Atlas of
SURGICAL TECHNIQUES

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Philip Thorek
M.D., F.A.C.S., F.I.C.S.

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Philip Thorek
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Clinical Professor of Surgery, University of Illinois College of Medicine;
Formerly Professor of Surgery, Cook County Graduate School of Medicine, Chicago;
Diplomate, American Board of Surgery

Illustrated by

Carl T. Linden

Formerly Assistant Professor in Medical Illustration,
University of Illinois, College of Medicine, Chicago

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Preface

The procedures described herein are those which have been most successful in my hands for over a quarter of a century. It is not the purpose, in a text of this type, to condemn or condone the various theories which lead to operative techniques. I wish merely to re-emphasize that these are the operations that have produced the best results in my patients. For example—I am well aware that vagotomy and pyloroplasty seem to be the *modern* procedures of choice in many cases of complicated duodenal ulcers. I am doing my share of them and have described the technique in this atlas. However, I am not convinced. at this writing, that this operation will replace the one that has given me such excellent results for similar ulcers, namely, vagotomy with anterior gastrojejunostomy and jejunojejunostomy. A surgeon is exposed to various methodologies but must apply his own custom-made logic to each case. Is it not an embarrassing admission that in 1970 we cannot agree on the ideal method of suturing bowel? We were taught and have taught that mucosa to mucosa anastomoses would not heal. Some of the current surgical literature refutes this in that it states not only that mucosa to mucosa will heal but that it is the method of choice. What was orthodox yesterday is heterodox today. Modern surgical debates revolve around four basic methods of suturing the bowel, namely:

1. The so-called "standard" anastomosis, a double row of inverting sutures, which seems to be the one most commonly used today;
2. The "Halsted" method—a single row of inverting sutures in which the needle theoretically catches the submucosa (I am certain that in many instances the surgeon unknowingly enters the lumen of the bowel);
3. The "Gambee' stitch, which is basically a one-layer through and through inverting stitch;
4. The "Navy", method, which has been described by Holloway and his Navy group.

Take your choice! However, be conversant with all, study them, experiment with them and then utilize that or those which prove best for your patients. I believe that a given method may be more applicable in one case than in another. Suffice it to state that many researchers are of the opinion that there are no significant differences in the healing of inverted or everted esophagogastrointestinal anastomoses.

The various types of suture materials have also brought some confusion to our surgical thinking. I have found catgut preferable when continuous sutures are used and #24 or #50 cotton when interrupted sutures are required.

The objective of a text of this type is to avoid confusion as much as possible. I have lived with this surgical philosophy—that I prefer to understand a little than to misunderstand a lot. Since these techniques represent personal preferences, I have not encumbered the text with a bibliography. The material in this book has been taken mainly from my notes of operative procedures which were made primarily for my surgical residents. As I have frequently stated, "to steal from one source is plagiarism, to steal from many sources is research." Inasmuch as this book is beamed mainly to the general surgeon and his residents in general surgery, organ transplantations, vascular surgery and the more complicated sophisticated procedures have been excluded.

I wish to thank Carl T. Linden for his magnificent wash illustrations which speak for themselves. I have been a most fortunate author in having the close collaboration of and exposure to the genius of an artist such as he. We have been in daily contact so that the format of this book presents the text and illustrations on specific opposing pages. My thanks also go to Leota Bailey, R.N., our former surgical supervisor, for her painstaking efforts in reviewing the procedures, typing and editing the text. J. B. Lippincott Co., as always, have been most understanding of and sympathetic to the quirks, foibles and fears of both illustrator and author. I owe them a special vote of thanks.

Philip Thorek, M.D.

Contents

CHAPTER 1

General Considerations

Sutures and Suturing

Skin sutures

The more commonly used skin sutures are depicted from A through F. The suture material is chosen by the surgeon, and should be nonabsorbable. I prefer #50 cotton.

A. The *simple interrupted* suture is one of the most commonly used. The cosmetic results are usually excellent, provided that the knot is tied snugly, not tight, and that massive bites are avoided.

B. The *continuous* skin suture approximation usually produces satisfactory cosmetic results. However, the surgeon is placing "all his eggs in one basket." If there is an infection, the entire suture must be removed. Should the suture break, the wound gapes.

C. The *locking stitch* (blanket) is an approximating skin suture of the continuous variety.

D. The *interrupted mattress* suture is a good type of skin-approximating suture. It should not be confused with the Halsted interrupted mattress suture shown in I.

E. Another interrupted type of mattress suture is the so-called end-on-end type.

F. The *subcuticular* stitch is placed immediately beneath the skin as a continuous suture. (It can be placed also as an interrupted suture.) It is popular because of the excellent cosmetic results.

Gastrointestinal sutures

It is disconcerting that there is no unanimity of opinion as to how the bowel should be sutured. In 1887 Halsted stated that only one row of sutures is necessary in end-to-end anastomoses of the intestines. Well-qualified surgeons still argue the pros and cons of one-layer versus two-layer methods of suturing, and the advantages and disadvantages of open or closed anastomoses. To add to these dilemmas, we must consider suture placement and suture materials. Some authorities state that the standard two-layer closure affords greater security and fewer leaks. Others insist that the two-layer closure jeopardizes the arterial and venous supply and the lymphatic return, thereby increasing edema, avascular necrosis, leaks, and abscess formation. The inverted cuff produced by the two-layer method supposedly constitutes a bowel obstruction hazard. Everting stitches in one-layer anastomoses avoid the constricting inverted cuff but are thought to be weaker and predispose to adhesion formation. And so the arguments go on and on ad infinitum. Who knows? Each surgeon has to make his own decisions based upon his experiences.

I prefer the standard two-layer closure for gastrointestinal anastomoses and a one-layer everting method in pyloroplasties. I prefer an *interrupted* suture technique unless the stomas are particularly wide as in gastrojejunal anastomoses. For large stomas I use continuous 00 chromic catgut for the inside suture lines and an interrupted nonabsorbable (#50 cotton) for the sero-serous suture lines.

Some of the more commonly used intestinal sutures are depicted from G through K.

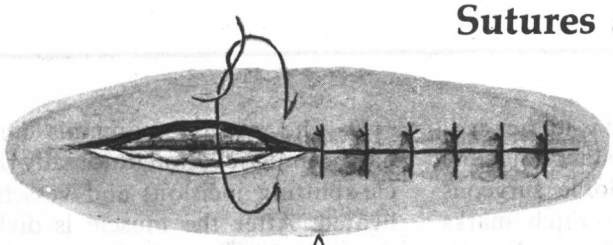
G. One of the most commonly used sutures in intestinal surgery is the interrupted Lembert. This type of stitch, as well as the continuous Lembert and interrupted Halsted mattress suture, includes the *submucosa.* In other words, this stitch includes the serosa, muscularis, and submucosa.

H. The Lembert suture utilizing the continuous technique.

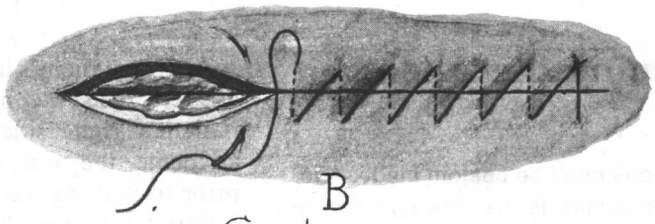
I. The interrupted Halsted mattress suture is a popular type of "serosa-to-serosa" stitch. Note that the needle does not enter the lumen of the bowel but includes serosa, muscularis, and submucosa.

J. The continuous Cushing "sero-serous" type of suture is also popular in some centers. Note that the needle does not enter the lumen of the bowel but includes the serosa, muscularis, and submucosa.

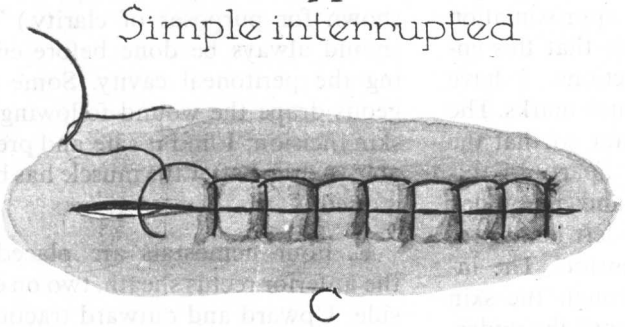
K. The continuous Connell has been a favorite of mine in gastrointestinal anastomoses for many years. I utilize this stitch as a through-and-through hemostatic suture grasping all layers. It is particularly useful when the stomas are large. The stitch goes from outside in and then comes out *on the same side.* This is repeated on the opposite side.



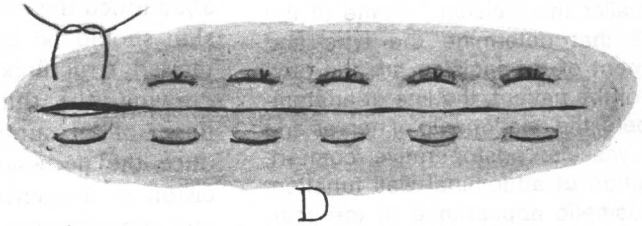
A
Simple interrupted



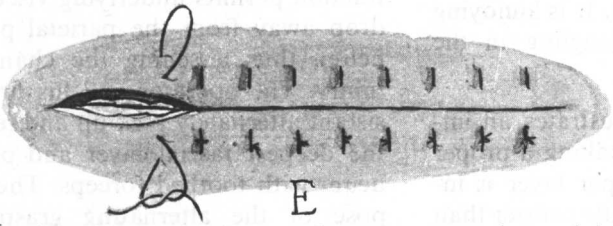
B
Continuous



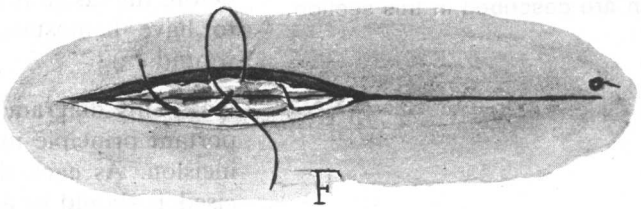
C
Locking stitch (blanket)



D
Interrupted mattress

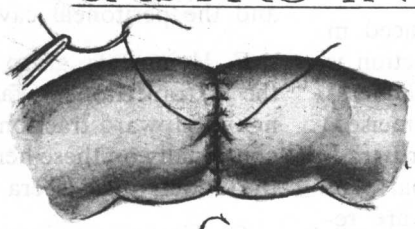


E
Interrupted end-on-end (mattress)

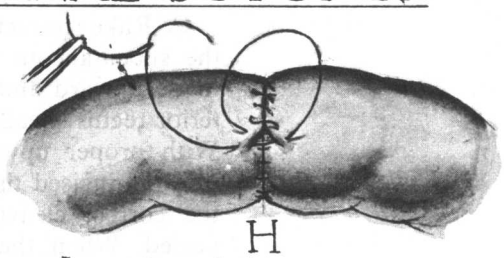


F
Subcuticular

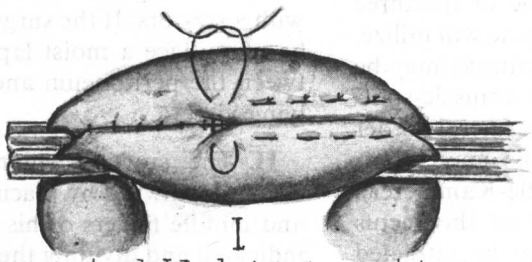
GASTRO-INTESTINAL SUTURES



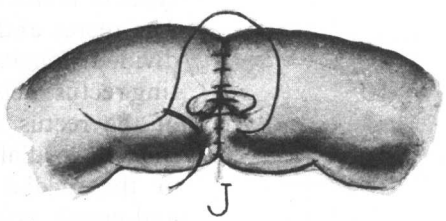
G
Lembert interrupted (sero-serous)



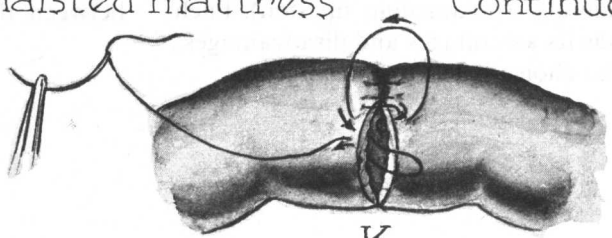
H
Lembert (continuous)



I
Interrupted Halsted mattress



J
Continuous (Cushing)



K
Continuous (Connell)

Opening the Abdomen

Incisions must be custom made. Adequate exposure is the *sine qua non* of all surgery. I am a firm believer in the axiom, "the bigger the surgeon, the bigger the incision—the smaller the surgeon, the smaller the incision." Some of the factors that determine the type and placement of the incision are the physique of the patient, the line of anatomical fibers, the relationship of nerves and blood vessels, postoperative comfort, restoration of abdominal wall function, and cosmetic appearance of the scar. Since specific incisions are described under the specific operations, only the principles of opening and closing the abdomen are described in this section.

A. The patient's head is to the reader's left; the surgeon is standing at the patient's right side. Some surgeons advocate the use of scratch marks prior to making the incision in preparation for better skin approximation on closure. Others state that this encourages wound infections. I have abandoned the use of such marks. The skin should be held taut so that the incised structures fall apart. In this drawing, the thumb and the index finger of the surgeon's left hand produce the necessary tension. The incision is deepened through the skin and subcutaneous fat until the underlying fascia is exposed. Bleeding vessels are carefully clamped and ligated before the fascia is cut. It is annoying to have hemostats dangling in the wound.

B. This diagram illustrates an important principle in making a proper incision. As each deeper layer is incised, it should be a little shorter than the one previously incised. This expedites closure and strengthens the sutured wound.

C. Rake retractors are placed in the subcutaneous fat and traction is made upward and outward. The anterior rectus sheath (fascia) is incised. With proper upward, outward traction the incised tissues fall apart and the correct cleavage planes are revealed. When the underlying rectus abdominis muscle is exposed, the surgeon decides which one of the three types of rectus incisions he will utilize. The rectus abdominis muscle may be divided longitudinally (muscle-splitting rectus incision), the lateral border of the rectus abdominis may be retracted medially (Battle-Kammerer), or the medial border of the rectus abdominis muscle may be retracted laterally (paramedian incision). Each has its advantages and disadvantages; the choice is left to the surgeon.

D. The rectus abdominis muscle has been divided longitudinally (muscle-splitting incision) and vessels are ligated. After the muscle is divided, the wound is draped. (Drapes are not shown for purposes of clarity.) This should always be done before entering the peritoneal cavity. Some surgeons drape the wound following the skin incision; I find it safe and preferable to drape after the muscle has been incised.

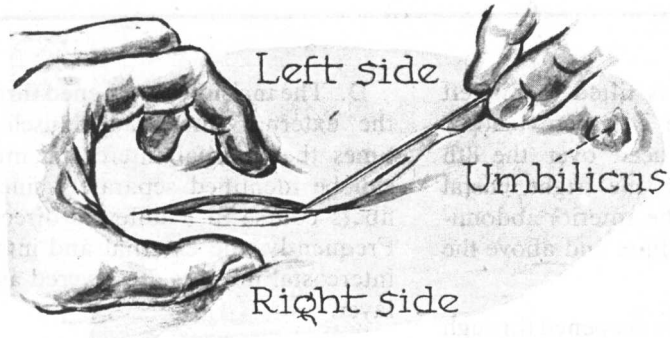
E. Four hemostats are placed on the anterior rectus sheath, two on each side. Upward and outward traction is made. If the anesthesia and relaxation are adequate, the upward, outward traction permits underlying viscera to drop away from the parietal peritoneum, thus lessening the chance of injury. The operator and his first assistant alternately pick up and release the deepest fascial layer and peritoneum with toothed forceps. The purpose of the alternating grasp and release is to make certain that no viscus has been included in the first grasp. The posterior layers are divided and the peritoneal cavity is entered.

F. Hemostats grasp the edges of the extraperitoneal fat and peritoneum. Upward traction is maintained continually on these hemostats so that the underlying viscera escape injury.

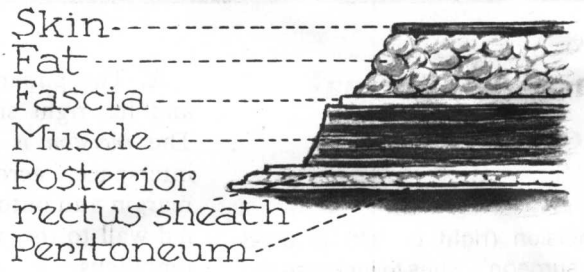
G. The incision is enlarged upward by continually elevating the tissues that are being cut. This is best done with a scissors. If the surgeon chooses, he may place a moist lap sponge between the peritoneum and the underlying viscera.

H. The surgeon enlarges the incision downward by placing the index and middle fingers of his left hand as indicated and dividing the peritoneum between these fingers with a scalpel.

Opening the Abdomen



A



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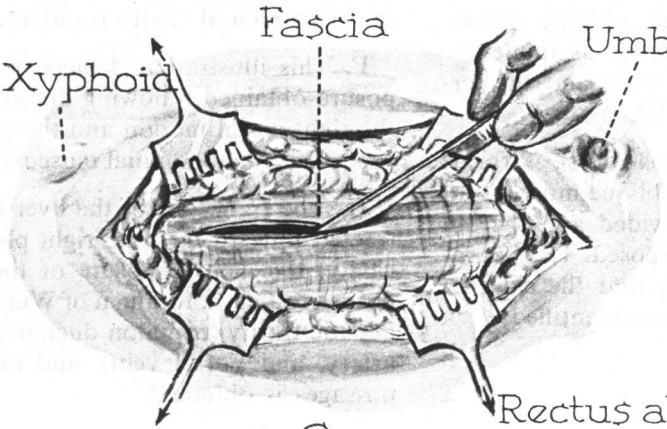
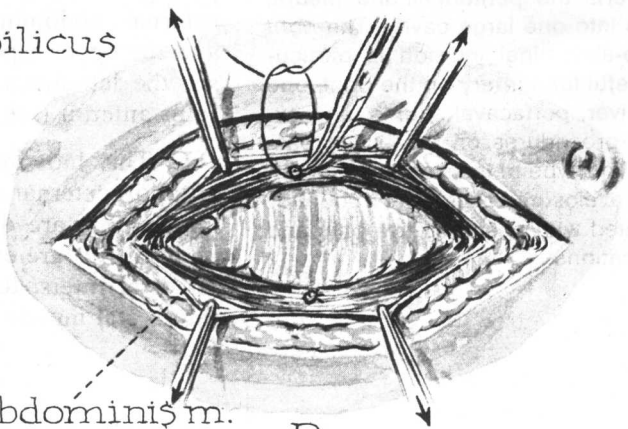
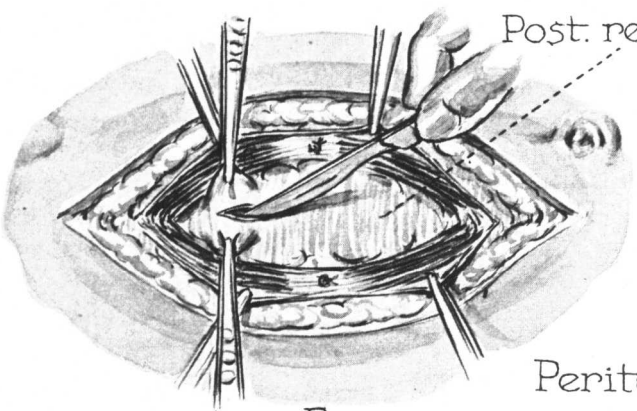


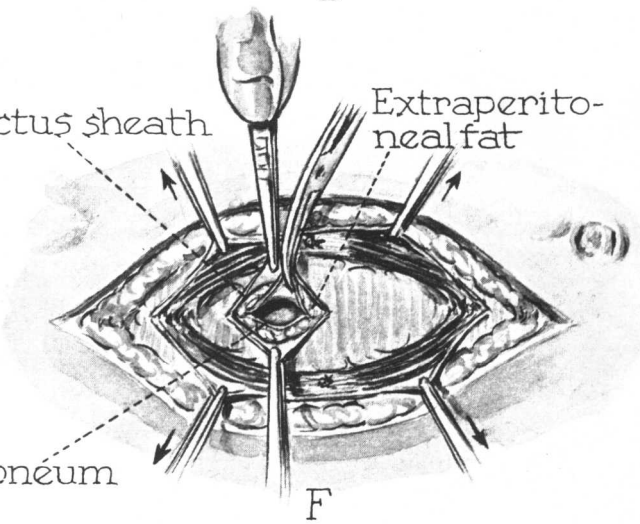
C



D



E



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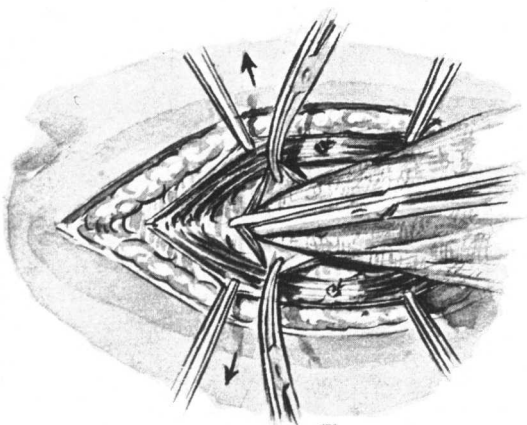
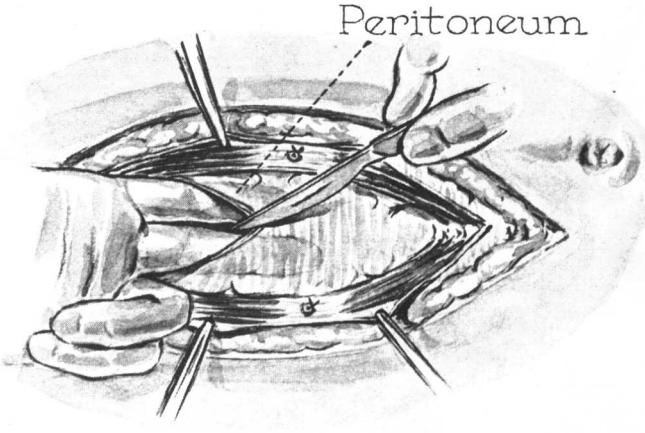


G



H

Thoraco-Abdominal Incision

This incision (right or left) is used when the surgeon wishes to increase the exposure of the operative field or when he contemplates one of the more extensive thoraco-abdominal operations. It converts the peritoneal and pleural cavities into one large cavity. The *right* thoraco-abdominal incision is particularly useful for surgery on the right lobe of the liver, portacaval shunts, and extensive procedures on the biliary passages. This type of incision is time-consuming at closure and is more frequently associated with postoperative pain and complications.

A. The patient is tilted to his left and his right side is hyperextended. The *incision* is placed over the 8th interspace, across the right costal margin and onto the anterior abdominal wall to the midline and above the umbilicus.

B. The incision is deepened through the skin and subcutaneous tissues, exposing the underlying muscles—the external abdominal oblique muscle and the upper aspect of its aponeurosis, the latissimus dorsi and the serratus anterior (see C).

C. The latissimus dorsi, serratus anterior, external oblique muscle, and aponeurosis are divided and the 8th and 9th ribs are exposed. The 8th intercostal interspace and the external intercostal muscle are identified.

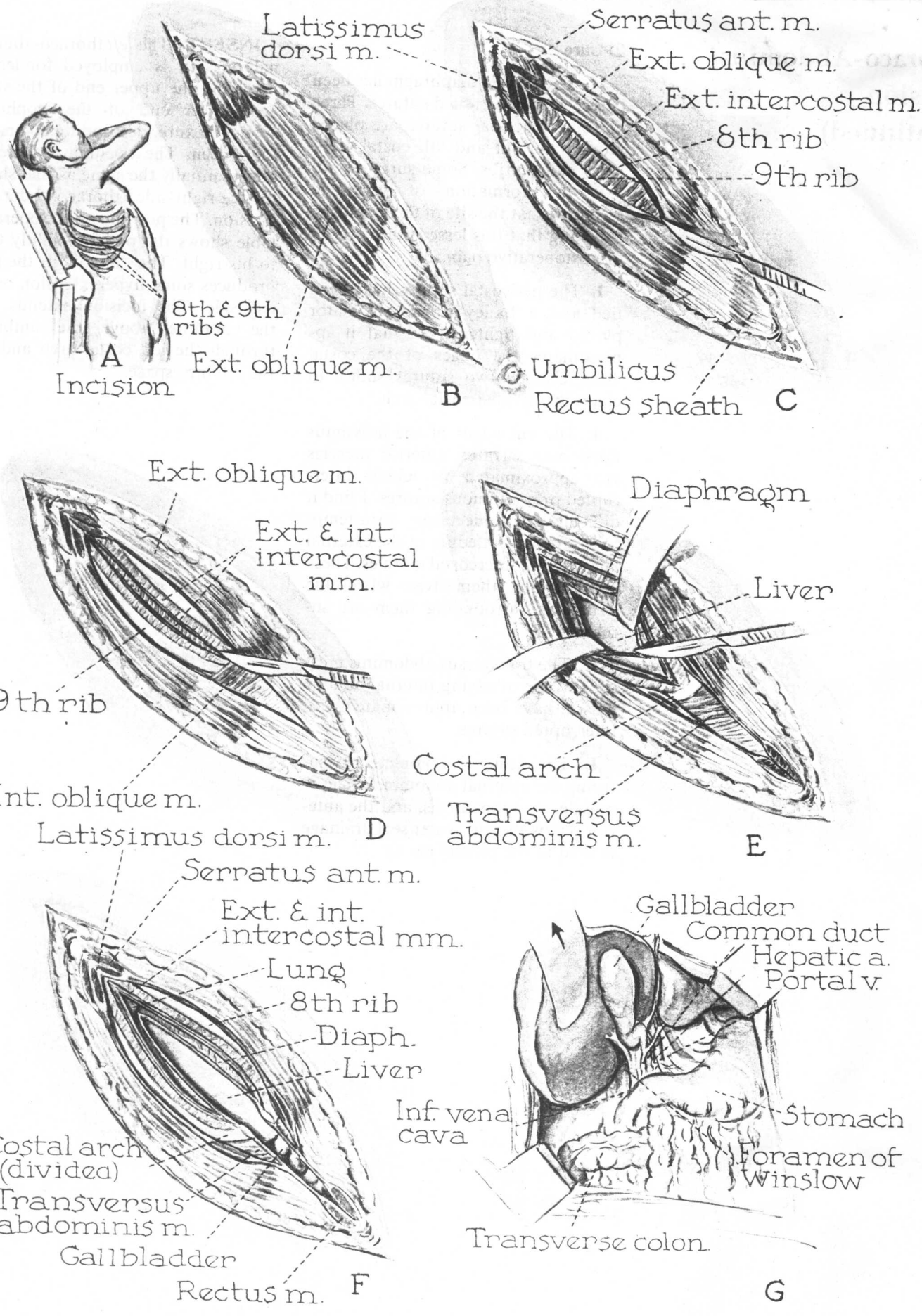
D. The incision is deepened through the external intercostal muscle. At times the internal intercostal muscle can be identified separately since its fibers course in a different direction. Frequently, the external and internal intercostal muscles are severed as one layer.

E. The parietal pleura and the right leaf of the diaphragm are incised and the right pleural cavity is entered.

F. This illustration depicts the exposure obtained following division of the right costal margin and the upper aspect of the abdominal musculature.

G. The right lobe of the liver is retracted upward into the right pleural cavity. Excellent exposure of the inferior vena cava, foramen of Winslow, hepatic trinity (common duct, hepatic artery, and portal vein), and biliary passages is obtained.

Thoraco-Abdominal Incision



Thoraco-Abdominal Incision (continued)

Closure

H. The incised diaphragm has been closed with interrupted sutures. Three or four pericostal sutures are placed around the 8th and 9th costal cartilages and/or ribs. Some surgeons advise the formation of periosteal "windows" at the site of these sutures, believing that this lessens the severity of postoperative pain.

I. The pericostal sutures have been tied and a Bailey rib approximator placed and tightened so that it approximates the edges of the costal arch. Usually two sutures suffice to coapt the divided costal arch.

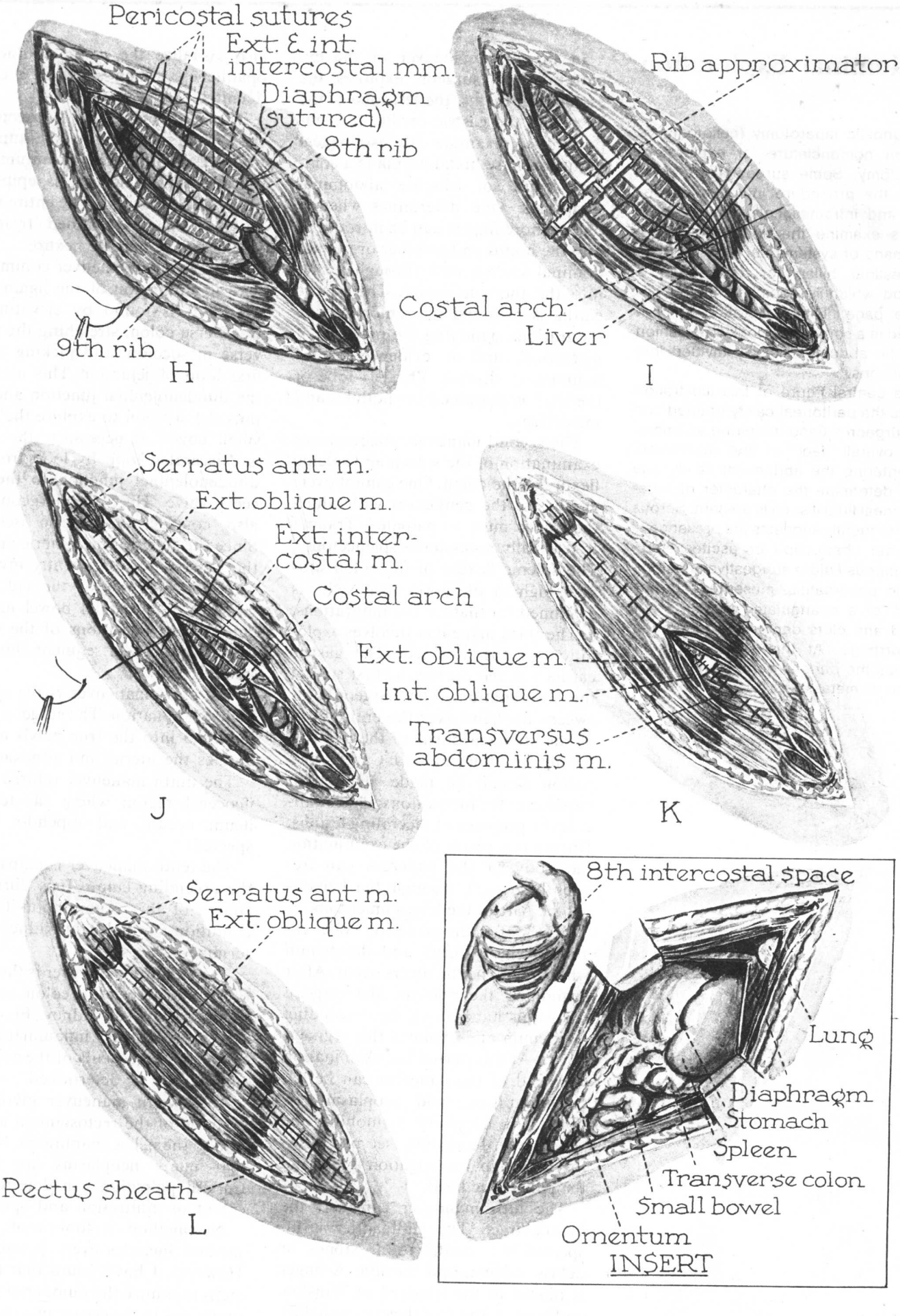
J. The cut edges of the latissimus dorsi and serratus anterior muscles are approximated by either interrupted or continuous sutures. I find it difficult and unnecessary to attempt to suture the cut edges of the external and internal intercostal muscles. These approximate themselves when the structures surrounding them are sutured.

K. The transversus abdominis muscle and the overlying internal oblique muscle have been approximated with interrupted sutures.

L. The closure is completed by suturing the external abdominal oblique muscle, its aponeurosis, and the anterior rectus sheath. Water seal drainage is used in the pleural cavity.

INSERT: The *left* thoraco-abdominal incision is employed for lesions involving the upper end of the stomach, lower end of the esophagus, splenic flexure, descending colon, and the spleen. The opening and closure are essentially the same as that shown for the right-sided thoraco-abdominal incision. The position on the operating table shows the patient slightly tilted to his right. The "break" in the table produces some hyperextension on the left side. The incision extends from the midline above the umbilicus through the left costal arch and into the 8th interspace.

Thoraco-Abdominal Incision (continued)



Abdominal Exploration

Diagnostic laparotomy (celiotomy) is *modern nomenclature for exploratory* laparotomy. Some surgeons prefer to divide the procedure into supramesocolic and inframesocolic explorations. Others examine the abdominal cavity by means of systems such as the gastrointestinal, billary, or renal. I use a method which is depicted on the opposite page. The exploration is conducted in a somewhat clockwise fashion with the abdominal cavity divided into 12 sections.

The central figure of this illustration shows the peritoneal cavity opened and the surgeon's hand acquiring an immediate overall "feel" or first impression. On entering the abdominal cavity one must determine the character of intraperitoneal fluid if such is present. Serous fluid frequently suggests the presence of a bowel obstruction or ascites; serosanguinous fluid is suggestive of hemorrhagic pancreatitis, mesenteric thrombosis, or a strangulated viscus. Frank blood and clots denote intraperitoneal hemorrhage. At this stage the hand sweeps the *parietal* peritoneum for evidence of metastases.

In the first maneuver of the exploration the surgeon explores the esophageal hiatus, the left lobe of the liver, and the gastric cardia. It is important to examine the esophageal hiatus because hiatal hernia is a common cause of obscure abdominal symptoms. One determines whether one or more fingers can be introduced into the hiatus and whether or not abdominal viscera pass through it and into the thoracic cavity. The gastric cardia is palpated for tumor masses, indurations signifying the presence of ulceration, and/or evidence of inflammatory disease. The left lobe of the liver is examined for nodules and metastases.

The second maneuver encompasses examination of the spleen and splenic flexure of the colon. One cannot overemphasize the gentleness with which the spleen must be palpated. Trauma to it usually necessitates splenectomy. The splenic flexure of the colon situated high in the peritoneal cavity is examined for masses and indurations.

The third maneuver involves exploration of the stomach. The gastric cardia was felt during the first step of the examination. The surgeon now sweeps his hand over the entire body of the stomach down to the pylorus, feeling for tumor masses. Careful palpation should be made along both curvatures for indurations which indicate the presence of ulcerating lesions. During this phase of the examination the body of the pancreas can frequently be felt through the hepatogastric part of the lesser omentum.

In the fourth maneuver one examines the pylorus and duodenum where many peptic ulcers occur. After examining the pylorus, the surgeon passes his hand along the descending duodenum and explores this segment of gut. At this part of the examination the head of the pancreas can be felt for indurations and neoplasms. At times it is necessary to mobilize the descending duodenum (see p. 119, A) for thorough investigation of it and the pancreatic head.

The fifth maneuver considers the biliary tract. The gallbladder is inspected for cicatrization, stones or debris, edema, and tension. A finger is placed in the foramen of Winslow and parts 1 and 2 of the common duct are palpated for stones or masses in or around the duct. The surgeon must also visualize the common duct for opaqueness which suggests a choledochitis.

The sixth maneuver is directed to the consideration of the omentum and transverse colon. The omentum may reveal signs of fat necrosis, epiploitis, or metastatic lesions. The entire transverse colon is examined from the splenic to the hepatic flexure.

The seventh maneuver commences with identification of the ligament of Treitz. It is found by elevating the transverse colon, stretching the transverse mesocolon, and picking up the first loop of jejunum. This identifies the duodenojejunal junction and permits the surgeon to explore the entire small bowel. If necessary, the bowel is eviscerated loop by loop from the duodenojejunal junction to the ileocecal valve. Here the surgeon must also consider mesenteric ischemia. Since the superior mesenteric artery is the vessel most frequently involved, careful evaluation of the color and viability of the small bowel must be determined. Pulsations of the vessels to the jejuno-ileal segment should be noted.

The eight maneuver is the gynecologic examination. The surgeon places his hand into the true pelvis and examines the uterus and adnexae.

The ninth maneuver returns to the ileocecal region where the terminal ileum, cecum, and appendix are inspected.

The tenth maneuver is palpation of the ascending colon. It is during the course of this examination that the condition of the right kidney is determined.

The eleventh maneuver is the palpation of the descending colon, proximal sigmoid, and left kidney. Frequently strictures, masses, inflammatory diseases, and diverticula of the colon and sigmoid can be determined.

The twelth maneuver involves inspection of the rectosigmoid and rectum to the pelvic diaphragm. It is here that many neoplasms are located. Careful palpation can determine the extent of infiltration and operability.

No method is fool-proof and no method includes every possible step. However, I have found that these 12 steps minimize the number of possible omissions in the course of a diagnostic laparotomy.

Abdominal Exploration