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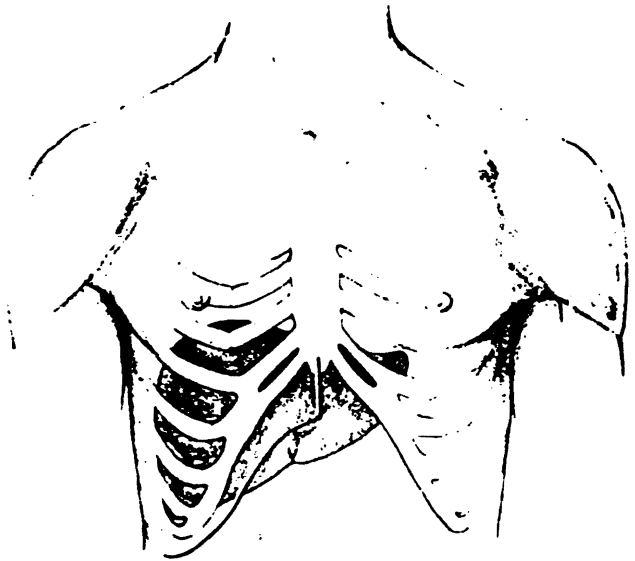
Trisegmentectomy

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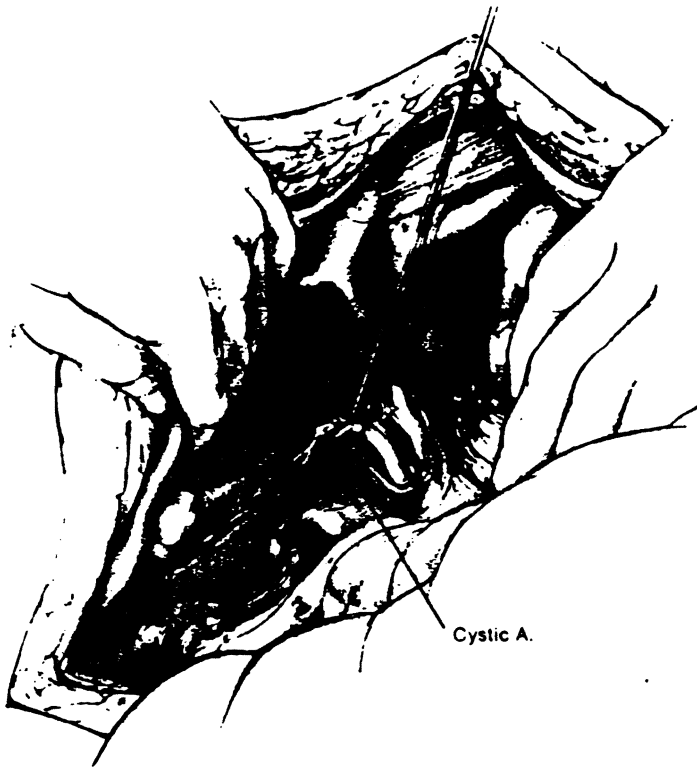
Trisegmentectomy (extended right hepatic lobectomy) is performed under general anesthesia, using multiple cardiovascular monitors and taking care to have adequate transfusion lines. A radial artery line for sampling as well as for pressure measurements is useful. Urinary output and body temperature are measured throughout.

A right subcostal incision is always used. This may be extended to the left side, or a thoracic extension may be made into the 7th or 8th right intercostal space. However, the most useful extension usually is up the superior midline with excision of the xiphoid process. Ordinarily, the subcostal incision plus the midline extension provides adequate exposure of the suprahepatic area and permits safe dissection of the right hepatic vein.

The decision about the extent of the final incision is almost always made at the operating table and is frequently dictated by the extent of the tumor. Whatever extensions are necessary for comfortable exposure must be made. Attempts to carry out a major right liver resection in cramped quarters are dangerous.

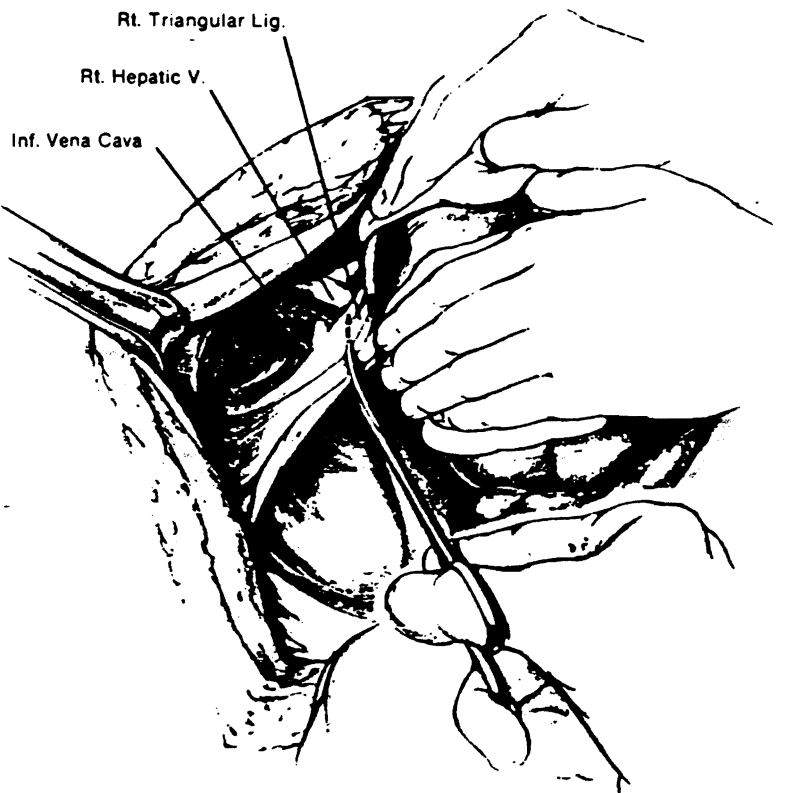


Ligatures on Cystic Duct



2. The abdomen is explored to rule out primary or metastatic tumor outside the liver. If there is extrahepatic spread of a primary liver tumor, resection should not be performed. Occasionally, isolated metastases in the right lobe have been removed, but only when the primary lesion elsewhere could be cleanly excised. The liver itself is carefully examined to assess the possibility of resection and to plan the extent of the resection.

For formal right lobectomy, trisegmentectomy, or left lobectomy, the first step is ligation and division of the cystic duct and cystic artery. Otherwise, identification and dissection of the bifurcation of the portal structures are difficult or impossible. In carrying out the hilar dissection it is useful to apply downward traction on the gastroduodenal ligament and countertraction superiorly on the liver.



3. For right lobectomy or trisegmentectomy, mobilization of the right lobe is usually begun at this time. The right triangular and coronary ligaments are incised. As the liver is rolled to the left the right hepatic vein comes into view. With sharp and blunt dissection, as much length as possible is developed of the right hepatic vein. If the dissection is easy, this structure is encircled now with a catheter or tape. It is not clamped until later, after the inflow to the proposed specimen is occluded.

4 Attention is returned to the portal hilum. For true right lobectomy or for trisegmentectomy the right branches of the portal triad structures are isolated and divided. Ordinarily, the hepatic arterial supply is most inferiorly located, the right portal vein is intermediate in location, and the right hepatic duct is most superior. Before ligating the right hepatic artery (or arteries) the presence of a pulsatile vessel to the remaining liver should be determined by palpation during test occlusion of the right lobar arterial supply.

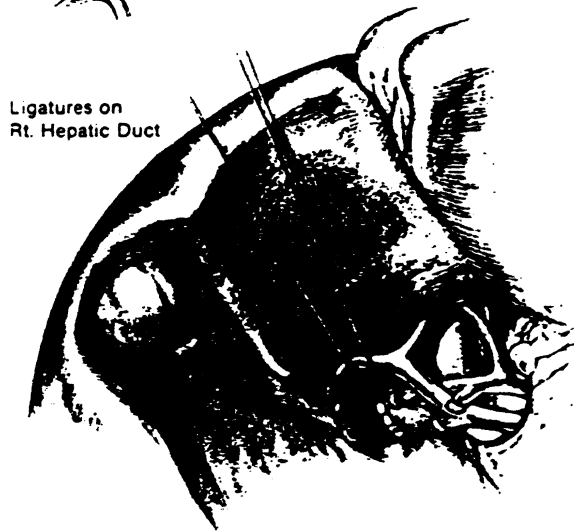
The right portal vein is freed and is divided between vascular clamps. The transected end of the right portal vein is usually closed with continuous vascular suture

rather than with ligation. The bifurcation of the common duct into the left and right branches usually requires some mobilization from the undersurface of the liver. The right hepatic duct is ligated and divided only after clearly identifying the left hepatic duct.

After completion of these maneuvers the true right lobe of the liver should be devascularized. A color demarcation of cyanotic versus pink tissue should be identifiable in about the center of the gallbladder bed and extending up to the diaphragm. The pink area will include the lateral segment located to the left of the falciform ligament, as well as the medial segment of the left lobe located to the right of the falciform ligament.



Suturing Rt. Portal V.



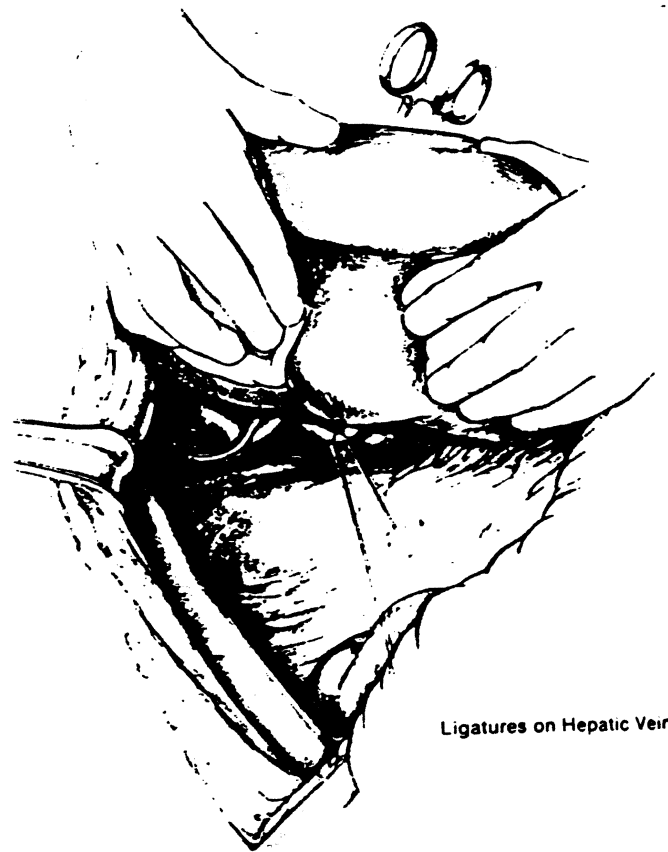
Ligatures on Rt. Hepatic Duct



5 With the blood supply of the right lobe occluded, it is now safe to clamp and cut the right hepatic vein. Ordinarily, two angled vascular clamps are inserted from the left side rather than the curved clamp depicted.

The central end of the cut right hepatic vein always requires vascular suture closure. If this large structure were ligated and if the ligature slipped off, the consequence would be a long defect in the suprahepatic vena cava which would almost certainly cause a fatal hemorrhage. The specimen (distal) side of the right hepatic vein should also be closed with a vascular suture.

6 By lifting the right lobe of the liver into the wound it is possible to encircle, ligate, and divide smaller hepatic veins entering the inferior cava. If a true right lobectomy is planned, the number of hepatic veins thus sacrificed will be few. On the other hand, performance of trisegmentectomy requires the sacrifice of a greater number. In either case, ligation of hepatic veins entering the retrohepatic vena cava should be done conservatively since these veins can be easily dealt with at a later time as the last step in the removal of the specimen. Excessive sacrifice of the hepatic veins could jeopardize the drainage of the hepatic remnant.



Ligatures on Hepatic Vein

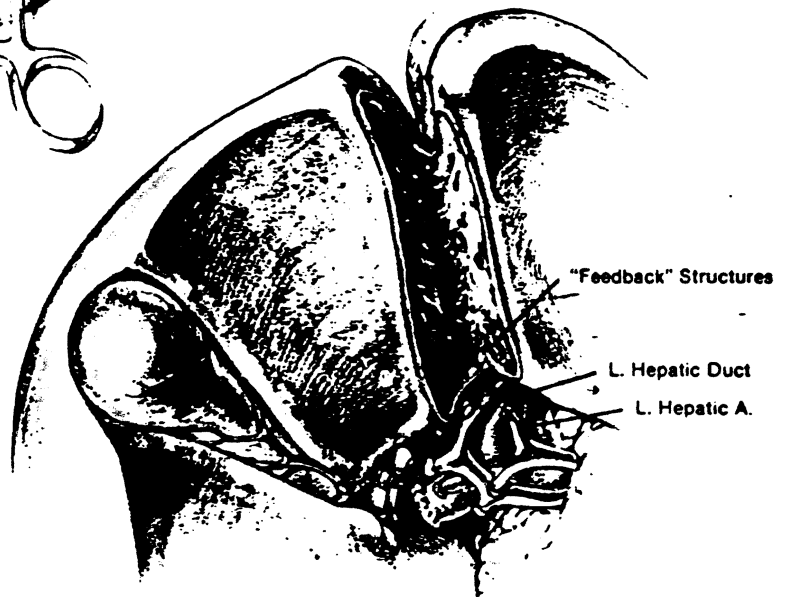
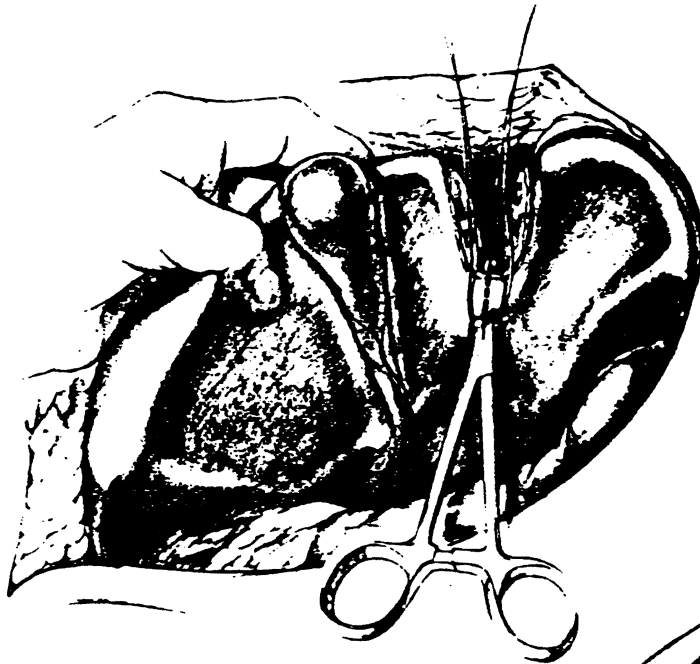
7 If true right lobectomy is planned, a line of transection is developed, starting the liver split in the middle of the gallbladder bed. However, if trisegmentectomy is contemplated, more dissection is required. The left hepatic artery, left portal vein, and left hepatic duct must be mobilized from the undersurface of the liver between the bed of the gallbladder to near the plane of the falciform ligament.

Even when this dissection is complete, the medial segment of the left lobe, which is the hepatic tissue between the gallbladder and the falciform ligament, will remain pink and vascularized. The reason is that the medial segmental blood supply as well as the segmental hepatic duct originates in the fissure defined by the falciform ligament and feeds back toward the right from this location. This medial segmental blood supply is usually interrupted only when the liver parenchyma is split during the actual hepatic transection. When the "feed-back" structures are encountered and ligated, the medial

segment of the left lobe becomes cyanotic whereas the lateral segment should remain pink.

If the plane of transection has been correctly selected, intersegmental veins will be encountered as the split in the liver deepens.

The blood loss during this time is usually 1000 to 1500 ml. As the transection plane is developed all structures bridging the specimen and the hepatic remnant are tied. These can be found by clamp dissection or by blunt dissection with the thumb and index finger (finger fracture). At the superior end of the resection the structures bridging the hepatic remnant and the specimen may become larger. These are hepatic veins. They are ligated with special care to prevent infringement on the left hepatic vein which should remain with the remnant. In trisegmentectomy a large middle hepatic vein is often encountered; it can be ligated or closed with a vascular suture.



8 The cavity previously occupied by the liver should be extensively drained. Eight or ten 1-inch Penrose drains are left in the space and brought out through the wound, a portion of which is left open. The wound defect necessary for adequate drainage is surprisingly large, often being 2 or 3 inches in length. To prevent evisceration the open tract may be packed for a day or so with vaginal packing. After a few postoperative days the packing and

drains are removed and the cavity is thereafter irrigated until it closes. Within 3 or 4 weeks the patient can be discharged in the ordinary case.

Postoperatively, all patients with trisegmentectomy become jaundiced. The icterus subsides in a week or two as regeneration proceeds. Thirty trisegmentectomies have been performed with the described technique with no operative death.

