severe suppurative vulvovaginitis. *B. diphtheriæ* and gonococci could not be obtained from the secretions in smears or cultures. Although the temperature did not rise over 100.6 F., the pulse rate was 140 per minute,

and the respirations 40. The child did not appear gravely ill and yet death suddenly occurred on the third day after admission.

The autopsy demonstrated an extensive lobular pneumonia involving the right lower lobe. Cultures of the heart's blood remained sterile.

Septicemia: A 24-year old man, well nourished and well developed, complained one day of distress in the upper abdomen and constipation. Five days later he fell acutely ill with vomiting, pain in the chest and abdomen, and fever of 100 to 103° F. He was operated upon that day for appendicitis, but the appendix was found to be quite normal. The following midnight he suddenly collapsed and died. The blood count the morning of operation had shown 9,000 white blood cells and in the evening of that same day 17,000 leukocytes, 90 per cent of which were polymorphonuclears.

A postmortem examination showed the presence of multiple subserous hemorrhages, acute splenic tumor, fatty changes of the heart, liver and kidneys, and acute tonsillitis. From the tonsils, heart's blood and spleen, was isolated a non-hemolytic streptococcus.

Peritonitis: A man of 40 who had had chills and fever that reached to 39.5° C. since the end of March had hemorrhage *per-rectum* on April 18. He developed generalized abdominal pain and frequent vomiting on the 21st of April, and next day, while preparations were being undertaken for removal to a hospital, he suddenly collapsed and died.

Typhoidal ulcerations of the lower ileum and other evidences of the disease were demonstrated at autopsy, and a pure culture of *B. typhosus* was obtained from the gallbladder and small and large intestine. One of the ulcers in the ileum had perforated, leading to diffuse fibrinous peritonitis. The lesions suggest that the disease was in its third and fourth week.

Acute interstitial myocarditis: A middle-aged man entered a hospital with the complaint of occasional attacks of pain in the lower abdomen during the past 10 years. At the time of admission he had been going through one of these episodes of pain that had lasted 19 days. On physical examination, the hypogastrium was found to be very tender, and the urinary bladder extended above the *symphysis pubis*. The temperature, pulse and respiratory rate were normal.

While walking about the ward the patient had a fainting spell accompanied by convulsive movements of the body, and died within 2 or 3 minutes.

Autopsy disclosed an acute seminal vesiculitis and perivesiculitis with extension of the process to the peri-rectal tissues. The urinary bladder was enormously enlarged and contained about one liter of urine, but there was no cystitis. The renal pelvis on each side was moderately dilated. The heart was essentially normal on gross examination, not enlarged or dilated, and the myocardium appeared firm and dark red. Microscopically the essential finding was that of rather intense and extensive infiltration of the interstitial tissues of the myocardium with polymorphonuclear leukocytes and lesser numbers of large mononuclears, lymphoid cells and eosinophils. Small extravasations of erythrocytes were also found. The inflammatory process seemed very recent, for there were no changes in the myocardial fibers and no fibrous tissue reaction. Since the condition was not suspected at the time of the autopsy, no cultures were taken.

The myocarditis was most probably secondary to the pelvic infection.

Embolism or Thrombosis of Pulmonary Arteries (6)

The youngest of these individuals was 10, and the oldest 82. Five were female and one male. In one of these cases there had developed bilateral *otitis media,* thrombosis of cerebral sinuses with softening of a large portion of the brain, and thrombosis of the left cardiac ventricle and pulmonary arteries. Death was probably the result of pulmonary infarction. A second case showed thrombosis of the right ventricle with embolism of the pulmonary arteries and infarcts of the lungs in the course of typhoid fever. In a third case, a woman 82 years old, extensive lobular pneumonia of the right upper lobe and gangrene were found, with thrombosis of one of the larger branches of the pulmonary artery. In a fourth case, operation for large multiple myomas of the uterus resulted in thrombosis of pelvic veins and embolism of the main arterial trunks to the lungs, with infarction of the left upper lobe. A fifth case was an instance of rather severe hypochromic anemia of obscure origin, although apparently of the secondary type, developing

thrombosis of the axillary and brachial veins on the left side, from which emboli were given off to the pulmonary arteries and resulted in multiple pulmonary infarcts. The sixth case, a 53-year old man, died suddenly on the street while going to work. Autopsy disclosed a probable syphilitic aortitis and slight cardiac hypertrophy. The larger branches of the pulmonary arteries were occluded by recent thrombotic material. No origin for emboli could be demonstrated at autopsy, and no pathologic basis was found for the development of thrombi.

Summary of cases of thrombosis and embolism of pulmonary arteries:

Typhoid fever, thrombosis	2
Bronchopneumonia and gangrene, thrombosis	1
Post-operative thrombosis of pelvic veins, pulmonary embolism	1
Severe secondary anemia, thrombosis of brachial and axillary vein, embolism	1
Pulmonary thrombosis or embolism, unexplained	1

Tumor of the Brain (3)

One of these was the case of a 59-year old man who collapsed on the street and was dead before arrival at the hospital. Autopsy revealed the presence of a capillary hemangioma situated in the *pons* and measuring 6 mm. in maximum diameter; there had been no rupture of vessels. A second case was that of a boy 16 years of age with a hemangioma in the white matter of the right cerebral hemisphere and rupture into the lateral ventricle. The third instance of tumor of the brain was in a girl 10 years of age. There had been symptoms of cerebral tumor for approximately 1½ years. A large cystic cavity was found in the cerebellum and projecting into it, a globular pedunculated mass that proved to be a protoplasmic astrocytoma.

Massive Hemorrhage (3)

This group does not include cases of ruptured aneurism. There were two instances of sudden death from exsanguination following rupture of a blood vessel in the wall of tuberculous cavities; both in men, 27 and 40 years old, respectively. The third case was a man 50 years of age who died quite suddenly 21 hours after splenectomy for acute essential

thrombocytopenic purpura. Massive hemorrhage into the operative field and peritoneal cavity was found at post-mortem examination.

Asphyxia (2)

One of these cases was a boy 10 years of age in whose pharynx were found three pieces of undigested meat that pushed down the epiglottis, thus producing complete obstruction of the entrance to the larynx; death followed within 5 minutes after choking. The second case was that of a man 31 years old who had had a large sublingual cyst for 7 years and who died quite suddenly during the induction of ether anesthesia for operative removal. The cyst was so large as to completely fill the buccal cavity, and death was ascribed at autopsy to asphyxia.

Oil of Chenopodium Poisoning (2)

These cases are so interesting as to merit detailed reports.

An eight-year old girl who gave no history of previous illnesses and who apparently was quite healthy at the time, since the physical examination was negative, was started on treatment for uncinariasis. She was given 8 minims of oil of chenopodium in two separate capsules, together with the "usual dose" (*sic*) of Epsom salts. A few minutes later she fainted, spit out one empty capsule and was dead in 15 minutes. The heart, one lung, liver, spleen, kidneys and stomach were removed for examination, but it is unfortunate that the brain was not included. The only significant findings were rather intense congestion of the lung with hemorrhage into groups of alveoli and edema.

The second case is that of a man, 18 years of age, well nourished and well developed who received two separate doses of oil of chenopodium of 60 minims each. The interval between doses is not stated, but they must have been administered on the same morning, for it is mentioned that following ingestion of the second capsule at eight o'clock, the patient went into a state of coma, had convulsions and died 2½ hours later. At autopsy there were found extensive burns of the second degree throughout the chest and abdomen, of which there is no mention in the history, and foci of lobular pneumonia in both lungs. Microscopically there was widespread hemorrhagic edema of the lungs and groups

of alveoli were filled with a recent exudate in which were prominent dense clumps of large bacteria. In an occasional air sac were groups of vacuoles. Stains for fat demonstrated the presence of moderately abundant, finely divided droplets within large phagocytic cells in the alveoli and interstitial tissues. Only one fair-sized drop was found. The brain was said to be edematous grossly, but was not studied microscopically.

Although it is difficult to be certain of the part played by the ingestion of oil of chenopodium in these two cases, the presumption is very strong that in both instances death was the result of its administration. It is well known that this drug may have a toxic effect, especially in children. The first case received 8 minims of the oil, a dose that cannot be considered excessive for an eight-year old child, and death may have been the result of idiosyncrasy to the drug.

Biesin [4] has reviewed the literature on the subject of poisoning with oil of chenopdium and believes that idiosyncrasy may explain some of the fatalities. It must, however, be remembered that different stocks of the oil may vary markedly in toxicity [5]. This ought to be considered before deciding that a given death is due to idiosyncrasy, but is a point of difficult practical determination.

To the second case were given 120 minims (8 cc.) of the oil in two doses. If only one dose (4 cc.) had been administered on the morning of death, this alone would have been excessive, but the available information seems to indicate that 8 cc. were actually taken. Stitt [6] considers 15 cc. as the maximum dose usually to be given, since fatalities are on record after amounts of 2 to 3 cc. The case under discussion appears to have received three to five times the recommended dose.

Autopsies on fatal cases have revealed no characteristic organic changes, edema and congestion of the lungs perhaps being the most frequent finding. Our second case presented a rather extensive lobular pneumonia that raised doubts in the pathologist's mind as to whether it could have developed or not after ingestion of the oil. Examination of sections of the lungs suggested that it might have originated by aspiration, and staining of frozen sections with scarlet red demonstrated finely-divided fat within phagocytic cells. Whether some of the oil found its way into the lungs, thus provoking

an inflammatory reaction is not possible to decide. At any rate, the pneumonia appears not to have been extensive enough to account for the mode of death, which most probably was the result of an overdose of oil of chenopodium.

Acute Ethyl Alcohol Intoxication (1)

A negro, aged 47, used to drink great quantities of alcohol daily. One morning he partook, immediately upon arising, of a concoction prepared by adding rum to the milk pressed from coconut meat. Soon after this he developed pain in the face, for which he took two tablets of aspirin (presumably 0.5 gm. each) followed by a little coffee. Shortly afterwards there was pain in the left side of the chest (precordial region (?)), convulsions and death within 10 minutes.

The autopsy was performed 23 hours after death, by which time the body presented far-advanced postmortem changes. Both cardiac ventricles were found to be dilated, and there was acute congestion of the viscera, edema of the lungs and fatty liver. The arteries throughout the body were remarkably free of atheromatous changes.

Chemical examination of the stomach contents and the brain disclosed the presence of ethyl alcohol, in the latter organ in a concentration of 0.291 per cent, which indicates distinct intoxication. Although this concentration is only moderately high, it must be noted that death occurred at four in the afternoon, and that the only dose of alcohol that is mentioned as having been taken on that day was ingested immediately upon arising in the morning. The concentration of alcohol in the blood and viscera must have been distinctly higher earlier in the day. It is unfortunate that the toxicologic investigation did not include a search for other poisons.

Death was ascribed to dilatation of the heart.

Acute Suppurative Mesaortitis (1)

This is the interesting and obscure case of an unidentified white man of approximately 35 years of age who was suddenly seized while on the street by severe pain, apparently in the chest or upper abdomen. He stretched out on the sidewalk and died within very few minutes. The organs were quite negative grossly, save for pulmonary congestion

and edema, mild atherosclerosis of the aorta and bilateral hydrocele. Microscopically the more notable changes were found in the aorta, in its thoracic and abdominal portions (three sections taken at random). There were extensive areas of necrosis of the *tunica media* with intense infiltration by polymorphonuclear leukocytes and lymphocytes. The *vasa vasorum* did not penetrate to the deeper portions of the media, and were not surrounded by round cells. In the myocardium was an occasional small area of fibrosis, or of edema and infiltration by lymphocytes and large mononuclear cells. Bacterial stains failed to reveal any microorganisms, and the etiology of the condition has remained a mystery.

Catheterization of Urinary Bladder (1)

A 50-year old man complaining of pain in the lower abdomen was found on physical examination to have a markedly distended urinary bladder. He was found dead in bed approximately 5 minutes after the bladder had been emptied by catheterization. At autopsy, a large abscess was found in the anterior half of the prostate extending to the perineal tissues in front of this gland. Death apparently resulted from shock due to sudden emptying of the over-distended bladder.

Operative Shock (1)

A man, 27 years of age, had tuberculosis of the lungs with effusion into the right pleural cavity. The exudate soon became purulent and it was decided to drain the cavity. A small amount of cocaine solution was injected into the tissues overlying the sixth intercostal space in the axillary region, and an incision made. Before the pleura had been reached the patient complained of dyspnea, became cyanotic and died. Autopsy left the actual mechanism of death unexplained.

Severe Anemia (1)

Determination of the type of anemia was not possible because of the absence of clinical data and hematologic studies. The case is that of a woman 20 years of age, who was pregnant and who was said to have had malaria 6 months prior to death, but to have refused treatment out of fear that her pregnancy would come to a premature termination. She went through a normal, spontaneous labor at term but died

very suddenly a few hours later. Bleeding appears not to have been profuse. At post-mortem examination the tissues were very pale and the bone-marrow of the middle third of the femur was found to be actively hyperplastic. The activity was mainly megaloblastic. There was no hemosiderosis of organs and no atrophy of the gastric mucosa. The heart was not fatty. This may have been an instance of severe anemia of pregnancy, of the pernicious type, with death resulting from the stress and strain of childbirth.

Status Thymico-Lymphaticus (1)

This is another instance of the difficulties so frequently encountered at the autopsy table in the determination of the cause of sudden death.

A well-developed and well-nourished man, 24 years of age, underwent operation for inguinal hernia. He had offered a history of frequent attacks of epilepsy. Operation was begun under local anesthesia and continued with ether. Death suddenly occurred towards the end of the surgical intervention. Schistosome pseudo-tubercles were found in several of the organs, and there was slight splenomegaly. The thymus was very large and there was hyperplasia of all lymphoid tissues. Death was ascribed to shock in an individual with the thymico-lymphatic constitution.

Chronic Glomerulo-Nephritis (1)

A man, 18 years of age, was admitted to the hospital because of fracture of the pelvis and left radius, and was apparently doing well until 12 days after admission when he suddenly complained of dyspnea and pain in the precordial region. The temperature rapidly dropped, the pulse rate became greatly accelerated and death occurred approximately 4 hours later with edema of the lungs. The autopsy disclosed diffuse, chronic glomerulonephritis, with slight cardiac hypertrophy and dilatation, slight subcutaneous edema of legs, and hydrothorax. This mode of termination of nephritis is not uncommon.

Sudden Death of Unknown Cause (6)

There were 6 cases that at postmortem examination failed to reveal pathological changes that would offer an adequate

basis for the sudden termination of life—an incidence of 9.8 per cent.

Case 1.—A man, about 30 years of age, was sleeping in a hammock after the midday meal. He is said to have cried out with intense pain and to have died very suddenly.

There were diffuse recent areas of hemorrhage into the pancreatic parenchyma, especially throughout the tail, part of the body and in the head about the termination of the common bile duct, which traversed the pancreas for a distance of 3 cm. Microscopically, no alterations were found in the pancreatic tissue or ducts, except for recent capillary hemorrhages. The blood vessels were normal. The hemorrhagic extravasations were not considered extensive enough to have caused sudden death and classification of the case as pancreatic apoplexy. The brain was not examined.

Case 2.—An infant, 2 months of age, is said to have been well until a certain day when it began to cry, refused nourishment and suddenly died two hours after the first manifestations of illness.

The child was the tenth-born of a poor family and seemed premature. There was congestion of viscera, areas of hemorrhage beneath the visceral pleura and slight fatty changes of the liver. The brain was not examined.

Case 3.—A fifty-four-day old infant was seen in the hospital one week before death with diarrhea, vomiting, coughing and pain on urination due to phimosis. The foreskin was stretched. On examination one week later the diarrhea and cough had ceased. While again stretching the prepuce for relief of the phimosis the child turned blue two or three times during fits of crying. The child was taken home apparently well, but did not take its nourishment, and 7 hours after the visit to the hospital dispensary, suddenly and quietly died.

The heart was found enlarged to 50 gm., mainly because of hypertrophy and dilatation of the right ventricle. The *foramen ovale* was patent and admitted the tip of the examiner's little finger. The viscera were congested. Although death was most probably cardiac, the anatomical finding of patent *foramen ovale* does not seem adequate to explain the right-sided cadiac hypertrophy and the mode of death.

Case 4.—A newborn female infant was delivered by forceps and showed difficulty on breathing during the first hour, and a low pulse of 45 per minute. Later the pulse and respirations were normal until 33 hours after birth when death came on suddenly without warning and unpreceded by cyanosis or convulsions.

Autopsy showed congestion of viscera with edema and interstitial emphysema of the lungs. There was no adequate explanation for the sudden demise.

Case 5.—A 60-year old man with chronic ulcer of the pylorus underwent operation for gastroenterostomy and did fairly well for about 2 days, when he suddenly jumped up in bed, had muscular twitching in the face and extremities and died in the course of a few minutes.

A slight fibrinous exudate was found on the peritoneum immediately about the gastroenterostomy wound, and there was hypertrophy of the prostate, distention of the bladder by urine, and acute hemorrhagic cystitis and pyelitis. Moderately advanced arteriosclerosis of the aorta was also noted but there were no changes in the coronary arteries or kidneys. The heart was normal in size but its right side seemed somewhat dilated. The brain was not examined.

Case 6.—A negress, 41 years of age, suffered from habitual constipation and frequently had pain in the lower abdomen. The day before death she awoke feeling ill, and took no nourishment. At 10 o'clock in the morning she complained of moderate pain in the hypogastrium and drowsiness. The following day at eight or nine in the morning she suddenly became worse and died in the course of a few minutes.

At autopsy, almost complete stenosis of the rectum was found 3 cm. above the anus, with ulceration of the mucosa from just above the stricture to the lower end of the rectum. Beginning at the cecum, there was enormous dilatation of the colon. The wall of the rectum in the region of stenosis had been replaced by fibrous connective tissue containing perivascular collections of round cells. The condition was thought to be syphilitic, but there were no evidences of this disease in other organs, and the possibility of its having been due to lymphogranuloma inguinale should be considered. The mechanism of death remains obscure. The brain was not examined.

SUMMARY

Sixty-one cases of sudden death in Puerto Ricans are analyzed from the point of view of the autopsy findings. Forty-one per cent of these were due to syphilis or arteriosclerosis, the former predominating as a cause of sudden death. This is contrary to what has been reported elsewhere, and possible explanations for this discrepancy are given. Brief abstracts are presented of the remaining cases, illustrating the wide diversity of conditions responsible for sudden death. Two cases of death following administration of oil of chenopodium are reported in detail.

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