COMPLICATIONS OF ABDOMINAL SURGERY AND THEIR MANAGEMENT

By W. Wayne Babcock, M.D., Philadelphia, Pennsylvania

(From the Surgical Department of Temple University)

THE best criteria of improvement in abdominal and pelvic surgery are reductions in mortality and morbidity. We constantly seek more accurate diagnostic measures that patients may not be harmed by delay. If our operative mortality in a certain field is 3 per cent we strain to reduce it to 2 and 1 per cent. If the postoperative treatment has required three weeks of hospitalization followed by months of partial disability and the wearing of protecting appliances, we seek measures to eliminate such delay and disability. Because a well known gynecologist lost one or more patients every year from hemorrhage following mass ligations in hysterectomy, two additional years of service with another operator were well worth while to the intern because they taught him that by double individual ligatures on every important vessel postoperative hemorrhage could be eliminated. Doubtless every experienced surgeon has found a measure or measures which once in a hundred or a thousand times will save a life or more frequently obviate a disability which may lead to an additional serious operation. If surgeons could pool their experiences and routinely adopt all the life and health-saving measures now in individual use it would seem substantial progress could be made. But it is not ordained for very diverse personalities to think and act alike. However, here are suggestions in which I personally have much faith.

Diagnostic Aspiration.—Is there blood, pus, visceral leakage or neoplasm involving the peritoneal cavity? Shall we use roentgen and other laboratory studies and speculate, and then Ochsnerize and delay? No patient with symptoms of an acute abdominal emergency is too ill to have an immediate aspiration of the peritoneal cavity performed under local anesthesia without moving him from his bed. A hypodermic needle has been recommended, but this merely samples supernatant fluid, which may be serous and odorless, while there is free fetid pus or other material in the pelvis or abdominal recesses. A narrow, nonirritating, double lumened aspirator ("searching sump") can at once be introduced through a small trocar puncture or stab wound to nearly any part of the peritoneal cavity and may imme-

diately establish by the character of withdrawn contents the intra-abdominal lesion. If pus, bile, urine or gastro-intestinal contents are withdrawn, the drain is left in to evacuate the cavity continuously until operation or other necessary procedure is instituted. If there is blood, one finds a guide as to whether the bleeding is continuous, intermittent or arrested; endometrial or malignant; and whether an operation is urgent or may be delayed. With serous fluids the finding of cancer cells in the centrifuged part has repeatedly saved the patient an unnecessary exploratory operation.

After an abdominal operation, should alarming symptoms develop, an early sump aspiration under local anesthetic may be life-saving. The small tube is introduced through the wound between stitches or through a puncture wound to the field of operation or dependent portions of the abdomen. Such diagnostic aspiration performed promptly when alarming postoperative symptoms develop will immediately differentiate operative hemorrhage, leakage or peritonitis, and enable one to save an occasional life.

Safety in Drainage.—Postoperative drainage is both abused and neglected. Adherent gauze drains are torn too early from septic wounds, with resultant fatal bacteremia; are left too long with perforation of a viscus; or are so large that a secondary troublesome and dangerous abdominal hernia follows. Drains made of gauze, rubber, plastic materials and alien animal products are very irritating to the peritoneoum and leave extensive intra-abdominal adhesions. Experiments of our group have shown that drains made of glass and rustless steel do not produce reactionary adhesions and that what has been deemed impossible—drainage of the entire abdominal cavity—may be continued for four or five days or more, provided no other adhesion-producing element is present. With narrow double tubes of glass or 18-8 alloy steel and continuous aspiration, prolonged and very adequate drainage of the abdominal cavity has been obtained with decided reduction in mortality and morbidity. The tubes are small and may be brought out of the abdomen through the operative incision or a small adjacent stab wound without leaving a weakness in the abdominal wall sufficient to cause a hernia.

I have used a sump drain in every case of operation on the biliary tract for the last three years, and to this attribute the absence of mortality in any case in which the operation was limited to the biliary system. The drain is removed as soon as the drainage ceases, usually within twenty-four to forty-eight hours. After a simple cholecystec-

tomy with double ligation of the cystic duct we have frequently had surprising quantities of bile aspirated, in one case 450 c.c. Yet the patients have little or no evidence of peritoneal reaction.

Some of my associates have considered, as I formerly did, that a small rubber tube or no drain was adequate after a simple cholecystectomy; result—two deaths, one from bile peritonitis which would have been prevented, the second from hemorrhage which would have been immediately demonstrated by the sump.

For a perforated appendix with diffuse purulent peritonitis we remove or isolate the appendix and without any other attempt to empty the peritoneal cavity introduce a sump drain 6 mm. in diameter to the bottom of the pelvis through the small muscle-splitting incision used. A free aspiration of offensive pus follows; in three or four days this becomes odorless and largely serous. This may be followed by clear serum which ceases to flow about the seventh or eighth day, when the drain is withdrawn. As the entire peritoneal cavity is drained and not walled off in the early period, there is much less danger of secondary abscesses. As a small muscle-splitting incision is adequate and is not kept open with irritating gauze or rubber drains secondary hernias, troublesome adhesions and other complications from drains are largely eliminated. In perforation of a peptic ulcer, gall bladder or intestine or peritoneal abscess two or more suction drains, including one to the bottom of the pelvis, are considered necessary. After rupture of a greatly distended, barium-filled transverse colon obstructed by cancer the pelvic sump drain continued to aspirate fecal particles until the seventh day, yet the patient during this time showed little septic reaction and recovered. Collections of blood are always serious, especially when in contact with a potential focus of infection, as an appendiceal stump from even a simple appendectomy. The few bacteria present enter the blood clot where, protected from phagocytes, they multiply greatly and then swarm out, usually with resulting fatal peritonitis. In those abdominal operations in which capillary oozing has continued, as from denuded areas in operating for pelvic inflammatory disease, we have used a gauze pack. Formerly, we closed the abdominal incision and brought the gauze out through the vaginal cul-de-sac. The slender sump drains 5 to 6 mm. in diameter have satisfactorily replaced such packs in cases in which the loss of blood alone will be trivial.

A perforated abscess or necrotic area may be plugged or guarded by a sump drain. For example, an advanced carcinoma of the sigmoid rested upon a large fused mass of lymphatic glands adherent to the iliac vessels. In separating the lymph nodes from the vessels a foul

abscess was encountered communicating with the intestine and it was obvious that the malignancy was ineradicable. A large sump drain immediately was thrust into the opening and the wound closed about it. The suction removed intestinal leakage as well as contaminated serum from the adjacent peritoneum. The intestinal leakage ceased in about a week, and with later withdrawal of the drain the fistula closed completely. The patient, a physician, was spared an offensive fistula during the remaining months of his life. In several cases in which there was leakage from the bladder into the peritoneal cavity one suction drain was placed on the peritoneal side while a second drain was placed in the bladder. In this way both bladder and peritoneum were kept dry. In four cases in which a ureter was divided, resected or anastomosed in operation for pelvic malignancy the drain served to protect the peritoneum from urinary leakage.

Tubular Glass Drains.—Large and small tubular glass (lamp chimney) drains occasionally are very useful in abdominal surgery. I first had them made for the stage drainage of highly septic gall bladders, the simple drainage of which had given in my hands a mortality of 16 per cent. The gall bladder was exposed and a large glass cylinder anchored over its fundus with four fine wire sutures. After several days when adhesions had isolated the area a button of gall bladder was removed by cautery through the glass tube. This afforded drainage, and later the tube was removed and the stones evacuated with forceps. In about one-fourth of the cases it was found desirable to remove the gall bladder after the acute process had subsided. Seventeen patients treated by such a stage exteriorization and drainage all recovered. Two patients treated by others with removal of the glass chimney in twenty-four or forty-eight hours, the period in which adequate isolation of adhesions had not occurred, died of peritonitis. In the majority of acute purulent gall bladders early cholecystectomy with sump drainage has proved a safe procedure.

Abdominal Gauze Packs.—To isolate septic areas and to control bleeding, gauze packs are of great value. However, they keep the wound open, are difficult to reinforce, adhere, are difficult to remove, and are an important cause of incisural hernia. We use a long strip of folded gauze, which is packed over the desired area and the end brought out of the abdomen through a long straight glass tube only about 1 cm. in diameter. The tube is best brought out through a short stab wound through the abdominal wall, and the operative wound closed without drainage. In a patient who has a bleeding lacer-

ation of the deep part of the inferior surface of the liver, the liver was found too soft to hold sutures and the hemorrhage was arrested by such a pack. The evening of the operation the patient was prostrated by a severe secondary hemorrhage from the glass tube, and I recalled a death from a similar recurrent hemorrhage from the region of the liver, which occurred during reoperation as I was trying to locate the bleeding area. In the present case, however, the packing of additional gauze through the protruding tube immediately arrested the bleeding. We have found this method useful in other cases of intra-abdominal bleeding. In operating for advanced carcinoma in the pelvis one develops a wholesome respect for the veins adherent to the anterior surface of the sacrum, hemorrhage from which may be controlled by gauze pressure, but the veins tear and bleed when one attempts to clamp or tie them. Here the gauze pack brought out through the small glass tube also serves well, and the drain may be removed in forty-eight or seventy-two hours. As this gauze does not come in contact with the abdominal wall or many peritoneal surfaces it is very easily withdrawn and the 10 or 15 mm. wound is soon sealed, leaving no obvious weakness for the development of a hernia.

Ileus.—Postoperative intestinal obstruction is one of the most dreaded postoperative complications. The reported high mortalities from surgical treatment we believe are largely due to delay and to the type of operation selected. The common cause is an adhesion leading to an obstructive angulation of the bowel, which continues until the distended bowel is deflated or the obstruction relieved. A common practice has been to use various agents to stimulate peristalsis and as a final resort to re-open the abdomen and separate the adhesions causing the obstruction. Then the separated bowel often slips back and re-adheres, with return of the obstruction. William Mayo told of a case of obstruction in the postoperative period for which he reopened the abdomen six or seven times to separate adhesions in the pelvis, which repeatedly reformed. The adhesions of the postoperative period are plastic and do not strangulate or interfere with the intestinal circulation, and the obstruction may be promptly and permanently relieved by a simple deflation of the intestine at a point proximal to the obstruction. We make it a practice not to disturb the obstructed area. This type should be clearly differentiated, however, from the ileus occurring months or years after an abdominal operation, at which time there are firm, well organized adhesions which constrict and strangulate, and if not quickly divided produce intestinal necrosis and often a fatal peritonitis. The obstruction

from the soft plastic adhesions, while without strangulation, if neglected leads to a fatal peritonitis as bacteria permeate the walls of the greatly distended intestine. In an experience of over fifty cases the mortality has largely been associated with delay in the deflation. With the onset of symptoms we promptly introduce a duodenal tube for Wangensteen aspiration of the stomach and upper bowel, and if there is no contra-indication, give small evacuant (milk and molasses) enemas, and leave a rectal tube in place. In the mild case these measures bring relief. If after twelve hours the symptoms continue and the abdominal distention has not decreased, a simple enterostomy is in order. By palpation and percussion the most distended intestinal coil is located. If apparently it is the colon, a small muscle-splitting incision is made at McBurney's point if the cecum is distended, and the appendix is withdrawn without dividing the meso-appendix. The wound is closed around the appendix, which is then opened and the largest lubricated rubber catheter that can be introduced is inserted well into the cecum. It should have two or three holes near the tip. By continued gentle irrigation with small quantities of saline solution or 10 per cent peroxide of hydrogen the bowel is gradually deflated. With a 14 or 16 F catheter this may require several hours of persistent effort, the patient meanwhile being covered and in the most comfortable position in bed. After deflation obstructive symptoms, unless there is some complicating condition, disappear and although the adhesions may remain the obstruction rarely recurs. If the colon is not involved, or if the appendix has been removed or has been obliterated, an attempt is made to exteriorize a cone of the most distended loop of bowel. By bringing a cone of the partly deflated bowel through a small opening in the abdominal wall the base of the cone may be anchored temporarily by hemostats, the tip of the cone opened and a catheter tied in by a double ligature tied at two places to an encircling dental cotton roll which prevents the bowel from retracting under the skin. If the base of the intestinal cone is compressed by the pressure of a rather small incision, leakage is prevented as well as fecal soiling, the great danger of an enterostomy. Occasionally the catheter must be introduced under the protection of a curved intestinal clamp or with only gauze isolation, after the introduction of two concentric purse-string sutures. Contrary to the general opinion, enterostomy may occasionally be life-saving after all evidence of peristaltic movement has ceased. If one enterostomy fails, after due trial additional distended coils should be evacuated.

In one of our cases in which there was prolonged delay with diffuse peritonitis, only after three tubes had been inserted in three

different loops of distended paretic bowel was the obstruction in the nearly moribund patient overcome. Frequently the ileus is a part of a peritonitis, which also requires treatment, and it is then important to aspirate the peritoneal cavity continuously. For example, recently I saw a thirty-two year old primigravida eight days after a supravaginal hysterectomy for a large fibroid tumor impacted in the pelvis associated with a two months' pregnancy. The abdomen was greatly distended and very tense, the bowels would not move and for three days there had been vomiting of quantities of opaque yellow fetid liquid (stercoraceous vomiting). The abdominal wound was necrotic beneath the skin, and near the midline what seemed the most distended intestinal coil was outlined by percussion and palpation. Under spinal anesthesia this was exposed by a transverse muscle-splitting, rectus-retracting incision. All adjacent intestinal coils were fused together by heavy plastic exudate with many small collections of serous and turbid fluid between the coils. A long 6 mm. sump drain was gently insinuated between the adherent coils, breaking into a large pelvic abscess from which a large quantity of malodorous pus was evacuated. Without other separation of the adhesions a 36 F catheter was tied in the greatly distended small intestinal coil with the immediate evacuation of between 1,000 and 2,000 c.c. of yellow fetid material like that the patient had been vomiting. Wet permanganate dressings were applied and suction drainage of the pelvis continued. The deep layer of the original wound sloughed out but the intestinal obstruction was relieved and the patient progressively improved without the necessity of further operation except the later closure of the enterostomy opening with fine alloy steel sutures.

The Miller-Abbott tube is not adapted to obstruction of the colon, may fail to pass the pylorus and requires so much manipulation, often over twelve or more hours, that we do not feel it is suitable for the very ill patient in an acute intestinal emergency.

Abdominal fistula often produces, we believe unnecessarily, prolonged disability. After operations on the biliary tract a continuous discharge, frequently of bile, follows. By introducing a small catheter, connected with an aspirating device, into the fistula, the tract is continuously emptied and its walls forced together by atmospheric pressure. This, in our experience, has repeatedly been followed by closure and healing within a few days. If closure does not follow soon, usually there is an obstruction, as from stone or stricture, that requires operative removal. A fistula of the duodenum occasionally follows a right nephrectomy; a fistula of the descending colon, a left

nephrectomy. If one is sent to you for closure you may accept it as a high tribute to your surgical skill. Even though a gastro-enterostomy has previously been done for the duodenal fistula, you will not consider the patient an evidence of diabolical enmity, for you will forthrightly close the opening in the duodenum with interrupted sutures of 36 or 38 alloy steel wire, to the amazement of those who have heard that external duodenal fistulas are incurable.

Small intestinal fistula may follow various abdominal operations, even vaginal hysterectomy, and in the early stage, while the wound is still irritated, may be closed through the abdomen with fine inverting wire sutures, something I have never succeeded in doing with other suture materials.

Some years ago we tried open glass tube drains through the perineum after abdominoperineal resection of the cancerous pelvic colon. Within two weeks' time a small intestinal loop had slipped into the upper end of the small glass tube in three patients, and had strangulated with resulting small intestinal perineal fistulas. Attempts to close the intestinal opening through the perineum failed, but I found it a rather simple operation to bring the open loop into an abdominal incision for closure with wire. Later a patient came in with a small intestinal vaginal fistula that had followed a Price type of vaginal hysterectomy about six weeks before, and the local irritation and erosion were almost unbearable. Evidently a loop of bowel had slipped into the jaws of one of the broad ligament clamps as it was tightened. The patient had been advised to wait and see if the discharge would not cease in time, which of course is not to be expected. The small opening was closed through an abdominal incision.

For the skin irritation of intestinal fistula a dry treatment with exposure of the abdomen under a bed cage, and thorough dredging of the skin with stearate of zinc powder in our experience has been much better than ointments or metallic varnishes. In certain cases the opening may be plugged with a mushroom catheter. For fistulas discharging liquids, aspiration drainage is the most satisfactory treatment. But with alloy steel wire sutures superficial intestinal fistulas often may be closed quickly without opening the abdominal cavity. Odorous discharges from abdominal and perineal openings are best deodorized by layers of gauze over the opening wet with 1:2000 to 1:5000 permanganate of potash solution.

With resection of the large bowel a complemental appendicostomy or enterostomy is an excellent routine procedure. An appendicostomy opening may be dilated by the daily introduction of large cathe-

ters so that in one week we have been able to introduce a 28 rectal tube.

Secondary abdominal abscesses are rare after the use of peritoneal sump drains. Abscesses in the pelvis are conveniently drained through the posterior cul-de-sac in the female and through the rectum in the male. I have been surprised at the effectiveness and absence of mortality from drainage through the rectum.

Wound infections are greatly reduced by the substitution of ligatures and sutures less irritating than catgut. Silk, linen or cotton thread is preferable but much better than any of these is alloy steel wire, which may be used for ligatures and sutures. Thomas E. Jones has published the most impressive results, for he had had 27.5 per cent of abdominal wound infections after resecting the colon for cancer. Substituting wire for part of the catgut sutures used, the infections dropped to 14 per cent; using wire alone, there was but one infection in over 100 operations. In so-called clean abdominal wounds we have seen during the ten years we have been using rustless steel wire no delayed secondary suppuration in the subcutaneous fat such as was not infrequent following the use of catgut.

Wound dehiscence and secondary incisural hernia in clean wounds have practically been eliminated by the use of the wire. Hospital confinement has been halved or better. After clean appendectomies patients are permitted to be out of bed as early as the second day, as are elderly patients in whom we fear hypostatic congestion after hernioplasty. Colonel Bethea, of Fort Sam Houston Hospital, Texas, is routinely getting the soldiers out of bed the day after a hernioplasty or appendectomy. We permit patients to go home seven days after an uncomplicated cholecystectomy or abdominal hysterectomy, and in ten to fourteen days after a gastric or intestinal resection, and thus far have had no accident from the practice. The use of transverse or oblique muscle-splitting abdominal incisions is a desirable added precaution against postoperative hernia.

An aseptic single clamp method of end-to-end resection has largely replaced all other methods for the removal of abdominal portions of the intestine. The single clamp also may be used in end-to-end or side-to-side intestinal anastomosis, or for an aseptic partial or complete gastrectomy. The loop of bowel to be removed is freed, the arms of the loop aligned with four guy sutures and divided between two narrow bladed clamps by cautery. This leaves the ends to be united in the grasp of a single clamp which is turned over, the posterior sutures inserted, then turned back for the anterior rows

of sutures, the clamp being opened and withdrawn as the anterior continuous suture is tightened, and inverts and seals the anterior edges of the bowel. With multiple short clamps of different sizes it is possible to do very complicated resections aseptically without soiling, such as a combined resection of the stomach, transverse colon and jejunum for a gastrojejunocolic fistula.

Elimination of Colostomy.—It is our impression that a permanent colostomy is not essential in any case of removable carcinoma of the large bowel, and in nearly 400 cases we do not feel that the radical nature of the operation has been compromised by the omission of the colostomy. Nearly all of these resections, except in patients with obstruction, have been done in one stage, apparently with a reduction in mortality and morbidity. In fifteen cases we have moved to the perineum a colostomy left by a Miles or other type of operation. Besides for carcinoma of the large bowel, the colostomy had been done for congenital absence of the anus and lower rectum, the bowel emptying into the bladder; for lymphopathia venereum, and for destruction of the rectum by heavy irradiation used for carcinoma of the uterus. The change to a perineal opening, even without sphincters, was found of decided advantage.

DISCUSSION

DR. FREDERICK S. WETHERELL, Syracuse, N. Y.: I am at an advantage, and also at a disadvantage, in that Dr. Babcock sent me the first draft of his paper, which I read, and upon which I based my intended discussion. However, he has left out many things in his talk which do appear in the paper.*

His thesis is based on the thought that if surgeons could routinely adopt life-saving measures, substantial progress would be made. The "sump drain," and other ingenious mechanical devices which Dr. Babcock has devised, are of inestimable value in the type of case in which he uses them. I have placed cotton before wire but know the excellent results which obtain in wound healing with the wire.

The disadvantage in this discussion is now quite evident for I am unable to make the exact remarks which I wanted and planned to do, as you are not aware of what Dr. Babcock's paper contains. I should like to reiterate the thought that obstetricians and gynecologists must read the same books that the surgeon reads. A recent one on surgical physiology I commend to all of you, as well as a perusal of the recent work of Scudder on shock. Knowledge of water balance and the handling of that problem are far from being well understood by many surgeons, and it is most important in the outcome of operations.

DR. THADDEUS L. MONTGOMERY, Philadelphia, Pa.: During the past two

*Dr. Babcock showed color slides and discussed the cases thus presented. His paper was not read from copy.

years I have had the rare privilege of working in the same institution with Dr. Wayne Babcock. I count this as one of the really important experiences of my professional career. Dr. Babcock's ingenuity, industry and constant striving towards perfection in surgery provide a stimulating association for any young man.

Because the question of cotton suture has been brought up, I would like to say a few words concerning our experience with this material in the Gynecological Division of our Department at the Temple University Hospital. This experience has been brief and probably not wide enough for me to speak with sufficient authority on a subject which has been so completely studied by more able workers in the surgical branches. Nevertheless, there were experiences encountered in our usage of this material in gynecologic surgery which might be of interest and significance to those who plan to undertake similar work.

We found the cotton suture a nice material to work with in many respects. Its delicate texture and its nice approximation of tissue were pleasing to the surgeon and the end results in many cases were quite satisfactory. Certain complications and conditions arose, however, which made us ultimately give up cotton as a suture material for routine usage.

In the first place, we found it difficult to secure a material of proper tensile strength for the ligation of large vascular pedicles, such as one encounters in the pelvis in the performance of hysterectomy, oophorectomy, et cetera. So often were we faced with the breakage of the ordinary sized cotton suture just at the critical moment of tightening a ligature on the uterine artery or the infundibulopelvic ligament that we finally resorted to a grade of quite heavy cotton for this purpose. This material was quite heavy and I often wondered if it did not constitute of itself a nidus of irritation in the pelvis in subsequent weeks. Again, the cotton is of such texture and woven in such fashion that instead of tightening up smoothly on the taking of the first knot there is a tendency to "jump" and with the final "jump," particularly on a heavy pedicle, the suture would break.

We found also, contrary to what has been stated by many of the advocates of cotton suture, that the sutures would not heal in, in the face of infection, but gave rise to prolonged sinus formation. For instance, in two cases of infected ovarian cysts which were drained by abdominal incision, cotton was used and prolonged sinus formation resulted which still persists. We have snagged out several pieces of cotton, but apparently some still remains in the deeper tissues. In two clean cases in the gynecologic ward infection of the abdominal incision took place. This was unfortunate but the infection seemed mild and we expected a rapid relief of symptoms, and anticipated that the suture material in deeper structures would heal in nicely without difficulty. To the contrary, however, these sinuses persisted, healing at one point and opening at another. This continued so persistently that we finally had to excise the entire skin incision and the involved fascia and reunite fascia and skin with wire sutures. The wire, incidentally, healed in without any evidence of infection.

Also, the handling of wet cotton is not an easy or altogether pleasant task for the surgeon who is not accustomed to it. The cotton clings to the glove and is dislodged with great difficulty. A good deal of gesturing and flipping of the hands, and snapping of the fingers, is necessary to dislodge the moist cotton from the surgeon's gloves.

All of these difficulties might eventually have been overcome by further trial if we had had the patience to extend it. I dare say, also, that much of our difficulty was due to the fact that none of us was accustomed to the usage of a nonabsorbable suture material. Be that as it may, we gave up the cotton suture technique for the reasons set forth and have returned to the use of chromic catgut of sufficient tensile strength to satisfy the needs of the particular situation in which it is employed, and of wire in the face of infection or in the face of obesity where there is danger of breakdown of catgut. I must say that we have been happier since we returned to these, our old favorites.

DR. VIRGIL S. COUNSELLER, Rochester, Minn.: I want to take this opportunity to express my appreciation of Dr. Babcock's excellent presentation. I do not believe that I have ever seen a more complete series of difficult surgical situations to handle. The tremendous experience that Dr. Babcock has had over the years certainly qualifies him better than anyone else to handle them and to pass on information to us.

There are a few points about which I should like to inquire. As you have noticed, many of the patients shown by Dr. Babcock were rather obese and elderly, so that, even if their body chemistry is normal, they are tremendous surgical risks, considering the many scars of life that they have sustained during the passing of the years. I should like to know whether Dr. Babcock has been doing anything to prevent thrombosis and embolism among some of these patients. I might say that we have been using dicoumarin for all patients who have undergone abdominal hysterectomy, and thus far we have not had one instance of embolism or phlebitis since we began to use it. Control patients have been those who did not receive it, and among them there have been some instances of phlebitis.

Also, I should like to know whether or not Dr. Babcock feels it is a distinct advantage to have patients out of bed sooner than was customary? I feel that it is a tremendous advance, that patients' wounds will even heal better than before and that their convalescence is helped greatly by such a practice.

I use very little silk, cotton or wire suture material. I know that Dr. Babcock has had wonderful results with wire, but I do not know that it is used generally throughout the country. What makes me somewhat skeptical about the value of cotton is the fact that it has been presented by some of the most capable workers in this country, and yet it is being very slowly accepted by the profession. I do not know whether this is due to caution or to something else; I think cotton in some types of wounds may be excellent suture material, but that it is not to be used to the exclusion of all other types of suture material.

DR. RONGY: May I ask Dr. Counseller when he started dicoumarin and how much was given?

DR. COUNSELLER: A dose of 300 mg. is administered on the first day after operation; then 200 or 300 mg. on every third day, depending on the reaction from the first dose.

DR. W. WAYNE BABCOCK, Philadelphia, Pa. (closing): To keep within the time limit and to demonstrate pertinent points quickly, I have shown col-

ored pictures of patients and operations rather than attempt to read a fairly long paper. I regret that this has handicapped Dr. Wetherell's discussion, although he has read the paper.

The Miller-Abbott tube is a very ingenious and praiseworthy device. I would join Dr. Abbott, however, in condemning the use of the tube as the sole treatment for a strangulating intestinal obstruction, a perforated appendix or bowel or an obstruction of the colon. There are times when any delay is inexcusable. The passage of the tube may require fourteen hours or may fail. An immediate enterostomy is relatively safe and usually is dependable. A delayed enterostomy is often too late. In a number of advanced cases of ileus we likewise have seen recovery follow one or more enterostomies.

As to water balance—the very ill adult patient does not require the 3,500 c.c. of fluid daily which has been advised. The athlete is put on a "drying out" regime before his intense exertion and tissues, edematous from hydration, do not heal as well as those of the somewhat dehydrated patient. Infants and elderly arteriosclerotic patients are prone to have cardiac arrest from distention of the cardiovascular system. One of my elderly patients developed precordial distress from the drip infusion of 90 to 100 c.c. of 5 per cent glucose and died suddenly, at a later occasion, when the flow was not stopped when symptoms appeared.

The results with cotton thread which I saw in New Orleans were very impressive but in our hospital Dr. Montgomery's experience was unsatisfactory, and experimenting on dogs we found that the thread led to a marked fibroplastic reaction.

While we have not used dicoumarin to prevent pulmonary thrombosis we were well impressed by the reports at the Mayo Clinic.

Six or seven years ago our group had several cases in succession. Since that time I have used wire sutures exclusively and it may be coincidental that I have had no further case of fatal pulmonary thrombosis or embolism. The patients are permitted to be out of bed earlier than before, after appendectomy in one to three days, after cholecystectomy in four or five days, after resection of the colon in three to six days. We also encourage patients to take light bed exercises, and we turn or raise them rather frequently to prevent hypostatic congestion. I imagine that laboratory tests in a fair number of these patients would have inspired the use of an anticoagulant.