How To Avoid Surgical Difficulties

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INTRODUCTION

I can think of no better way to begin my presentation than to quote the opening sentences of my close friends, Drs. Grover C. Pemberthy and Harvey B. Stone, when honored, as I am on this occasion, by being asked to present to you a lecture in honor of one of the founders of your hospital and of its surgical department, the late Dr. Roy D. McClure.

Dr. Pemberthy said in his lecture presented in April, 1957, "The gracious invitation to present the Roy D. McClure Lecture, I consider a very particular honor, but my acceptance is with a feeling of humility." Dr. Stone in his lecture given the next year said, "The invitation to give this year's Roy D. McClure Memorial Lecture is a great honor and I appreciate it deeply."

I, too, feel deeply honored at being asked to join with those who have previously given this memorial lecture and you in honoring Dr. McClure on this occasion.

Three of the previous essayists, Drs. Pratt, Holman, and Pemberthy, in their excellent memorial lectures, have outlined the philosophy of surgery and its progress, and emphasized Dr. McClure's training in surgery under that great group of distinguished American medical scientists, Osler, Halsted, Welch and Kelly while Dr. McClure attended Johns Hopkins Medical School. Later he became one of Dr. Halsted's residents, following the late John Finney, Joseph Bloodgood, Harvey Cushing, and Hugh Young. The readers of Dr. Pemberthy's and Dr. Pratt's memorial lectures will find an excellent review of the progress of surgery in the first half of the twentieth century, with particular reference to the development of a surgical department in Johns Hopkins Medical School and the relationship of Dr. McClure to it. Dr. Emile Holman's lecture given in 1960, titled "Personal Reminiscences of Osler, Halsted, and Cushing," which I could not find in publication, undoubtedly gave further insight into the development of surgery as influenced by these men during this period. From the residents trained by Halsted, already mentioned, and

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many others, such as the late Monte Reid of Cincinnati, James Mitchell of Washington and Roy McClure, who also made their own contributions to surgery, stems "the lengthening shadow" of Halsted's teachings.

In the early years of the twentieth century when Dr. McClure was receiving his training, William J. and Charles H. Mayo at Rochester, Minnesota, were performing large numbers of surgical operations at St. Marys Hospital, training large numbers of assistants who became leaders in clinical surgery in the communities where they lived, many receiving appointments to the faculties of nearby medical schools. Thus began another type of graduate training in medicine, surgery, and the specialties, by a group of men engaged in the practice of a cooperative type of group medicine, many of whom were members of the Faculty of the Mayo Foundation Graduate School of Medicine at the University of Minnesota.

Unlike some of the previous essayists, who were trained at Johns Hopkins Hospital, I entered the Mayo Foundation as a fellow in medicine in June, 1920. After a year of intensely interesting work in the examining rooms and in the research laboratories which were being developed under the direction of the late Leonard Rowntree and Reginald Fitz, I transferred to a surgical fellowship. It was my good fortune in the ensuing 3 years to work as a first assistant to William J. and Charles H. Mayo, E. Starr Judd, and Verne C. Hunt. During this time, too, I worked on several research problems in our laboratory of experimental medicine and surgery. This research was done under the direction of the late Frank C. Mann in collaboration with his associate, Jesse L. Bollman. In 1924, I was appointed a surgeon in the Mayo Clinic which position I held until my retirement at age 65 in October, 1960.

I make these personal references only to indicate that, even in those years, graduate training in medicine, surgery, and the specialties was available in our country, the two outstanding examples being the fellowships offered by the Mayo Foundation Graduate School of the University of Minnesota in Rochester, Minnesota, and the residency training at Johns Hopkins Hospital in Baltimore.

But to return to Dr. McClure. His contributions to surgery were influenced by the opportunities given him as one of Dr. Halsted's residents to work with him in clinical and experimental surgery and to continue his surgical work at the Rockefeller Institute under Carrel in vascular surgery. These prepared him to organize and develop a Department of Surgery in the Henry Ford Hospital. These and many more incidents in Dr. McClure's life have been covered so well in the previous lectures that it seems unnecessary to elaborate further on his accomplishments; yet I would like to say that, in my opinion, three of his outstanding accomplishments were the organization and development of the surgical department of this hospital, his training of such outstanding surgeons as Frank Hartman, William Altemeier, Brian Blades, Henry Harkins, Edward Compere, Samuel Marshall, Conrad Lam, William Johnson, Emerick Szilagyi, Laurence Fallis, Brock Brush, and others with whom I am not acquainted, and his founding of the Central Surgical Society where young surgeons could meet in company with members of the American Surgical
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Association and present the results of their investigations and research. Here again one sees "the lengthening shadow" of this great surgeon.

A year or so ago, I received an invitation to speak at the Southeastern Texas Chapter Meeting of the American College of Surgeons on "How To Get out of Trouble." The writer added "... with your extensive experience," which complicated my consideration of the invitation. As I thought about the subject, it occurred to me that "How To Get out of Trouble in Surgery" might be a more appropriate title, for I hadn't had any particularly serious troubles since I raced a police car many years ago. I, therefore, wrote to the secretary of the Chapter and suggested that "... in Surgery" be added to the title. Further, I thought it might be best to talk also on how to avoid trouble during surgical procedures, because the best way to handle trouble is to avoid it. Finally we changed the title to "Surgical Troubles and How To Avoid Them."

A very experienced surgeon, the late Verne C. Hunt, said in discussing surgical troubles, "If there is anything that has ever happened to any surgeon that hasn't happened to me, I don't know what it is."

Surgical accidents will occur with varying incidence depending on the skill and the experience of the surgeon. The problem is how to keep out of trouble surgically.

KEEPING OUT OF TROUBLE

The members of this fine medical and surgical clinic and hospital, like my Mayo Clinic colleagues, have the very good fortune to have been trained in schools, colleges and hospitals, where men were held to a rigid code of endeavor, and we find it difficult to place ourselves in the position of the surgeon who has been less fortunate if there are any such. It is one thing to have the advantage of advice of colleagues with national reputations, and the help of a group of carefully selected doctors of medicine who have spent 4 additional years in graduate training in one of the medical specialties, and another not to have these valuable aids to surgical accomplishment. Let us take just one example of this, but a very important one, and that is teamwork in the operating room. In the surgical clinics I have visited around the world, for the most part the best work I have seen has been in the clinics of surgeons whose anesthetist, surgical nurses and assistants have worked on the "team" with the surgeon for months or even for years. My surgical nurse, Miss Doris Unland, was a part of my surgical team for 25 years and my nurse anesthetist, Miss Rebecca Bramble, was with me for 12 years, having been one of my surgical nurses prior to becoming an anesthetist. I have seen, however, very able surgeons who did the entire operation themselves and whose assistants only exposed the operative field. The late Paul Banzet of Paris, and Hans Lorenz of Vienna were two such surgeons. Their surgical procedures were skillfully performed, and their results were excellent. One disadvantage of this method is that the assistants, particularly the first assistants, do not have an opportunity to participate in the performance
of the operation. This is not good. When the surgical team is functioning properly, the first assistant is as much the surgeon as the surgeon whose judgment determines the procedures to be performed. In my own experience and in my surgical observations, a properly functioning surgical team is essential when one is dealing with complicated surgical procedures.

In recent years the science and art of general anesthesia have followed almost a pattern in the surgical clinics I have visited in this country, Moscow, Leningrad, Cairo, Bahrain, Singapore, Hong Kong and Japan, namely, induction with thiopental sodium given intravenously, tracheal intubation, anesthetizing gas and oxygen, and a muscle relaxant given intravenously. One of the purposes of the last, of course, is to give complete relaxation of the abdominal wall and to enable the surgeon to carry out the necessary surgical procedure without hindrance from protruding intestines and inability to explore the operative field properly.

Obviously these aids, with proper exposure of the operating field, experienced assistants, anesthetist, and surgical nurses are valuable in helping the surgeon keep out of trouble during a surgical procedure, and to these must be added proper lighting of the operative field. But, let me point out again that the skillful, experienced surgeon unable to have this skillful assistance may carry out an excellent surgical procedure. Paul Banzet’s surgical nurse autoclaved the drums containing his instruments, operating table linen, sponges and dressings. She opened the drums, and he removed their contents, placing them where they belonged over the patient and covering the instrument table. On many occasions, particularly during my active duty in the Navy, when trained anesthetists were not available, spinal anesthetics properly given or inhalation anesthesia with ether gave satisfactory anesthesia and operations were well done.

What does all of this add up to in keeping out of trouble during the performance of a surgical procedure? Just this, whatever the circumstances and the conditions prevailing, the responsibility rests with the surgeon. He must be able to perform the indicated surgical procedure properly in each case. If he has not been trained as both a physician and surgeon to diagnose and treat (and these terms are used in the broadest sense) and to perform accurately the indicated procedure, he should not attempt the operation, unless a surgeon experienced in the treatment of such conditions is unavailable and an emergency operation is necessary.

The most experienced surgeon may be in trouble occasionally, but many, many times less often than the surgeon with less experience. Two years ago there appeared in one of our national lay magazines an article entitled “Can We Get Rid of Bad Doctors.” One of the examples given was that of a surgeon who in performing neurologic operations had a mortality rate far in excess of that of surgical specialists performing operations of similar type. Such men are always in trouble surgically. If a surgeon is to keep out of trouble surgically, he must be able to evaluate the

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surgical problem. He must have had sufficient experience to determine the propitious time to operate, if operation is necessary. He must have had experience in the performance of the procedure either as a surgeon or as an assistant surgeon or, in addition to training in general surgery, he must have seen the operation performed, preferably repeatedly.

In the performance of the procedure the operating surgeon must know accurately the anatomy of the region being operated on and its distortions by the pathologic lesions present. I have operated on many hundreds of patients for postoperative strictures of the common hepatic ducts. Almost all of the strictures had followed either a primary operation on the gallbladder or a secondary one on the bile ducts, usually the former. Most of the patients had been operated on by men with insufficient experience in the surgical treatment of biliary lesions, especially of the complicated ones.

Unfortunately, even experienced surgeons may have trouble, too. Many years ago, I cut across the common ducts in two cases. I recognized the technical error in one case and immediately corrected it with an end-to-end anastomosis of the common duct. In the other case I did not recognize the error until 3 days later when the patient became jaundiced. (This patient had had a gangrenous gallbladder with inflammation binding it to the common duct.) I operated again 2 days later. During the delay I was able to determine that complete occlusion of the common duct was present by discovering the absence of bile in the duodenum and by the increasing jaundice. At operation ligatures were found on the divided ends of the common duct. They were removed, and an end-to-end ductal anastomosis was made with good results.

The significant point in these cases is that I should have identified the common bile and the common hepatic duct before I removed the gallbladder. In the case of the gangrenous gallbladder in which the pericholecystic inflammation had bound the common duct to the gallbladder, it would have been much better had I removed the gallstones and drained the gallbladder rather than removed it. Moreover, as I had to re-operate on the patient and find the cut ends of the ducts to anastomose them, it should have been possible to have recognized the cut ends of the duct at the initial operation, for ligatures were placed around each. The lower one had been considered the cut end of the cystic duct and the upper one, the cystic artery surrounded by inflammatory tissue. An immediate cholangiogram showing the relative position of the gallbladder and common duct might have prevented the injury, or a cholangiogram made after the cholecystectomy would have indicated the absence of ductal continuity.

The corollary of this is that a surgeon should never proceed with a surgical operation without knowing and identifying the regional anatomy, and if a technical error is made, it should be recognized, repaired, corrected, or compensated for before the abdomen is closed and the patient is returned to his room.
HEMORRHAGE

Excluding fatal cardiac disorders such as cardiac arrest, probably the most frequent cause of trouble during operations is hemorrhage resulting from cutting into or through or tearing blood vessels in the course of an operation made difficult because of complications from the lesion. These may be the result of an inflammatory process or invasion from a malignant one. A small but typical piece of tissue removed for immediate microscopic examination usually will allow the pathologist to distinguish the inflammatory from the malignant lesion. This information helps the surgeon in making the decision as to whether, in the presence of malignant invasion of large blood vessels, the risk from hemorrhage following removal of the lesion could be prevented by ligation of the blood vessels without loss of circulation to vital structures and, if not, whether vascular anastomosis could be made without or with prosthetic transplants to restore circulation.

When I was a young surgeon, I said that I would never let a patient die from hemorrhage — whether on the operating table or during the postoperative course. This made it obligatory that I completely control all hemorrhage from cut blood vessels before letting the patient leave the operating room. If the bleeding was a diffuse oozing from large areas, hemostatic absorbable materials were used to cover the area. Gauze packs were placed on top of these to exert pressure. These packs were never removed until at least 7 or 8 days had elapsed after the operation and until the gauze had been moistened repeatedly with a weak antiseptic solution to free it from surrounding tissues. In these cases, especially if the patient has been operated on for a biliary or a gastroduodenal lesion, I have had blood coagulability tests immediately done. While waiting for the report, I have given vitamin K₁ intravenously or sometimes a transfusion of freshly drawn blood. If the patient had had a recent pregnancy, especially if a miscarriage had occurred, fibrinogen was given.

I recall a young woman slightly jaundiced on whom I performed cholecystectomy. There was a slight, but rather persistent ooze from the gallbladder fossa in the liver in spite of repeated interrupted sutures placed to approximate the oozing areas. This was not entirely satisfactory, so a narrow (1/2 inch) double strip of iodoform gauze was placed in the liver notch. This seemed to control the oozing. The patient’s convalescence was quite normal until the gauze, which stuck quite firmly to the liver, was twisted around to free and remove it. After a few hours the patient showed evidence of mild shock which increased in severity. She was taken to the operating room, her incision was opened, and the blood clots were removed from above the liver and below the diaphragm. These had depressed the liver and partially rotated it and thus caused interference with the circulation in the inferior vena cava. With return of the liver to normal position, her condition rapidly improved and she made a good recovery.

In another case, the same symptoms developed the evening following repair of a stricture of the common duct. This patient was so ill that her incision was opened

*Bollman and I have demonstrated this experimentally in dogs.
in her room under proper surgical technic. Bile gushed forth from the right sub-diaphragmatic area. Her condition rapidly improved and she recovered.

The corollary of both of these cases is that if there is a question of post-operative serious intra-abdominal bleeding, the patient's incision should be opened and the bleeding controlled. If hemorrhage has not been the offender, the cause for the patient's reactions may be found and can be corrected.

But to return to the discussion of hemorrhage: Occasions will arise in which it is difficult to control bleeding from important arteries and veins or both by ligature or suture. In such cases one or several large hemostats may be left in place and the incision closed around them. Seventy-two hours later each hemostat is carefully unlocked, but their jaws are not separated lest the end of the blood vessel be again opened. Six hours later serum will have completely freed the closed end of the blood vessel from the hemostat, and the hemostat can be safely and easily removed. I learned this method of producing hemostasis from Dr. Will and Dr. Charlie Mayo and have used it innumerable times in controlling bleeding from uterine vessels in difficult vaginal hysterectomies, or from renal vessels when subcapsular nephrectomies have been performed on patients whose previous operation on the kidney had obliterated the normal anatomic lines of cleavage. Indeed, I have used it to close bleeding areas on the lateral wall of the inferior vena cava following nephrectomy for extensive hypernephroma and in difficult operations on the right adrenal gland where the caval openings of the torn adrenal veins could not be sutured without danger of tearing the veins and enlarging the openings. On a few occasions I have placed a hemostat temporarily on the cystic artery or across part of the right hepatic artery.*

Some of you may doubt that the bleeding vessel could be accurately ligated or safely sutured. Nevertheless, the fact remains that a hemostat, used as I have described, successfully controls bleeding from large blood vessels. I have never had it fail to do so — indeed, I have never had to re-close the unlocked jaws (due to bleeding) before they were freed by serum from the vessel.

INADEQUATE INCISIONS

It scarcely seems necessary to speak of inadequate incisions before an audience of surgeons such as this, but I shall do so nevertheless, since I have seen some surgeons who made an operation unnecessarily difficult and sometimes over-dangerous by trying to work through an incision that was too small or was improperly placed. The incision should be of such size and in such a position that exploration of other likely areas of disease is possible.

The late Dr. Charles H. Mayo almost lost his life when he was operated on, while on a trip away from Rochester, by a celebrated surgeon who removed a diseased

*This was done as an emergency procedure on a patient whose right hepatic artery had been injured elsewhere during a cholecystectomy at which time part of the common duct had been evulsed. The opening in the hepatic artery had been closed by sutures. Bleeding recurred from the artery after I removed the sutures in its wall when I was repairing the stricture of the common duct, and it recurred again 8 days after the repair of the stricture.
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appendix but failed to note at operation that the gallbladder was also diseased. Continuing evidence of disease led to an emergency exploration of the gallbladder (on the advice of Dr. Will Mayo) and after its surgical drainage he recovered. This case has many important lessons: One of the most important, in addition to the value of an incision of sufficient size to observe or palpate other intra-abdominal structures, is that the position or reputation of the patient should never influence the surgeon in his selection of the operation to be performed. It should not tempt him to do an inadequate operation because of its lesser risk.

THE EXPLORATORY INCISION

Failing to advise an abdominal exploratory incision may lead to serious consequences because complications may develop before operation becomes a necessity. Thus if, in spite of using all the possible aids to diagnosing the offending lesion and determining its location, the consulting surgeon fails to recognize that the patient probably has an intra-abdominal lesion of uncertain type and location, both he and the patient may be in trouble unless he convinces the patient of the necessity of an exploratory operation. A small but definite number of patients have intra-abdominal lesions that produce atypical symptoms, sometimes bizarre ones. No help is received in identifying the lesions by laboratory, x-ray or endoscopic examination, and the lesions can be identified only by abdominal exploration. What are some such lesions? They are the normally functioning gallbladder with small gallstones which do not show in the cholecystogram or common duct stones that are not visualized by cholecystography or intravenous cholangiography, the small bleeding ulcer on the posterior wall of the stomach or duodenum, the gastric neoplasm of the leather-bottle type (limitis plastica), the pancreatic neoplasm that is not producing jaundice, the adrenal and the ovarian neoplasm, the obstructing intestinal adhesions that produce intermittent, incomplete obstructions and, believe it or not, subacute appendicitis.

When I advise an abdominal exploratory operation, I tell the patient that it should be considered another laboratory test, similar to an endoscopic examination, with little difference in risk, and with ambulation on the following day and that it is of great value in locating the lesion and treating it properly. I add that, if no lesion is found, knowing this fact gives great satisfaction.

There are definite clinical symptoms and signs that indicate the need for abdominal exploration. These include persistent abdominal discomfort in a patient more than 45 years of age, abdominal discomfort associated with obscure fever, loss of appetite, loss of weight, feeling of tiredness or weakness (especially if not experienced before), feeling of fullness after eating, crampy abdominal pain, tarry stools, and light-colored stools and dark urine.

A few years ago I removed a large ulcerated small intestinal lesion which had produced massive intestinal hemorrhage in an elderly man. The lesion, which had not been demonstrated during gastrointestinal roentgenologic examination, was a
melanoepithelioma secondary to a primary lesion which the patient had had some 20 years before.

In preparing for presenting a paper on “The Advantages of Abdominal Exploration,” I visited with the head of our department of pathologic anatomy, Dr. Archie Baggenstoss. I asked him if he would choose at random from his necropsy records those of 10 patients with primary malignant lesions that had escaped preoperative detection. He reminded me immediately of one of our colleagues who developed a malignant lesion on his lower gum. It was an unrecognized metastatic lesion. The primary lesion was in the stomach, but although the patient had had some mild digestive symptoms for years, repeated roentgenologic examinations of the stomach failed to show the lesion on the posterior wall of the fundus.

Another patient, a 69-year-old man, was comatose when he arrived at the Mayo Clinic. Three years earlier his physician had diagnosed “heart condition and obesity.” Two weeks before his visit, the patient had lost his appetite, and a week before that he had had a sudden pain in the left-lateral part of his thorax. He had had some nausea and vomiting a few days before his arrival and admission to the hospital. He died without regaining consciousness. At postmortem examination, carcinoma of the stomach with metastasis to regional lymph nodes and to the paraaortic lymph nodes was found.

Another patient had an undifferentiated malignant tumor of the gallbladder with metastasis to the head of the pancreas, adrenal gland, liver, and skull. His symptoms had been bizarre and similar in their lack of localization to those I mentioned earlier. Abdominal exploration seemed indicated but was not done.

A 34-year-old woman entered our clinic on July 27, 1958, giving a 6-week history of severe general pruritus. Three weeks after the onset of pruritus an enlargement of the abdomen was noted. She lost weight and experienced slight midepigastric aching. Although she was not jaundiced and there was no elevation of her serum bilirubin, she died of liver failure. At postmortem examination, a carcinoma of the tail of the pancreas and metastatic carcinoma of the liver were found. Keep in mind that she was a young woman whose illness lasted but 6 weeks. Women and young people infrequently have malignant lesions of the pancreas, and such lesions are usually associated with a long illness.

A patient who had yearly physical examinations had not been feeling well for about 6 weeks when he began to have abdominal pain which diminished in severity if he sharply flexed his body. The pain was worse at night. Examination with roentgen rays revealed nothing of significance. Abdominal exploration revealed a small carcinoma in the mid-portion of the pancreas and peritoneal metastasis.

One of my friends, aged 68, whom I had seen on the golf course 2 weeks before, had complained of feeling weak for some time. A thorough medical study
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revealed nothing abnormal except a mild anemia. Examinations with roentgen rays were also negative. Subsequently the patient noticed a slight enlargement of his abdomen; consequently surgical exploration was thought to be indicated. At abdominal exploration, small metastatic tumors were found; the primary lesion was a carcinoma of the adrenal gland.

These cases are late cases. They indicate, however, that malignant lesions may develop in different parts of the body and may produce very mild symptoms which may be disregarded until the lesion becomes large or diffuse or produces metastasis, when the signs and symptoms are recognized as indicating the presence of a serious lesion.

Lest you get the idea that nothing could have been accomplished if the lesions had been found during an earlier abdominal exploration, I want to say that in my 36 years of experience as a surgeon 50 per cent of the patients on whom I advised and performed abdominal explorations proved to have lesions responsible for their symptoms, and that, in half of these, the lesion was removable. Concerning those in whom no lesion was found, the failure to find a lesion was of value to both patient and surgeon. Such a finding should never be looked on as disappointing or of little value.

Some malignant intra-abdominal lesions are difficult to recognize without an abdominal exploration. Consider the gastrointestinal tract. Lesions on the posterior wall and in the fundic end of the stomach are difficult to identify, and so are the types of cancer which infiltrate the gastric wall or a portion of it. Also roentgen-ray or gastroscopic studies usually fail to reveal such lesions. Cytologic examinations may be helpful, but there is still a large margin for error: Cytologic studies of gastric washings may not be made unless the patient's symptoms suggest a gastric lesion; also, they are of little value in the diagnosis of infiltrating cancer. Malignant tumors of the pancreas practically never are recognized early. Fortunately those in the head of the pancreas, in two out of three cases, will produce sufficient obstruction of the common bile duct (where it passes through the head of the pancreas) to result in varying degrees of jaundice. But in one third of the cases, the common duct passes behind the head of the pancreas, and jaundice may not develop. Tumors in the mid-portion and the tail of the pancreas are seldom detected until they are of sufficient size to make them inoperable. Small intestinal malignant tumors, which occur infrequently, will bleed if they ulcerate or produce colicky abdominal pain if they are of sufficient size to produce obstruction. Unless they are fixed to some adjacent structure, however, they usually cannot be demonstrated roentgenographically. Small malignant tumors of the colon (I am referring particularly to polyps) proximal to areas visible during proctoscopic examination may escape detection unless the barium is expelled after a barium enema and air-contrast roentgenograms are made.

Mesenteric tumors, too, and tumors of retroperitoneal tissues (lymphosarcomas, leiomyosarcomas, liposarcomas) unless large enough to be palpated cannot be demonstrated roentgenographically. Most retroperitoneal tumors are fixed making their re-
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moval impractical, but a specimen for microscopic examination should be taken. If
by chance the tumor is a lymphosarcoma, response to irradiation may be unbelievably
good.

For about 20 years my work consisted of treatment of lesions of the outside
of the body, the neck, the intra-abdominal structures, and the genitourinary tract
of males and females, adults and children. Urologic surgery was particularly in-
teresting to me because there were not only problems related to the pathologic nature
of diseases of genitourinary structures but also problems related to the effects of
the lesions on renal function, fluid balance, and chemical balance. The problems
were more complex when obstruction occurred with its usually associated secondary
infection. In addition, what made urologic work most interesting to me was the
accuracy with which urologists could make diagnoses, employing intravenous uro-
graphy, cystography, pyelography, and differential tests of renal function.

During this time I also became interested in hyperfunctioning lesions of the
adrenal cortex. On several occasions, I reported on adrenocortical malignancies which
could only be recognized by exploration of the adrenal glands. However, the lesions
usually produced some metabolic disturbances which enabled us to suspect their
presence on consideration of the patient's history, physical examination, and particularly
the results of chemical laboratory tests. One patient, a woman whom I had operated
on many years before, had been operated on unsuccessfully elsewhere for a suspected
intra-abdominal lesion; none was found, and postoperative intestinal obstruction
developed requiring another operation. These last two operations were done in a
foreign country under circumstances which are difficult to evaluate. The abdominal
pain continued, and we advised re-exploration.

Although there were no symptoms indicating adrenocortical hyperfunction, the
lesion proved to be a carcinoma of the right adrenal. The encapsulated tumor
measured approximately 20 by 10 cm. The patient was well for several years before
a nodular, movable, recurrent lesion, measuring approximately 5 cm. in diameter,
developed. It was easily removed. Following its removal, the patient had a moderate
hypoadrenal shocklike reaction which responded to the administration of adrenocortical
substances. There had been no such reaction after the removal of the large primary
lesion.

Occasionally exploration reverses a grave prognosis based on a clinical diagnosis.
For instance, a middle-aged woman with abdominal distention and an irregular mass
in the pelvis was thought to have carcinoma of the uterus with ascites, but on
abdominal exploration, she proved to have a huge ovarian cyst and intrauterine fibroids
which were incarcerated in the pelvis. The cyst and the uterus were removed without
difficulty.

Except when there is a possibility of altering a grave prognosis as in the case
just mentioned, patients are advised to have an abdominal exploration only after every
other method of lesser risk and inconvenience has been used to make a diagnosis.
Although the risk of surgical procedures in modern times, particularly that of making a small incision in the abdominal wall and gently examining intra-abdominal structures, is minimal in most cases, one must always remember there are cases in which the risk is high. I refer especially to patients with painless jaundice secondary to infectious hepatitis. In such patients, surgical procedures are associated not only with a serious operative risk but also with possible accentuation of the hepatitis which can cause the patient’s death. Similarly, patients who have had recent acute coronary thrombosis are poor operative risks. Many such patients have pain which appears to derive from intra-abdominal causes when in reality it is referred pain secondary to acute coronary occlusion.

A surgeon undertaking an exploratory operation must have the knowledge and have had the experience to enable him to recognize pathologic changes, visible or palpable, of the structures examined and to relate his findings to the patient’s symptoms.

One of the necropsy protocols that Dr. Baggenstoss chose for me concerned a 66-year-old woman with a 4-month history of anorexia. Jaundice and light-colored stools were present for 2 weeks. On examination she was jaundiced, grade 3, and her liver was enlarged, extending down to the umbilicus. Exploration was advised. The diagnosis at operation was diffuse metastatic carcinoma of the liver. The primary lesion, a carcinoma of the left intrahepatic duct, extended into the left lobe of the liver and into the right hepatic duct causing obstruction. The clue to the location of this unusual lesion in the intrahepatic ducts, with associated jaundice, was flaccidity of the gallbladder and common bile duct. The history of light-colored stools suggested the presence of obstruction of the biliary passages. The flaccid gallbladder and common duct indicated that the primary obstructive lesion lay within the liver, in the intrahepatic ducts.

Several years ago Landry and I reported on a group of five or six patients on whom I had operated. Each had a small malignant lesion of the ampulla of Vater. In two of these patients, the only signs of disease were anemia and tarry stools. Laboratory examinations not influenced by anemia or blood in the stools, including gastrointestinal roentgenoscopy, gave negative results. At abdominal exploration, distention and enlargement of the gallbladder and common duct indicated the presence of an obstructing lesion at the lower part of the common duct, but none was palpated. An incision through the anterior wall of the duodenum exposed the ampulla of Vater which contained a malignant lesion approximately 8 to 10 mm. in diameter.

In another patient, who had attacks of pain in the upper left part of the abdomen, I found nothing but a nodule approximately 1 cm. in diameter in the tail of the pancreas. At first I thought it might be a cyst; on closer inspection, however, it proved to be solid. It was excised and reported to be an adenocarcinoma.

On another occasion many years ago, while examining a male patient who gave a history of having tarry stools, I felt a moveable tumor approximately 8 to 10 cm.
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in diameter in the pouch of Douglas. After making rounds, I suggested to one of my assistants that he examine the patient and let me know what he found. He reported that he had found nothing. I asked if he had made a rectal examination; he had, but had felt nothing abnormal. I returned with him to the patient's bedside, examined the patient, and felt nothing. The results of a roentgenographic study of the gastrointestinal tract were negative, but because of the episodes of intestinal bleeding and my original finding of a palpable mass on rectal examination, an exploratory operation was performed, and a lymphosarcoma was found arising from Meckel's diverticulum. The tumor could be moved into and out of the pelvis with ease. This mobility explained the difference in the findings on rectal examination on the two occasions.

I recall an older patient who came to the Mayo Clinic because of a history of two episodes of fainting followed by tarry stools. He had had attacks of coronary thrombosis, and with the last attacks of intestinal bleeding, he apparently had mild myocardial anoxia which caused his physician to think he might not recover. Gastrointestinal examination revealed nothing abnormal. Roentgenologic examination of the stomach, duodenum, and small and large intestines revealed no abnormalities. In view of the severe myocardial anoxia with his last attack of bleeding, an abdominal exploratory operation was advised. I carefully searched the gastrointestinal tract for a lesion but found none. Since 75 per cent of such bleeding results from ulceration of the stomach or duodenum, the interior of the lower part of the stomach and the upper part of the duodenum was exposed by a longitudinal incision through the pylorus. I could see or feel nothing abnormal in the stomach or duodenum. The longitudinal incision was sutured transversely, making a Heineke-Mikulicz pyloroplasty. The patient's postoperative course was satisfactory until the ninth day when he had a sudden coronary occlusion and died.

I attended the postmortem examination and studied the lining of the gastrointestinal tract from the pharynx to the anus with the pathologist. The opened viscera were passed over a lighted stage, but nothing was seen. Reviewing the patient's history of recurrent intestinal bleeding, the pathologist was still not satisfied. He then examined the viscera, using a low-power objective of the microscope, and found innumerable superficial areas of ulceration in the gastric mucosa.

This case illustrates how one can fail to find a lesion on abdominal exploration although it may cost the life of the patient. It also shows that lesions may escape detection even during careful examination at postmortem examination unless the search is intensive. In cases in which one has been unable to identify a bleeding gastrointestinal lesion, partial gastrectomy or pyloroplasty with vagotomy gives one an opportunity to view the interior of the stomach and duodenum; and the operation yields excellent results if minute areas of ulceration are present in the stomach or duodenum, especially in the former.

I have discussed how errors of judgment may be prevented by abdominal exploration in certain patients who present diagnostic problems and in whom malignant
lesions were suspected or found at the exploration. I must remind you that in many more cases requiring exploration inflammatory and other nonmalignant lesions involve various intra-abdominal structures. For instance, patients with attacks of gallbladder colic may require exploration because the gallbladder seems to fill and empty on cholecystography. Many times, small gallstones cannot be palpated by the examining surgeon and are only demonstrated when the gallbladder is opened, either at the time of operation or after the gallbladder has been removed because the patient's history suggests gallbladder disease. A stone, or stones, may enter the common duct from the gallbladder leaving a "normally functioning gallbladder" on cholecystography; a third of the patients in this group have neither jaundice nor chills and fever. Gastric and duodenal ulcers on the posterior wall are frequently not demonstrated by either roentgenoscopy or gastroscopy. Also gastrointestinal roentgenoscopy fails to reveal most small lesions of the small intestine.

I want to make some comments referable to secondary abdominal exploration. There have been times when I have thought it desirable to advise and carry out an abdominal exploration when a similar procedure had been done previously by another surgeon. These cases are difficult indeed to handle. However, after even a few weeks a lesion overlooked at the time of one exploration may increase in size or produce pathologic changes which make it easily identifiable at a second exploration. In these cases, I have always explained this possibility to the patient, who usually has complete understanding. He may make it easy for the second surgeon by saying, "My symptoms are worse; I know there must be something wrong. I've tried to avoid another operation, but I can't go on this way." It is always helpful for the second surgeon to speak with the first surgeon, inquiring as to the areas covered in the exploration.

I remember a patient, on whom I operated, who had carcinoma of the mid-portion of the pancreas, which was producing attacks of hypoglycemia. I had thought the lesion inoperable because it seemed adherent and fixed to the retroperitoneal duodenum and to the superior mesenteric vessels. Biopsy revealed it to be a grade 3 carcinoma with invasion of the veins. The patient, of course, continued to have attacks of hyperinsulinism after the exploration. He consulted one of my friends in another city. This surgeon telephoned me and asked about my findings and why I thought the lesion was inoperable. He said the patient's attacks of hyperinsulinism were becoming more frequent and more severe and he thought he would re-explore him. He removed the lesion with most of the pancreas, the spleen, and part of the duodenum. The patient survived and lived for about a year before metastasis occurred and resulted in his death.

On another occasion, I was more fortunate. The patient had been operated on twice previously for a pelvic tumor. Infection and intestinal obstruction necessitated re-operation. A small intestinal fistula developed subsequently, and the patient lost a tremendous amount of weight. She was in poor condition when I saw her in consultation. It was obvious that the fistula had to be closed or the patient would
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die. I explained to her the risk of the surgical procedure and the uncertainty of success, but she agreed to the operation. The night before I was to operate, one of my surgical colleagues told me that an able surgeon, a friend of his, had last operated on her. He had been unable to close the fistula because the intestines were so “frozen” together, that he was unable to separate them to relieve the partial obstruction distal to the fistula. At operation, through a higher incision, I found that the mass of intestines involved only a few coils which were adherent to the lower abdominal wall. After dissecting the adherent coils from the abdominal wall, the mass (including the fistula) was removed. An intestinal anastomosis was performed, and although a pelvic abscess, requiring drainage, developed subsequently, neither the fistula nor the obstruction recurred. She regained her health and was in excellent condition when she returned for re-examination about a year later.

THE CONSULTATION (BOTH MEDICAL AND SURGICAL)

Having briefly discussed problems arising in the course of surgical diagnoses and surgical procedures and how to avoid them, my presentation would not be complete without a discussion of the possibilities for trouble from the time the patient is first seen in the office or in consultation with medical and surgical colleagues and one’s young assistants or associates.

In complicated cases, I believe that collaboration with a medical colleague or colleagues who are truly specialists in their fields is of tremendous value to both patient and surgeon. I refer particularly to the gastroenterologist, the specialist in metabolic disease, the urologist, the roentgenologist and, on occasions, the psychiatrist. The physiologicochemical changes in patients with complicated lesions of the gastrointestinal tract, the endocrine system and the urinary tract are intricate, and their correct analysis and preoperative and postoperative treatment may make the difference between life and death, even though a short and technically perfect surgical procedure has been performed.

For example, to differentiate between intrahepatic and extrahepatic jaundice requires a detailed painstaking study of the patient’s history and liver function. It also requires a careful selection of the laboratory studies to give a proper profile and a decision whether a liver biopsy by percutaneous needle aspiration or abdominal exploration is necessary. Careful analysis of the data obtained from these studies in relation to the patient’s symptoms is absolutely essential because an operation on a patient with intrahepatic jaundice of infectious nature may be fatal, whereas failure to operate on a patient with a so-called silent common duct stone may result in the grave complications of liver failure from biliary obstruction and infection or in peritonitis from perforation of the biliary tract, with death. In both cases of complications of common duct stone, the proper procedure would probably save the patient. I have operated on three or four patients with thorazine jaundice that was not recognized before operation, for each had taken only an insignificant amount of thorazine. In cholangiohepatitis without extrahepatic obstruction the patient’s clinical studies may vary little, if at all, from those of patients with extrahepatic obstruction. Fortunately, removal of extrahepatic obstruction and surgical drainage of either
gallbladder or common duct or both in the patients with thorazine jaundice or cholangiohepatitis seems to produce rapid subsidence of the jaundice, and it did not do any harm. Moreover, the surgical operation eliminated the possibility of a common duct stone or a removable early lesion of the ampulla of Vater or head of the pancreas. Extreme care must be taken not to operate on the patient with infectious hepatitis, for this always makes the patient's condition worse and may result in a fatality.

For 2 or 3 years it has been customary at the Mayo Clinic to ask the patient whether he has ever taken cortisone, or whether he has taken medicine for arthritis, asthma, colitis, or eye troubles. If he has, we ask, How much? For how long? and When? Failure to recognize the presence of adrenal cortical dysfunction in patients and failure to prepare patients so affected for operation as one would, if a subtotal or total adrenalectomy were contemplated, produce the most serious postoperative complications and sometimes death. Patients with adrenal dysfunction whether due to the administration of cortisone, to hyperfunctioning adrenal cortical lesions, to hyperplasia producing the Cushing syndrome, or the primary aldosterone syndrome require most careful chemical and physiologic studies and interrogation in making the preoperative diagnosis and the decision as to the probable best surgical procedure to follow in each case. Not many surgeons are able to make and interpret the studies accurately without the aid of medical colleagues who have a detailed knowledge of the problems and how to handle them.

I have brought psychiatrists into this discussion of consultations because they have been a great help and have kept me out of trouble in cases in which morphine, codeine, or one of the substitutes for them has been taken by patients for long periods to relieve the pain from lesion which the patient is suspected of having. I have seen many patients whose abdominal symptoms resulted from addiction to one of the opium derivatives or a substitute. On the other hand, if the addicted patient also has a surgical lesion, the psychiatrist, in a few days of intensive treatment by substituting one or more of the marvelous new tranquilizers, can prepare the patient for operation and control the patient's reactions after the operation. If these addicts are operated on without such withdrawals and substitutes, their postoperative course is stormy and serious and multiple complications, such as ileus with vomiting, restlessness and pain, may ensue.

**DIAGNOSTIC ROENTGENOLOGIC EXAMINATIONS**

Preoperative and postoperative roentgenologic studies are of the utmost value. They supply visual evidence of the presence of a suspected lesion, and occasionally when used routinely will reveal an unsuspected early lesion. On the other hand, such examination, even in the hands of the most skillful and experienced roentgenologist, may fail to show the presence of a lesion when the clinical examination indicates that one is present. Some of these lesions are: both benign and malignant gastric lesions in the fundus and the posterior wall of the stomach, the early scirrhous carcinoma involving the gastric wall but not extending into the lumen, the shallow ulcer on the posterior wall of the duodenum which may be the cause of painless
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intestinal bleeding or the large craterous ulcer penetrating into the pancreas and producing crisis-like attacks of pain that simulate attacks of biliary colic.

I have mentioned earlier in this paper some of the possible roentgenologic errors in the diagnosis of lesions of the biliary tract. I have presented all of these to emphasize the importance of the patient's history and the results of the clinical examination in the proper evaluation of negative findings on roentgenologic examination in a patient with a good history or clinical evidence of disease. The same also applies to certain chemical laboratory tests which seem at variance with the clinical evidence at hand.

THE HISTORY

Securing an accurate, detailed, and inclusive medical history of the patient's illness is, I believe, the most important part of a consultation. The date of the onset of symptoms, their character, severity and duration, their constancy or intermittency, and their relation to a previous operation may quickly lead to a diagnosis with confirmatory evidence being obtained from x-ray or chemical laboratory tests or from both.

The injection of a nonirritating radiopaque substance into a drainage tract may reveal a fistula communicating with a hollow viscus or an intra-abdominal pocket containing fluids or solids. If the fistula is found and it is a biliary fistula, this procedure will indicate the part of the liver or biliary tract involved and whether the bile passages are obstructed below the fistulous opening.

THE PHYSICAL EXAMINATION

Regardless of what diagnostic procedures have been performed or what their results have been, I never fail to study the history and examine the patient, even though there may seem to be little likelihood of palpating certain lesions. Failure to examine the patient and the record makes an unfavorable impression on the patient who expects all examinations to be revealing and necessary. Furthermore, occasionally I have encountered a previously unsuspected abnormality, such as an enlarged liver or spleen, or a tumor of the pelvic viscera. Secondary malignant tumors may be felt as masses in the pouch of Douglas or implants on the pelvic peritoneum. I know of cases in which melanotic epitheliomatous lesions were found between the toes, and in which an enlarged signal cervical node led to an accurate diagnosis of intrathoracic or intra-abdominal lesion which otherwise might not have been made. Apropos of melanotic lesions, I removed a few years ago an ulcerating bleeding intestinal lesion which had produced a massive intestinal hemorrhage in an elderly man. The lesion, which was not demonstrated on x-ray examination of the intestines, was a melanoepithelioma secondary to a lesion that had developed in one of his eyes some 20 years before!

THE PERSONAL RELATIONS

Before closing I should like to refer briefly to an aspect of, or attitude used in, the surgical consultation that is, I believe, of the utmost importance when a surgeon is in consultation with surgical colleagues or is seeing a patient who has been operated on previously by one surgeon and who desires to consult another surgeon
for one reason or another. Many of the surgical consultations in which my colleagues at the Mayo Clinic and I have had concerned patients referred to this clinic or coming of their own volition. Many of these patients have had previous operations; some have continued to have the same symptoms; others have had symptoms that were related to the surgical procedure performed. In discussing any postoperative complications with patients, I have always tried to explain to them what the conditions were prior to operation, and the complications which the disease might produce with regard to disturbances of function of other structures. I also have explained carefully what we would try to accomplish by re-operation if we recommended one, what the possibilities of a successful result would be, the difficulties of the operation, and the risk involved. And it pleases me very much to say, as an American surgeon, that although surgeons in other communities have seen patients with complications that followed operations which I performed, and may have re-operated on these patients to the satisfaction of the patients, very, very few of these surgeons have criticized to the patient the work which had been done previously.

When consulting with my medical colleagues particularly in complicated fields which I have mentioned, I listen with respect and appreciation to their advice as to what surgical procedure they think is indicated. Whenever I have disagreed with them, I have tried to state my reasons for the differences of opinion, but I have been hesitant indeed in trying to force my opinion on them to the extent of insisting that a surgical procedure be carried out when they were unwilling to agree with me, unless I had positive or overwhelming evidence to support my opinion. When my colleagues and I could not agree, I have suggested that further consultation with other consultants would be helpful. It has been of great value also to ask for the privilege of following the patient's course during the period of observation and study. Such a request is a manifestation of my or any surgeon's continuing interest in the case. If changes in the patient's progress developed, this request has led to my securing the consent or, indeed, being asked by the medical consultant to carry on with the surgical procedure which I had recommended. Apropos of this, modern surgical therapy has enabled us to control many infections with antibiotics, hemorrhage by transfusions, gastrointestinal stasis or obstructions by inserting nasogastric or nasointestinal tubes for aspiration and restoration of fluid and electrolyte balances before an operation is performed, so that a few hours, a few days or an even longer delay in the performance of a surgical procedure is seldom detrimental to the patient. Cooperative observation of such patients by physician and surgeon has been of the utmost value in deciding on the best procedure to be followed in many of the complicated cases that I have described. In addition it draws the cooperating specialists together and impresses on each the need for cooperation. Many friendships form this way.

If, on the other hand, the surgeon is going to be dogmatic and insistent that his decision be followed, he may lose the friendship of the other consultants. If the dogmatic surgeon makes an erroneous decision and the patient suffers, his conscience is bound to trouble him and his ability as a wise consultant is questioned by his colleagues and by the patient or the patient's relatives.
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Finally, I should like to say a word about the patient who is dissatisfied with the surgical opinion prior to operation or the care subsequent to it. When the patient's progress is not as satisfactory to him, to his family, or to the surgeon as it should be, it is a great advantage if the surgeon suggests, and, if necessary, insists, to the patient that consultation is desirable. I have found that a fresh viewpoint may uncover important information which, when acted on, is of benefit to the patient. Moreover when the patient's condition is so serious that everything possible seems to have been done or is being done, the satisfaction of this additional opinion to the patient and the patient's relatives, as well as to the surgeon, is profound.

COMMENT

Rather than write on "How To Get Out of Trouble in Surgery," I have tried to write on the subject of how to keep out of trouble in surgery. The most important way to keep out of trouble in surgery is good sound training in the basic medical sciences, training in the art and practice of surgery, and willingness to recognize that no matter how great one's experience, any one person cannot have complete and detailed knowledge in every field of surgery. Assistance is needed either in the diagnosis of the surgical lesions or in surgical performance in complicated cases from specialists who have had greater experience in the management of the surgical problem under consideration. Successful surgical procedures are dependent on accurate diagnoses, proper preparation of the patient for operation, recognition at the time of operation of the exact nature of the pathologic lesion and how best to manage it without detriment to the patient. A properly anesthetized patient, adequate assistance at the operating table, and adequate exposure of the operative field which is properly lighted are essentials to the performance of an accurate surgical procedure. Barring unexpected accidents such as cardiac arrest, the control of severe hemorrhage is probably the most frequent problem which presents itself at the time of the surgical procedure. Injury to adjacent viscera is probably next in frequency. Both of these complications are usually avoidable if the surgeon knows the regional anatomy in relation to the pathologic lesion present and has the experience to deal with it properly with a minimal risk. At one time or another, complications will occur during and following surgical procedures performed by even most experienced surgeons, but they occur with far less frequency on the service of the well-trained surgeon experienced in the type of operation that he is performing. Recognition of the complication and its immediate correction or compensation for, regardless of the time involved, is essential.

If one does not have the experience and the ability to carry out these corrective procedures, immediate surgical assistance by one who has had such experience is imperative. But more than that, a surgical procedure should not be undertaken by any surgeon who is not qualified to handle any complication that may arise.

For certain types of surgical lesions it is almost imperative to seek the cooperation of medical specialists working in related fields. I refer particularly to endocrinologic, gastroenterologic and urologic lesions. In addition, in certain cases the advice, counsel, and assistance of the psychiatrist are of great value before, during and after operation, particularly for patients who have become addicted to opium derivatives, barbiturates, and certain tranquilizers.