

REFLEXES ORIGINATING IN THE COMMON DUCT GIVING RISE TO PAIN SIMULATING ANGINA PECTORIS*

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THE OCCURRENCE of gallstone disease with cardiac syndromes is now so well recognized that it would seem that further evidence on this relationship is hardly necessary. However, the frequency with which surgeons still see patients who have been classified as having serious cardiac disease, and who are simultaneously suffering from gallstone disease, but are denied surgical relief for the latter for fear of cardiac death, prompts us to make this report.

In 1909, Robert Babcock,¹ of Chicago, called attention to the frequent association of gallstone disease with heart disease. It is interesting to quote from his classic paper: "There is, however, another point of interest in this matter of the symptomatology of gallbladder disease, namely, the occurrence of disorders in the action of the heart, from arrhythmia and precordial oppression, without dyspnea, to demonstrable dilatation and incompetence, dating usually from some attack of biliary colic or acute cholecystitis, and thenceforth maintained by recurrences of the acute disturbance." He then concludes, after reporting 13 patients with this syndrome: "Experience has convinced me that the opening and draining of the gallbladder are attended with less danger when properly performed, even though myocardial incompetence be present, than is the doctrine of noninterference. Did time permit, cases could be cited which prove the peril to the patient from acute cholecystitis and fatal dilatation of the heart in cases with a history and symptoms of chronic cholecystitis, not to mention that from hepatic colic."

In 1935, Fitz-Hugh and Wolferth² pointed out that a "patient with gallstone disease may present such a convincing array of cardiac symptoms that the internist may wrongly condemn the sufferer to a 'life sentence' of cardiac servitude. In addition to this problem of mimicry . . . there is a growing conviction among internists and surgeons alike that chronic disease of the gallbladder may either initiate or aggravate actual heart disease—especially so-called coronary heart disease."

Fitz-Hugh and Wolferth found that in numerous instances flat or inverted T-waves in the electrocardiogram prior to operation became erect and normal subsequent to adequate biliary tract surgery. They concluded that "in the present stage of our knowledge it would be idle to speculate as to the nature of myocardial disturbances responsible for the remarkable electrocardiographic

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changes observed. It seems clear from the evidence, however, that not only may gallbladder disease injure the myocardium but that the process, at least to a certain extent, is reversible."

We have observed patients who have been decompensated for months and who had chronic auricular fibrillation restored to compensation and a regular cardiac rhythm with no change in the medical program following the simple removal of gallstones by cholecystostomy.

CASE REPORTS

Case 1.—Hosp. No. 19622: P. R., white, female, age 64, was admitted to the Hospital of the University of Pennsylvania, August 6, 1930, with a history of heart trouble over a period of eight years. She was short of breath, suffered from recurrent palpitation and right upper quadrant pain. For seven months she had been confined to bed. At varying periods she had had attacks of severe pain in the right upper abdomen associated with extreme nausea. She had taken digitalis for a number of years. She was markedly dyspneic and cyanotic. Examination of the heart showed this to be totally irregular. The heart was enlarged. The lungs were filled with moist râles at both bases. W. B. C. 9,200. There was ankle edema. There could be no doubt but that she had cardiac decompensation. Whether the right upper quadrant pain was due to gallstone colic or to distention of the liver was not immediately clear. A roentgenogram of the abdomen disclosed a large gallstone.

She was operated on August 9, 1930, three days after admission. The gallbladder was drained and the stone removed. On September 5, 1930, she was discharged from the hospital in good condition, and with complete cardiac compensation.

This patient was extremely ill on admission to the hospital. Two of my colleagues, one a surgeon and one a cardiologist, considered her too sick for operation when first seen. Three days later, with her general state unchanged, she was operated upon. The operation did not upset her; in fact, she began to improve markedly immediately thereafter.

When seen three months later she was free of dyspnea and cyanosis. Cardiac rhythm was normal and she was attending to certain of her household duties.

We have seen patients with long-standing serious cardiac disease made hopeless invalids by the aggravation of their cardiac symptoms and the additional symptoms imposed by a gallstone-bearing gallbladder or the presence of stones in the common duct.

Case 2.—Hosp. No. 42806: F. B., white, female, age 53, was admitted to the Hospital of the University of Pennsylvania, August 30, 1939. She was told that she had a "leaky heart" after peritonitis at age 25. She claimed that she had no very distressing symptoms until one and a half years ago when she had an attack of palpitation associated with weakness which lasted several hours. At the same time she began to have attacks of "indigestion" associated with abdominal cramps and diarrhea, and pain in the upper abdomen radiating around to the right side of the back. Some of the attacks had been severe enough to require morphine, although minor attacks occurred every few days. Each of these attacks was followed by increased palpitation and weakness. There was no doubt in her mind that these symptoms were augmented, if they were not initiated, by the attacks of abdominal pain. Her condition became such

that her physician placed her on a program of restricted activity. She had never been decompensated.

She was found to have an old "rheumatic" mitral valve disease (stenosis and insufficiency) with some myocardial degeneration; extrasystolic arrhythmia, with episodes of auricular fibrillation. In addition, she was found to have gallstones.

A cholecystectomy was performed September 6, 1939. Following cholecystectomy she had three attacks of paroxysmal auricular fibrillation, after which these disappeared.

She still has her heart disease but 15 months after operation she remains greatly improved, is able to resume many of her previous activities, and is not fibrillating. Although she still tires easily the attacks of "palpitation" occur only at rare intervals.

There have been indications in some of these patients that the symptoms of existing coronary disease can be made worse by superimposed gallstone disease and what is more surprising is that gallstone disease may, at times, initiate a train of events with symptoms which in many particulars resemble true angina pectoris. We have seen a number of the patients who for variable periods of time have been treated as cases of true angina pectoris by men considered competent in the field of cardiology and who, following the removal of a gallstone-bearing gallbladder or stones from the common duct, or both, have had complete freedom from their supposed anginal attacks.

Recently, Layne and Bergh³ reported that sudden distention of the common duct in man caused reflex spasm at the lower end of the common bile duct, which they designated as spasm of the sphincter of Oddi. They found that the spasm thus produced resisted levels of pressure within the common duct as high as 400 to 600 Mm. of water, and in some instances persisted for as long as four minutes.

The apparatus used in these experiments consisted of a large glass flask, or reservoir, of about 75 cc. capacity, connected by rubber tubing to the T-tube in the common duct of the patient. A glass Murphy drip bulb is used to demonstrate the flow of fluid within the system. The pressure developed within the common bile duct is registered by a glass manometer.

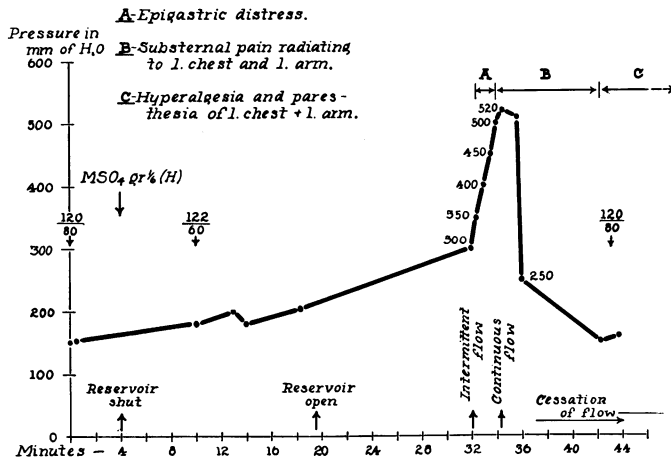
We wish to report the records of two patients in whom gallstone disease was associated with the symptoms of angina pectoris.

Case 3.—Hosp. No. 43748: S. L., white, female, age 48, was admitted to the Hospital of the University of Pennsylvania for the second time, February 23, 1940, with a history of attacks of severe precordial pain, occurring mainly at night but occasionally after meals, and accompanied by palpitation and dyspnea. The precordial pain radiated through to the back and down the ulnar aspect of the left arm to the finger tips. Following these attacks the patient noticed residual soreness of the precordium and paresthesias of the left forearm and fingers of the left hand. The pain was sometimes relieved by large doses of nitroglycerin.

The attacks began about five years previously, six months after a cholecystectomy performed elsewhere. There was no history of jaundice, acholic stools, nausea or vomiting. Until the last attack of pain a few days before entering this hospital, she had had no attacks of abdominal pain, all previous pain having been precordial in location. In spite of all previous therapeutic efforts, the attacks of pain had become more severe and more frequent. A diagnosis of angina pectoris had been made in another institution,

and a left stellate ganglionectomy had been performed. No relief was afforded by this procedure; in fact, the patient became much worse. Frequent attacks of pain were now brought on by the mildest exertion, even by eating. Many of the attacks came on at night while the patient was sleeping. She had lost 44 pounds in weight and had become practically bed-fast.

In December, 1939, she was first admitted to the Hospital of the University of Pennsylvania. At this time ballistocardiographic studies were made by Dr. Isaac Starr, which showed an abnormally low cardiac output, thought to be indicative of myocardial damage. Alcohol injection of the second, third, fourth and fifth thoracic sympathetic ganglia on the left side was done at this time. The patient was discharged and re-admitted February 23, 1940. During the interim she had become steadily worse. A few days before readmission she had experienced her first attack of definite abdominal



GRAPH I.

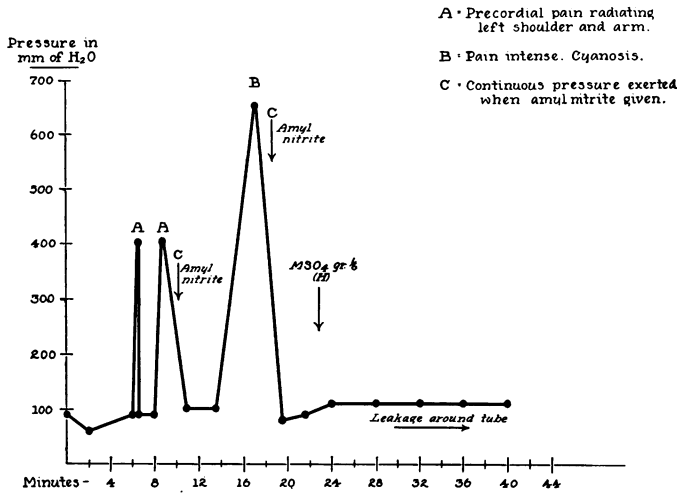
pain. This pain had been located high in the epigastrium and right upper quadrant. However, at this admission, it was thought that her electrocardiogram for the first time showed evidences of coronary artery disease and localized myocardial damage.

In view of the lack of results from previous therapy, and because of definite suggestion of a biliary tract origin for the patient's complaints, a celiotomy for exploration of the common bile duct was performed, March 22, 1940. A thick, kinked common duct was found, plastered with adhesions, and containing some "sand" but no stones. The duct was freed of adhesions, thoroughly irrigated and a T-tube left in place. Shortly after operation the patient declared that she was free of her former attacks of pain. She found that she could eat liberally without fear of discomfort. She was soon out of bed, and for the first time in five years, was able to walk about freely without recurrence of pain. Ballistocardiograms made at this time showed a normal cardiac output.

On the eighth postoperative day studies of common duct resistance were made (Graph I). At the first severe distention of the common duct the patient complained bitterly of precordial pain, radiating down the ulnar aspect of the left arm, entirely similar to her previous attacks. She was very upset and had to be reassured that these pains were entirely a product of the procedures at hand, and not a recurrence of her old trouble. Distention of the common duct was repeated twice more on the same day, with exactly similar results. For several hours after the termination of these

studies, the patient complained of residual soreness in the precordium and of numbness and paresthesias of the left arm and hand. Four days later the experiments were repeated with similar results. At this time continuous electrocardiographic and ballistocardiographic tracings were made by Doctor Starr. Distention of the common duct was performed three times, and in each instance an anginoid attack was precipitated whenever the common duct pressure was raised to levels of 450 and 500 Mm. of water. The severe precordial pain subsided promptly upon release of the high ductal pressure, leaving residual precordial soreness, and paresthesias of the left arm and fingers of the left hand. The electrocardiographic and ballistocardiographic tracings showed nothing significant except for a slightly diminished cardiac output during the periods of severe distention.

The patient was shortly afterward discharged, symptom-free, and has remained so to date, despite removal of the T-tube from the common duct.



GRAPH 2.

Another patient in this series also gave a history of precordial anginoid pains suggesting coronary artery disease, prior to operation.

Case 4.—Hosp. No. 10770: K. T., white, female, age 45, was admitted to the Hospital of the University of Pennsylvania for the third time, December 9, 1940. She had previously had an appendicectomy and a hemorrhoidectomy, with uneventful recoveries. Her blood pressure readings had never exceeded normal figures. Since 1933, seven years before admission, she had experienced recurrent attacks of pain in the left side of the chest under the left breast with radiation to the left shoulder, produced by physical exertion or mental strain. She also had shortness of breath on exertion and swelling of the ankles. The attacks of this pain soon recurred so frequently that she could not perform her household duties and she became a semi-invalid. She was seen in the Robinette Foundation and a diagnosis of angina pectoris was made, on the basis of arteriosclerotic heart disease. In September, 1940, she first experienced an attack of intense pain in the right upper abdominal quadrant. The attack was accompanied by nausea and slight jaundice. Subsequently, she was studied in the gastro-intestinal department and a diagnosis of cholelithiasis was made. She had several more similar episodes of abdominal pain.

On December 13, 1940, cholecystectomy and choledochostomy were performed. Gallstones were found in the gallbladder, but exploration of the common duct revealed none. Following operation the patient was able to sleep on her left side for the first time in several years. She had no further attacks of pain, and when ambulatory was entirely comfortable and experienced absolutely no pain.

A pressure study of the common duct, similar to the one described above, was carried out on this patient (Graph 2). When the pressure was raised to a level of 400 Mm. of water pressure the preoperative anginal type of pain occurred. The pain ceased immediately upon reduction of the pressure. When the pressure was maintained at a high level, it was reduced gradually upon administration of amyl nitrite. It is interesting to note that the original anginal attacks were partially relieved by this drug. The ballistocardiographic tracing showed no abnormality before operation, after operation or simultaneously with the rise in pressure. Negative results were obtained with the electrocardiograph.

A cholangiogram was made through the T-tube and the films showed a narrowing of the lower end of the common duct. It is quite possible that an associated pancreatitis caused the slight jaundice. Four weeks after discharge the patient returned for another cholangiogram, and the duct was found to have become slightly larger. Follow-up examination, nine months later, revealed that this patient was completely relieved of all pain.

Bellet and Meade,⁴ in our laboratory, have attempted to produce significant changes in the electrocardiogram of the dog by distention of the gallbladder or common duct. They obtained no major changes in the electrocardiogram unless prior to distention of the biliary tract some minor abnormality had been produced in the coronary blood flow. When even a small coronary vessel had previously been ligated, abnormalities in rhythm and conduction were obtained.

The subject of viscerocardiac reflexes has been well summed up from the physiologic aspect by Scott and Ivy.⁵ They conclude that: (1) Changes in cardiac rate, rhythm, and output can be caused by distention of the common bile duct in dogs; (2) such changes are inconstant, variable, and unreliable; (3) success or failure in the production of such changes by common duct distention depends on the presence or absence of functional or organic cardiovascular abnormality at the time the distention is carried out.

Barker, Wilson and Coller,⁶ and others, have reported cases of abdominal disease simulating coronary disease. In three of their four cases, the electrocardiogram was normal. In the fourth, it showed definite evidence of coronary artery disease. All were cases of cholelithiasis and cholecystitis; and all were relieved of their symptoms by operation.

Recently Gilbert, and his associates,^{7, 8} have published important contributions in this field. They have shown that there is a decrease in coronary blood flow upon distention of the gallbladder, or distention or irritation of its ducts. Gilbert has called attention to the fact that both clinical and experimental evidence indicates that stimuli originating in the gallbladder may cause a decrease in the coronary blood flow which results in a disproportion between blood supply and blood needs similar to that which occurs when intrinsic anatomic changes are present in the vessel walls. In the one instance pain

is the result of spasm induced by extrinsic autonomic stimuli, in the other the disproportion becomes evident when additional demands are made upon the restricted supply of blood in the coronary vessels. The degree to which intrinsic and extrinsic factors are involved in bringing about a restriction in coronary blood flow without doubt varies greatly in different patients and accounts for the variability of the preoperative and postoperative symptoms. While the intrinsic factors may be irreversible, the extrinsic factors are reversible provided their cause can be eradicated.

Distention of the common bile duct in the presence of muscular irritability at the lower end of the duct will cause reflex spasm in this region and physiologic blockage of the duct. It is important to the investigator to realize that after the administration of morphine sulphate, gradual distention of the duct such as obtains during experimental determinations of sphincter resistance or perfusion pressure also causes reflex spasm nearly as marked as that produced by rapid distention under the same conditions. For this reason, values for perfusion pressure obtained after the administration of morphine sulphate necessarily have a wide range, from the levels of pressure at which definite flow is first noted, to the high levels of pressure needed completely to overcome the vicious cycle of reflex distention-spasm. After morphine sulphate, then, even small increments of common duct pressure will promptly produce reflex spasm, which in turn raises the perfusion pressure level necessary to overcome resistance to flow in the common duct. To overcome resistance at this new level, additional increments of pressure are necessary, but these, by their distending effects, produce still more spasm and increase the perfusion pressure value still more. Thus a staircase phenomenon of increasing perfusion pressure values is produced before peripheral ductal resistance is completely overcome at a very high level of pressure.

The observations of Best and Hicken,⁹ Doubilet and Colp,¹⁰ and McGowan, and his associates,¹¹ demonstrate that degrees of irritability in the duodeno-choledochal region sufficient to cause biliary tract pain are often encountered in certain types of patients. Layne and Bergh have reported no cases in which this irritability was of sufficient magnitude that mere sudden distention of the common duct in these patients created severe reflex spasm, and a high degree of mechanical obstruction of the common duct. In the present studies, comparable degrees of spasm have been produced by sudden distention only after the administration of morphine sulphate.

SUMMARY

We believe, however, that these are the first reported patients in which anginal attacks have been consistently reproduced experimentally in man, by distention of the common duct.

It can now be safely assumed that gallstone disease or disease of the common duct may aggravate the symptoms of preexisting heart disease. Reflexes arising in the extrahepatic bile passages may at times bring about

a restriction in coronary blood flow which produces the symptoms of angina pectoris. When the extrinsic factors giving rise to these reflexes are removed, the anginal symptoms disappear. Similarly such reflexes may further decrease the coronary blood flow brought about by intrinsic changes in the coronary vessels. While adequate surgery does not completely relieve the patient of his cardiac symptoms, some measure of relief is nearly invariably obtained.

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DISCUSSION.—DR. CHARLES G. MIXTER (Boston, Mass.): Doctor Ravdin has brought clearly to our attention a problem that is always difficult—has the patient biliary tract disease, coronary disease, or has he both? Furthermore, he has emphasized the part that biliary tract disease may play in the aggravation of the concomitant heart disease. Finally, he has been able to reproduce in patients in whom the common duct pathology has been removed, the anginal symptoms by distention of the common duct.

Left-sided pain in biliary tract disease is usually explained by pancreatitis, or an extension of the pericholecystic disease to the left side. Rarely, pain may occur on the left side without extension of the inflammatory process. On embryologic grounds, the common duct must be assumed to have a bilateral innervation. This would explain the occurrence of left-sided pain.

Recently, Doctors Fine and Starr, of our clinic, have reported two cases of crossed pain in biliary tract disease. The first patient was a female, age 45, with an eight-year history of severe stabbing pain, starting in the epigastrium and radiating around the left costal margin and to the left scapula, occasionally to the left shoulder, arm and finger tips. The attacks were not related to food, exercise, or rest. A cholecystectomy had been performed six years previously. The gallbladder had contained stones. The common duct was normal to palpation and was not opened. Recurrence of attacks of pain in the chest led to a diagnosis of angina. There were no jaundice and no gastro-intestinal symptoms. The electrocardiogram and glucose tolerance curve were normal. Duodenal drainage yielded crystals. At operation a single pea-size stone was removed from the common duct. She has been symptom-free for two years.

Case 2 was a female, age 71. Her first attack occurred one week before entering the hospital, and she had had nightly seizures of girdle pain, of equal intensity, on both sides. The electrocardiogram showed a probable intraventricular block. The icteric index was 15. Cholecystogram showed cholelithiasis. At operation, a small gallbladder, containing stones, was excised, and stones were removed from the common duct. During convalescence clamping of the common duct drainage tube initiated pain. At other times she was symptom-free. A cholangiogram revealed a small residual stone. To establish a relationship between the common duct stone and the preoperative left-sided pain, saline solution was injected both slowly and rapidly, with a reproduction of the pain along the left costal margin and in the left scapula. There was no pain reference to the epigastrium or right side. It was

felt this procedure forced the calculus into the duodenum, as a subsequent cholangiogram failed to show a stone. Removal of the tube was followed by rapid closure of the sinus, and there has been no recurrence of the attacks of pain.

There is a small, but distressing, group of cases in whom symptoms persist after cholecystectomy with or without a demonstrable lesion of the common or hepatic ducts. In these, severe attacks of pain persist without associated fever, jaundice or elevation of white blood cells. Dyskinesia of the biliary tract has been discussed in the literature for some years. Dilator drugs usually give transient relief and gradually, over a period of months, cessation of symptoms occurs. Occasionally, one sees a case characterized by more severe pain suggestive of definite biliary colic, in whom benzedrine or atropine give no relief, and in whom the symptoms persist.

An example of this type of case occurred in an intelligent woman of about 40. Following cholecystectomy for stones, colicky pain without jaundice recurred. A number of months later her common duct was explored but no pathology was demonstrated. Her convalescence was uneventful, except that every time the common duct tube was clamped an attack of colic was brought on. After prolonged drainage the common duct tube was removed, the sinus healed readily, but attacks persisted. Finally, a dorsal sympathectomy with resection of the great splanchnic nerve and removal of the lower three dorsal ganglia was undertaken by Doctor Smithwick. The patient has been free of symptoms for over two years. We have had two other similar cases in whom dorsal sympathectomy has afforded relief, but the time that has elapsed since operation has been too short to venture the assertion that they have been cured.

DR. GEORGE J. HEUER (New York): Doctor Ravdin's paper has brought up a great many interesting questions in this matter of association between gallstone disease and heart disease.

One of the interesting things that we found in a study of a fairly large series of cases of gallstone disease was that a rather high percentage of the patients with gallstone disease, who arrived at age 50 or over, had cardiorenal disease and hypertension. In comparing this group of cases with such information as we could get from life insurance statistics, it was evident that patients in our series who were over 50, and had gallstones, had in a much higher percentage of complications, if you want to call it that, such as heart disease and hypertension, than we could find occurring in the normal population of the country in the same age-group. I hope that Doctor Ravdin will indicate whether that has been his experience.

The question again arises as to whether gallstones in some way provoked these conditions in a higher percentage of cases or whether patients with these conditions were more prone to gallstones. This is very difficult to get at, of course, and I doubt whether one could arrive at a definite answer, but, certain it is, I think from our series of cases—and they number some 1,200—we have studied—that there is a higher incidence of these cardiorenal conditions with hypertension in the age-groups over 50, than occur in the population ordinarily.

DR. FRANK K. BOLAND (Atlanta, Ga.): We have had some reference this morning to historical medicine, and it is with the object of reminding you of another historical fact that I rise. This historical fact also illustrates to us the diagnostic clinical acumen of some of the forefathers in medicine, who worked without electrocardiograms and without roentgenograms.

You will recall that John Hunter died in a hospital committee meeting from an attack of angina. Hunter's physician was none other than Edward Jenner. Hunter was known to have these heart attacks, but Jenner insisted that he also had gallstones. The point I wish to give you is that the autopsy revealed that Jenner was right and that John Hunter had gallstones and also had coronary sclerosis.

DR. JOHN A. WOLFER (Chicago, Ill.): Along the line of Doctor Ravdin's presentation, I want to put two side-lights on record. One was in a woman of about 60 years of age, upon whom I had performed a radical mastectomy. A short time after the

operation she developed typical precordial pain, radiating down the left arm, associated with some dyspnea and slight cyanosis. The electrocardiogram was typical of coronary disease, and as the symptoms progressed, further study revealed that she had a small diaphragmatic hernia, and when the diaphragmatic hernia was filled with food she had the typical electrocardiographic findings of coronary disease, and when the gastric pouch was empty her electrocardiogram was perfectly normal.

The other is a reversal of the syndrome exemplified by this case. A man from South Carolina was diagnosed as having a fulminating acute cholecystitis, with fever of 102° F. and leukocytosis of 22,000. He was seen by a surgeon in that community, who refused to operate upon him because of the severity of the symptoms. He recovered, went to Florida, and I saw him the next spring.

His history was perfectly typical of chronic cholecystitis, having right upper abdominal pain, distress after eating, and nothing which would suggest cardiac disease. A study of the gallbladder revealed it functioned normally. Further study revealed nothing organic in his gastro-intestinal tract. The next morning he was found dead in bed. At autopsy, there was found an enormous scar in the heart, which I can only describe to you as looking like the bottom of a white china saucer. Almost the entire myocardium had been replaced by a scar tissue. Yet the man gave a typical gallbladder story, so much so that Doctor Case, when he examined his gallbladder, he made a little note after his interpretation saying: "I hope that my negative cholecystographies will not deter Doctor Wolfer from taking this man's gallbladder out." Yet, he had no gallbladder disease, and his history would indicate he did have the effort syndrome. In other words, he became distressed when walking and developed indigestion and pain with walking. But beyond that there was nothing.

By the way, the electrocardiogram was reported: "Nothing significant found."

DR. HARRY B. ZIMMERMANN (St. Paul, Minn.): We have sufficient diagnostic machinery for limited diagnosis of gallbladder disease, but quite often the question comes up as to whether one wants to use surgical therapeutics in the presence of cardiac disease. I am fairly convinced that there is something to the modern idea that atheromatous disease has a great deal to do with metabolic reverses. Quite often disease of the extrahepatic biliary tract, besides gallbladder, can aggravate such disturbances in the metabolism, and I would not hesitate in persons with fairly definite atheromatous disease and cardiac disease to use surgical therapeutics.

DR. I. S. RAVDIN (closing): I think the observations that Doctor Mixer and Doctor Smithwick have made in the patients with dyskinesia are very important observations, because everyone interested in the surgery of the extrahepatic biliary passages must have seen a group of patients who continued to have colic, even though there remain no stones in the common duct.

I am sure that Doctor Heuer's observations are correct ones. There is a higher incidence of cardiac disease in patients with biliary tract disease, patients with stones, and a greater incidence of hypertension in the patients past 40 years of age—I believe Doctor Heuer said 50—than there is in the population at large.

Doctor Wolfer's observation merely accentuates the fact that we must be exceedingly careful in attempting to arrive at an accurate diagnosis. We have, however, seen two additional patients whom, had we followed our inclination, we might not have operated upon, and the patients would certainly have died; two patients with acute obstruction of the common duct who immediately went into shock, so that it was impossible to record either their systolic and diastolic blood pressure. They were operated upon under continuous spinal anesthesia at a time when blood pressure could not be recorded. Immediately after drainage of the common duct the blood pressure returned so that it could be recorded.

This merely goes to show that both of these individuals were diagnosed, initially, as having enormous cardiac infarctions. Both of these individuals showed evidence of preexisting cardiac infarction. Both of them survived operation well, and have done well since operation. It merely further emphasizes the fact that one can, by having reflexes which arise in the extrahepatic biliary passages, so accentuate intrinsic existing disease of the coronary vessels as to set up a train of events which produces nearly complete

cardiac incompetency and which can be relieved providing the mechanism which initiates these reflexes is relieved.

I am perfectly sure that many of these individuals that are not now being operated upon should be, and our experience has shown that the risk of operating upon these individuals, properly prepared before operation and properly taken care of during operation, is not great. At the present time everyone is being operated upon with continuous spinal anesthesia, which I believe, in this group of patients, provides the greatest safeguard.



WAR SURGERY

The outstanding feature of the surgery of the present war, as compared with that of the last, was the almost complete disappearance of the ward dressing trolley and the war gas apparatus. The appalling pain caused by the daily, or twice daily, dressings had gone, and in its place was the modern technic of excision and fixation. Fixation was practically always by plaster of Paris, although in the wounds of the thigh in fat women complete fixation by this means was an extreme difficulty. An addition to the technic was the use of sulfanilamide by packs or in powdered form, or by insufflation on the surface of the wound; although the use of sulfanilamide had helped to prevent sepsis in some cases which had not come for operation for four to eight hours after the infliction of the wound, nothing could replace the perfect excision of the wound, which was the essential point in the treatment. Nothing was so criminal as to suggest that the excision could be done badly so long as sulfanilamide was used. The main problems met with now were shock, for which fortunately the treatment was almost standardized; the prevention of sepsis, which depended largely on the excision of infected and dead tissues and the wide opening-up of tissues which had become infected; and fractures of the pelvis, which had occurred more frequently than normal owing to the falling in of bombed houses. In many of these cases of fractured pelvis there was a rupture of the urethra, and it would be well if agreement could be reached on the ideal treatment of this complication.

—T. P. McMurray at a meeting of the Liverpool Medical Institution as reported in the *British Medical Journal*.