

THE RIGHT THORACO-ABDOMINAL APPROACH*

JOHN P. HEANEY, M.D.

HOUSTON, TEXAS

AND

GEORGE H. HUMPHREYS II, M.D.

NEW YORK, N. Y.

THE NEED FOR AN APPROACH to the contents of the right upper quadrant of the abdomen which would provide more satisfactory exposure, has long been appreciated. This has been especially true in regard to patients with biliary tract disease who are, as a rule, quite obese.

Numerous surgeons, including one of us (J. P. H.) had occasion during the war to operate upon patients with wounds involving both the thorax and abdomen which required exploration of both cavities, on the right side as well as on the left. Thus far, we have not heard of the elective use of an approach to the right upper quadrant via a segmental thoraco-abdominal incision, although Carter has speculated about the possibilities of such an incision for lesions of the right lobe of the liver.

For an appreciable period, we have had under consideration the right thoraco-abdominal approach which, it was believed, might offer the solution sought to the problem of exposure. At first, it seemed apparent that the right lobe of the liver would certainly become more readily accessible for safe surgical attack, not only because of the exposure of the lobe *per se* but because the inferior vena cava might also be reached and temporarily controlled during the process of excision, *above* the liver as well as below.

Further, it occurred to us that in procedures upon the biliary tract through the conventional abdominal route, it was primarily the immobility of the costal margin which prevented good exposure. By using the segmental thoraco-abdominal incision, the costal margin might thus be eliminated as a barrier. The right lobe of the liver could then be gently rotated backward and upward into the lower thorax through a radial diaphragmatic incision. As a result, the biliary tract and porta hepatis, which usually nestle deep in the posterior part of the right upper quadrant, overhung by the liver, would be exposed easily and consistently in a manner heretofore achieved only occasionally and then, as a rule, in thin patients.

With these ideas in mind, the incision was first used in the anatomy laboratory. Through it, a complete dissection of the extrahepatic biliary tract, caval, and pancreatico-duodenal regions was performed. Although the tissues were fixed and the liver lobe rigid, we were encouraged to believe that this approach might indeed be worthwhile.

The maneuver was next tried in dogs. Because of the lobulated nature of the canine liver, it was necessary to reserve judgment as regards the mobility of the liver in man, but these animals served to illustrate that if the

* Submitted for publication, May 1948.

liver could be readily retracted as believed, then certainly the anatomic parts to be dealt with would be adequately uncovered.

The last phase of the preliminary work was done in the postmortem room where the tissues, when relatively fresh, are as nearly of the same consistency as in the living patient. This work demonstrated clearly that the procedure deserved clinical trial.

It was decided that the first case should be a simple cholecystectomy in order that if the patient presented any complication not foreseen by the pre-



FIG. 1.—The patient is placed on a horizontal table with sand bags beneath the right shoulder and buttock and with the abdomino-thoracic region centered over the "break." The table should be of the type which permits rotation in its long axis. This movement facilitates access to any part of the wound.

liminary work, it might still be feasible to remove the organ through the abdominal segment of the incision in a more nearly conventional manner. However, the most obese patient available was selected in order to put the presumed advantages of the procedure to real test.

CASE REPORT

On May 7, 1947, a 45-year-old, Para IV, Puerto Rican housewife presented herself because of severe right upper quadrant pain of 24 hours' duration. For 14 years she had suffered from intolerance to fatty foods with indigestion and belching. This was sometimes accompanied by right upper quadrant and epigastric discomfort which infrequently radiated through to the scapular region. During attacks, she occasionally had nausea and vomiting but had never had chills, fever or jaundice. The episode which brought her to the hospital seemed more severe than previous ones. She vomited more intensely and felt "chilly" but did not record her temperature. The pain radiated to the

lower angle of the right scapula and to the right shoulder. She had noted that her urine was darker than usual, but two stools passed after onset of her present illness were normal in color. She had never had typhoid fever. Past history and inventory of systems were otherwise non-contributory.

Physical Examination.—Temperature 100.2; Pulse 80; Weight 195 lbs.; Height 61."

The patient was a well developed, very obese woman in no distress. The skin and sclera were clear. The abdomen was protuberant with a very thick abdominal wall. There was moderate spasm in the right upper quadrant with direct and rebound tenderness in that area. No mass or viscus was palpable. The remainder of the physical examination revealed no further relevant abnormal findings.

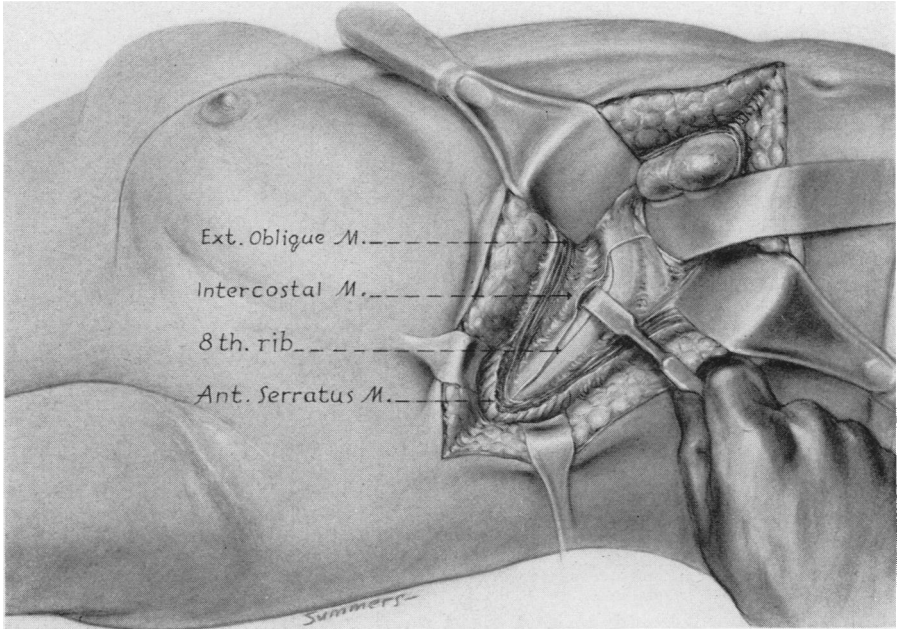


FIG. 2.—The abdomen has been entered; an exploration can be made through this segment of the wound. The 8th rib is then resected subperiosteally after which the costal margin is divided. Some operators might prefer an intercostal approach.

The impression at the time of admission was:

1. Acute cholecystitis superimposed on chronic cholecystitis with cholelithiasis.
2. Obesity.

Laboratory Findings.—Studies following her admission revealed a serum bilirubin of 3.6; alkaline phosphase 6.4; white blood count 10,100 with 53 per cent polymorphonuclears; the urinalysis showed four plus bile. An electrocardiogram was negative as was a chest film. On symptomatic care and a low fat, low caloric diet, the patient improved. A cholecystogram on the 11th hospital day revealed the presence of dye in the gallbladder with a 3 cm. area of translucency, which was interpreted as a single large stone. She was, therefore, prepared for cholecystectomy and operated on the 14th hospital day.

Pathologic Findings.—The gallbladder was moderately distended and contained several large faceted stones, one of which was tightly impacted in the ampulla. The cystic duct was thickened but the common duct showed no evidence of disease. The duodenum, head of the pancreas, right lobe of the liver, and stomach presented no abnormalities.

THORACO-ABDOMINAL APPROACH

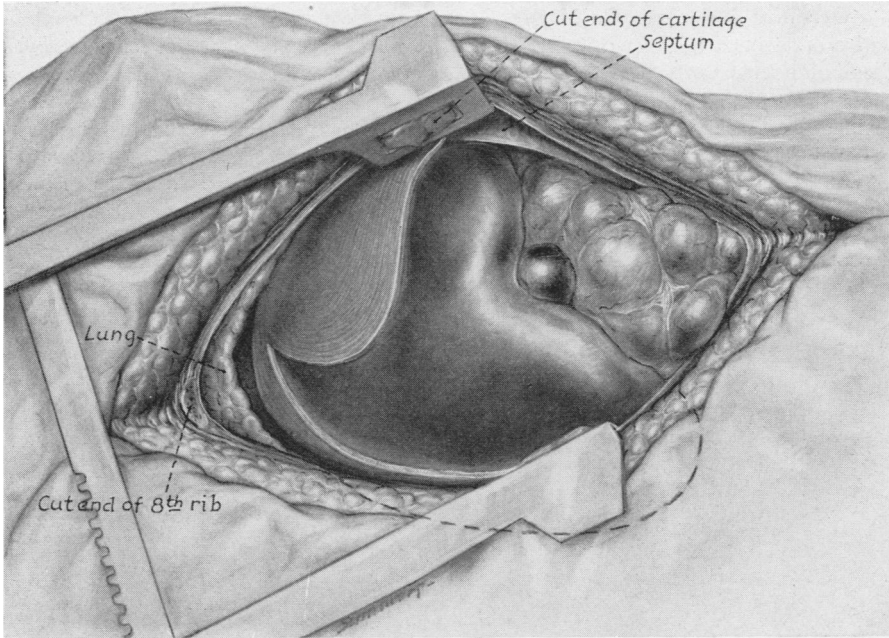


FIG. 3.—The addition of the radial incision to the diaphragm, from costal margin to dome, reveals the antero-superior surface of the liver. The lower lobe of the lung is evident above; the gallbladder, fundus and colon appear below. Note the cut edges of the diaphragm which have been separated, along with the mural components of the incision, by the Finochetto retractor.

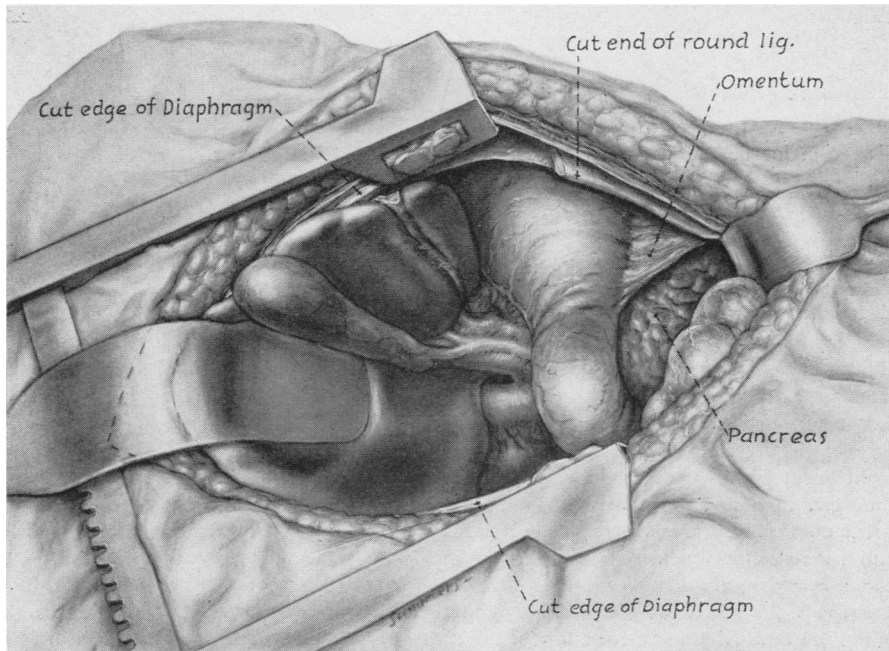


FIG. 4.—The right lobe of the liver has been turned upward through the diaphragmatic defect into the lower chest. The structures formerly overhung by the liver, are thereby uncovered.

Operative Procedure. On May 22, 1947, the patient was anesthetized with a combination of agents administered intratracheally. A long curved incision was made overlying the ninth interspace. It extended from the mid-axillary line downward and forward across the costal margin, and over the abdomen to the linea alba at a point 5 cm. above the umbilicus. This incision was carried through the subcutaneous tissue to expose the external oblique muscle and anterior rectus sheath. The latter was divided transversely as was the right rectus muscle. The external oblique muscle was split in the direction of its fibers, whereas the internal oblique, and transversus abdominis muscles were

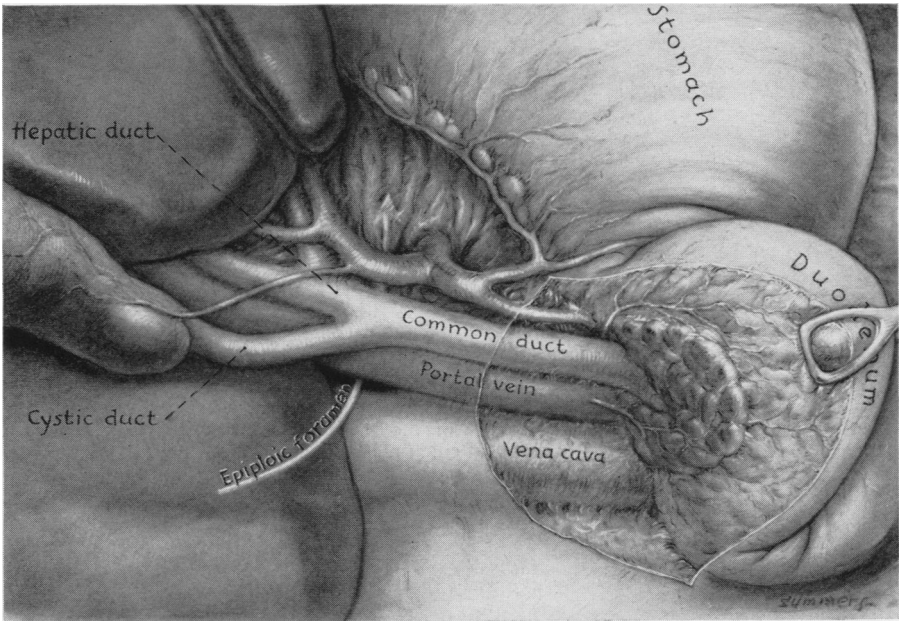


FIG. 5.—This enlargement, which shows the duodenum reflected, was made from a dissection in the postmortem room. It illustrates the extensive exposure of the biliary tree and allied structures, which is possible through this approach.

transected in the line of the incision. The common costal cartilage was divided between the 9th and 10th ribs and the chest entered through the 9th interspace. The abdomen was then entered by means of a radial incision in the diaphragm which extended from its periphery at the point of division of the costal margin, to the right dome. Following this the peritoneum was divided throughout the length of the abdominal segment of the wound. A Finochietto retractor was placed between the 9th and 10th ribs and spread. In this manner, the wound was held wide open without other retraction. Next, the right lobe of the liver was gently rotated upward through the diaphragmatic defect into the right lower chest, exposing the gallbladder, the porta hepatis, the gastrohepatic omentum, the vena cava and the pancreatico-duodenal region admirably, in spite of the patient's great obesity. The stomach and hepatic flexure were packed off with moist abdominal pads; several filmy adhesions between the duodenum and gallbladder were divided. The common and cystic ducts were identified and isolated as were the common hepatic duct, and the right and left hepatic ducts with their accompanying vessels. This dissection permitted unusually extensive study of the duct system. The cystic duct was then divided between clamps. The proximal end was ligated with a transfixion suture of No. 000 Deknatel. The cystic artery was also divided and ligated with the same material. The

THORACO-ABDOMINAL APPROACH

gallbladder was dissected from the liver, from ampulla to fundus, without difficulty after which the bed was repaired with interrupted silk sutures. The peritoneum over the cystic duct stump and in the region of the porta hepatis was also approximated by means of interrupted sutures. After the liver had been replaced in its normal position, a cigarette drain was inserted into Morrison's pouch and brought out along the gallbladder bed through the abdominal part of the incision. The diaphragm was then closed with interrupted No. 000 Deknatel. A single suture of No. 0 Deknatel was used to approximate the cut edges of the costal margin. The thoracic and abdominal mural components of the incision were then closed anatomically with interrupted sutures of No. 000 silk. The patient's condition during and after operation was excellent.

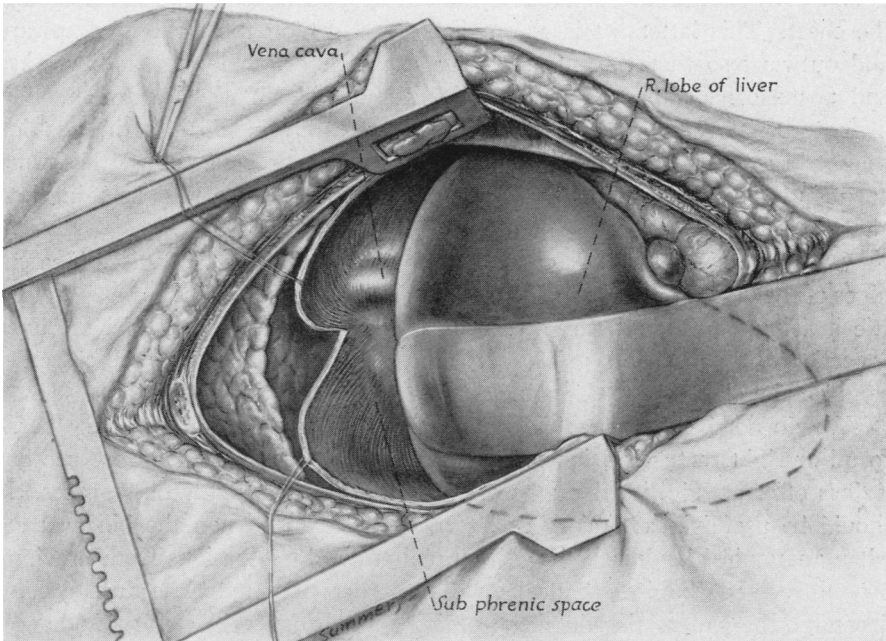


FIG. 6.—The liver has been retracted downward; the diaphragm edges are suspended by means of silk sutures to show the position of the inferior vena cava *above* the liver. The liver lobe is also outlined to demonstrate its position. (See Text.)

Postoperatively, the temperature rose to 100.2 on the first day; 102.6 on the second; 101.8 on the third and then declined gradually to normal. This fever was due in part to transient atelectasis of the right lower lobe, which responded to coughing efforts. Her convalescence and wound healing were otherwise favorable and uneventful. She was discharged on the 15th postoperative day. She has been followed in the outpatient clinic since operation and has remained well.

DISCUSSION

This cholecystectomy was performed with ease in spite of the patient's unusual obesity. There was no tugging upon retractors and no difficulty in exposure. The right lobe of the liver was easily rotated upward into the lower thorax and produced no change in the patient's general well being. There was no torsion of the inferior vena cava or structures of the hepatic

trinity. The cystic duct and artery were dealt with under direct vision in a wide open wound, rather than in one overhung by the liver, costal margin and abdominal wall. Not only was the common hepatic duct readily accessible throughout its entire extent, but each of the right and left hepatic ducts was accessible over a distance of $1\frac{1}{2}$ to 2 cms., permitting unusual certainty in palpating for stones or, had it been necessary, the performance of high biliary-intestinal anastomosis.

The phase of the operation which was potentially the most hazardous, namely, the division of the cystic artery and duct, was rendered less so because of the exposure afforded by the maneuver of displacing the liver into the chest. This latter act is accomplished by turning the right lobe upward and outward so that the inferior surface, which originally faced downward and posteriorly, comes to face anteriorly and still slightly downward. The liver does not rotate as if upon a hinge but readily molds into the position sought in a "fluid" type of movement. During the process, the portal fissure opens in the same manner as a single pleat of an accordion, thus bringing into view a greater extent of the biliary tree.

Our particular patient brought out only one unforeseen difficulty. The cut edges of the diaphragm retracted so that at the peripheral part of the diaphragmatic incision, it was not easy to suture the edge because of the friable liver beneath and the unyielding rib superficially. It is probable that a rib resection would make closure less difficult.

We do not believe that this approach should supplant the ordinary paracostal or right rectus incision for cholecystectomy in the average instance but it does offer an additional degree of exposure for exceedingly obese cases. It should be useful in secondary and tertiary operations upon the biliary tree, when anatomical landmarks have been obliterated by adhesions from previous procedures. It would seem ideal for plastic operations upon the duct system. Secondly, the pancreatico-duodenal region was also superbly exposed, though this latter region was not the one in which we were primarily interested. We have witnessed numbers of pancreatico-duodenectomies through both transverse and vertical abdominal incisions in which that operative field was less well exposed than in this case. Thirdly, the portal vein and inferior vena cava are readily evident throughout much of their proximal extent; as a result the incision should be useful in performing portocaval anastomosis.* Fourthly, the right lobe of the liver is exceptionally well exposed and its removal might be made safer by the temporary control of the inferior vena cava *above* the liver, as well as below. Fifthly, in selected patients who have an unusually high diaphragm, in addition to their other indications for the approach, it is possible that the contents of the right upper quadrant might be satisfactorily exposed through the chest and diaphragm alone, without the addition of the abdominal mural segment of the incision. Thus the gallbladder might be more

* This approach has recently been used by Dr. Arthur Blakemore in a case of portal hypertension. Portocaval anastomosis was accomplished with excellent exposure. Post-operative recovery was uncomplicated.

easily removed in some cases through the chest than through the abdomen, just as splenectomy and gastrectomy are sometimes more satisfactorily accomplished from *above*, on the left side of the abdomen. The incision should also be valuable in the occasional inflammatory or neoplastic lesion which traverses the diaphragm to involve both the right lower lobe of the lung and the right lobe of the liver.

Lastly, if one encounters unusual difficulty while operating upon right upper quadrant structures through a conventional abdominal incision, the segmental mural and diaphragmatic components may be added to obtain the additional exposure which is so valuable in time of need. This combination of ordinary abdominal incision, plus subsequent addition of the segmental components, has been used to advantage on the left in numbers of cases, without compromise of circulation of the flaps so formed.

CONCLUSION

We believe that the right thoraco-abdominal segmental approach offers valuable additional exposure in properly selected operations upon the biliary tree, the pancreatico-duodenal region, the portocaval region and the right lobe of the liver.

If unexpected technical difficulties are encountered in the right upper quadrant and additional exposure would be advantageous, it can be used as an adjunct to the ordinary right rectus, paracostal, or transverse abdominal incisions.

BIBLIOGRAPHY

- Blakemore, Arthur H.: Portacaval Anastomosis—Observations on Technic and Post-operative Care. *Surg. Clin. North Amer.*, **28**: 279, 1948.
- Carter B. Noland: The Combined Thoracico-abdominal Approach with Particular Reference to its Employment in Splenectomy. *Surg., Gynec. & Obst.*, **84**: 1019-1028, 1947.
- Garlock, J. H.: Combined Abdominothoracic Approach for Carcinoma of Cardia and Lower Esophagus. *Surg., Gynec. & Obst.*, **83**: 737-741, 1946.
- Gurd, F. B.: Anatomic Principles Involved in Incisions. *Surg. Clin. North Amer.*, **25**: 271-284, 1945.
- Harper, F. R.: Thoracico-abdominal Approach to Upper Portion of Abdomen and Upper Pole of Kidney. *Arch. Surg.*, **54**: 517-528, 1947.
- Humphreys, George H., II.: An Approach to Resections of the Esophagus and Gastric Cardia., **124**: 288-300, 1946.
- Lampson, R. S.: The Abdominothoracic Approach for High Gastric Neoplasms: Preliminary Report. *Connecticut M. J.*, **11**: 503-507, 1947.