

REVIEW ARTICLE

NEW TECHNIQUES IN LIVER RESECTION

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In the last two decades liver resections became more liberal due to many factors:

1. Better knowledge of intrahepatic anatomy of bile ducts & the blood vessels. (1)
2. Development of better technique & parenchymal dissection to the point that some resections would not need blood transfusions. As one of the major hazards of hepatic resection was bleeding & blood loose. (2)
3. Using generous incision in the abdomen as roof top incisions or transverse upper abdominal incisions as well as using costal margin retractors made the operation more easier without using thoracic extensions of the wounds which used to increase the morbidity of the operation (3). In 1952 , Jean Louis Lotart - Jacob under took the first successful extended right hepatectomy this was pioneering surgery

In 1957 Claude Couinaud published a book entitled (The liver , anatomical & surgical studies) (4) . This publication was also a special event in liver surgery, as he pointed that the liver was divided into two separate surgical lobes, right & left lobes & each lobe is divided into four segments enumerated in Latin No. from I to VIII .

In 1963 another surgical event occurred of heroic proportions Thomas Starzl carried out the first liver transplantation in Denver- USA (5).

Liver resection is indicated in:

1. primary benign or malignant liver diseases.
2. In some secondary metastatic diseases when involving segments of the liver that could be removed together or involving one lobe of the liver specially secondaries from colorectal malignancies.
3. In some cases of carcinomas of the bile ducts or cholangiocarcinoma near or at the confluence of bile ducts ,although the problem will be more

Complicated as the patient will be in a state of obstructive jaundice (6).

In liver resection two steps are important to decrease blood loss & bleeding:-

1. Division of parenchyma.
2. vascular control of hepatic inflow & out flow.

To start with in early hepatic resections there were no uniform methods developed for dividing the parenchyma. In late thirties Kocher type-crushing clamps used to divide the parenchyma (8). After beginning of modern with RA of hepatic surgery. In 1952 the chosen points of scissors & the handle of the scalpel were often proposed as instruments to use for "cutting" liver parenchyma.

In 1974 Lin proposed the finger fracture method, where by the parenchyma is pitched between Finger & Thumb (9). This is found as an excellent method for isolating the large intra hepatic sheath & in some what gentle fashion it can also be useful for isolating hepatic veins.

Newer & more sophisticated instruments have also been used. Lasers have not yet established a place (10) .but U/S dissector is now quite widely used. In its present form the device consists of pencil shaped instrument of about 30 cm in length which is connected to U/S generator & the instrument is controlled by foot pedal (11). Coagulating diathermy is also useful but has great disadvantage that it does not discriminate between parenchyma & vessels & duct particularly in the region of the hepatic veins & their branches (12). The second point which is vascular control of inflow & outflow of the liver:

The risk of severe intraoperative haemorrhage occurring when the liver parenchyma is divided has lead to research in to means of controlling the vascular inflow & outflow to the liver.

1.Total Inflow Occlusion (Pringle's Manoeu-ver):

In 1908 J. Hogarth Pringle of Glasgow published a paper entitled (Notes on arrest of hepatic haemorrhage due to trauma)(13) . this was the first time that total clamping of hepatic pedicle in order to arrest haemorrhage had been proposed. The risk of ischaemia from total clamping has been overestimated & that the liver can tolerate warm ischaemia for up to 65 min. With outlasting any permanent damage. Now it is a common practice by many surgeons to do 15 min clamping & 10 or 15 min. declamping during which time the trouble some minor bleeding points are controlled. Total occlusion of inflow has the advantage over partial occlusion in that there will be no bleeding from the surface of the liver which is retained.

2. Partial Inflow occlusion:

In hepatectomy partial occlusion has long been practiced by those who divide the hepatic pedicle structures outside the liver. However Makuuchi has extended this technique to dissection of hepatic pedicle structures outside the liver for clamping of the branches beyond the confluence without division (14). Thus in the removal of the ® lateral sector of the liver for example the hepatic artery & the® branch of the portal vein are dissected & clamped.

3.Total Inflow occlusion & Partial Outflow Occlusion:

Nagasue has advocated clamping the hepatic vein draining the part of liver being resected as well as total inflow occlusion. claiming to have less blood loss during resection than when total inflow occlusion is used (15).

4. Total Vascular Exclusive Of The Liver

In addition to total inflow occlusion, total out-flow occlusion is done by clamping the I.V.C. above & below the entry of hepatic veins. Following clamping of the I.V.C.(16) It is best to wait for 5 min. before proceeding, to make sure there is no haemodynamic instability due to occlusion of cardiac return from the lower half of the body through the I.V.C. If the B.P falls & if it is felt necessary to proceed with total vascular exclusion.

The aorta above the entry of the renal arteries can be clamped & this may lead to normalization of the BP. In the selective setting haemodynamic instability is not usually a problem.

5. Total vascular Exclusion Of the Liver & In Situ Perfusion

The technique is the same as above plus perfusion of the liver through either divided portal vein (which is reanastomosed later) or through superior or inferior mesenteric vein with cannula passed up to portal vein & clamp edit is important here to make sure that the excluded vena cava & the hepatic veins have communication with systemic venous system so that the perfusate does not spill over in to the general circulation (17).

6. Extra Corporeal Liver surgery

This is the extreme end of vascular exclusion in which the liver actually resected from the patient, surgery is under taken on the bench (17) & the liver then replaced .As autograft, clearly this is similar to liver transplant surgery. Pichl Mayer report this technique & this regarded developmental, as knowledge of the segmental anatomy of the liver makes it difficult to see when extra corporeal surgery would be needed. Certainly this technique has a place in certain circumstances. One of the major development in the surgical techniques in liver resection is the intra-hepatic approach to the pedicles & the hepatic veins & this technique is of two kinds:

1.Anterior Intra-hepatic Approach:

Here the liver parenchyma is divided along one of the fissures of the liver before the hepatic pedicles or veins are isolated. The hepatic pedicles structures are isolated as almost a final stage in the resection. Similarly hepatic veins are isolated inside the liver also at a late stage of the operation. This technique was elaborated by Ton that tung(18). Initially the technique was described without vascular control & was often associated with a lot of blood loss. Today it is performed with hepatic inflow clamping, either totally or to the part resected.

2.Posterior Intra hepatic Approach

Here there is more central control of the Glissonian sheath beyond the confluence where the sheath which contains the portal trinity is controlled all together without dissection of the components of the sheath(19). This is done by an incision in front & another one behind the portal fissure where the porta hepatis. The index finger is passed through the anterior incision & the thumb through the posterior incision & the sheath is

encircled by both fingers & then a tape is passed around it by the aid of a curved artery forceps & by pulling on the tape the confluence could be approached easily & the (L) sheath controlled as well going more peripherally the medial & lateral sectoral sheaths as well as segmental sheaths could be approached to verify the land marks of the lobes and the segments, one can apply vascular clamps on the sheaths where the parenchymal delineation will be evident. The extra hepatic approach, this approach has been used by Lotard - Jacob & Robert. This approach is used by English speaking world (20) in this technique the porta hepatis is dissected first & the three components of the portal trinity isolated & taped. The disadvantages of this approach are:

1. The variations & anomalies of the portal trinity structures are very common & the necessity of being aware of these anomalies is an important disadvantage of this approach.
2. Division of structures to one or other side of the liver is usually undertaken close to the confluence so that the vessels which are arising from left system which supply some of the ® side of the liver or vice - versa may be inadvertently divided leading to unwanted necrosis of retained liver tissue.
3. This technique is time consuming.

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