Hepatic Resections—The Changing Scene

As a technique becomes safer, indications for it expand. The surgical treatment of benign and malignant hepatic lesions has changed markedly over the last 20 years, from a time when partial hepatectomy was a relatively rare operation to the modern era, when major hepatic resection is being safely practised in many medical centres worldwide.

Although the first successful elective hepatic resection was recorded by Langenbuch in 1888, the liver has always been regarded a surgically difficult and dangerous organ and, indeed, some 20 years ago, the reported mortality of major liver resections was as high as 33%.1 The high mortality and morbidity rates from haemorrhage, infection or bile leakage thus discouraged physicians from referring patients for hepatic resection. However, the procedure has seen an impressive evolution and now major elective hepatic resections for tumours can be performed with a less than 3% mortality.2,3

The development of the operation can be traced through three different periods. Prior to 1970, hepatic resection progressed from small 'atypical' resections to the well-controlled removal of anatomically defined portions of the liver. Intrahepatic anatomy, including the precise course and relationship of the intrahepatic blood vessels and bile ducts, and the division of the liver into segments, was described by Couinaud in France in the mid-1950s.4 Thus, the concept of partial hepatectomy, involving removal of one or more segments of the liver by isolation of the relevant portal pedicle, severance of the relevant hepatic veins and removal of associated liver tissue, was defined and a nomenclature for hepatic resections based on these anatomical descriptions was developed.4

The second period stemmed from major advances in diagnostic modalities, in preoperative understanding of diseases and the operative management of bleeding. The extraordinary development of radiological imaging techniques such as ultrasonography, computed axial tomography (CT), magnetic resonance imaging (MRI), selective angiography, endoscopic retrograde cholangiopancreatography (ERCP) and percutaneous transhepatic cholangiography (PTC) has allowed an accurate and clear display of hepatic and biliary lesions, including hilar cholangiocarcinoma. Preoperative duplex ultrasonographic scanning can show tumour involvement of the portal vein and hepatic vessels, including their sectoral and segmental branches and may obviate angiography. Haemangiomias and cysts can be diagnosed accurately and usually differentiated from malignant disease. Whenever a major hepatic resection is contemplated, display of the vascular anatomy by selective angiography is of considerable value. With the advent of safe, simple and quick intraoperative ultrasound using a 7.5 mHz probe, the surgeon can localize tumours within the liver, identify metastatic extension and define vascular anatomy in relation to the lesions. Improved hepatic imaging has not only helped surgeons to take correct decisions but has also allowed the development of operations such as segmental and subsegmental resections.

The anaesthetist is now able to monitor body functions continuously and act effectively using many new devices. A rapid infusion pump which can inject blood at the rate of one litre per minute is now available and blood loss is now much less of a problem. Early detection of various coagulopathies and appropriate blood product therapy has solved the problem of intraoperative bleeding. One of the risks of major hepatic surgery is the large volume of blood loss during and after operation. In hepatic resection for tumours it is very important to employ techniques which allow tumour clearance and at the same time provide control of blood loss. This is particularly difficult when dealing with large tumours which are closely attached to the inferior vena cava (IVC) or the major hepatic veins. Techniques such as complete vascular isolation, hypothermic perfusion of the liver and haemodilution have been described for controlling
blood loss during surgery, but in most instances these are not necessary. Intraoperative bleeding can be minimized by proper inflow control, meticulous parenchymal dissection and by reducing retrograde bleeding from the hepatic veins. The use of the Pringle manoeuvre and the recently described pedicle ligation technique reduces bleeding during prolonged dissection of hilar structures and bleeding from the parenchymal surface during transection. These techniques are simple, reproducible and because they do not require expensive, cumbersome equipment are popular. Control of the hepatic veins outside the liver prevents bleeding which is encountered during parenchymal dissection, when major veins are transected inside the liver substance. We have found that maintaining a central venous pressure below 5 mmHg allows safe dissection and dramatically decreases the amount of blood loss should the IVC or a major hepatic vein be damaged.

Technological innovations have generally been directed at reducing the extent of bleeding associated with transection of the parenchyma, firstly by methods of dissection to skeletonize intraparenchymal vessels and secondly by control of bleeding from the raw surfaces. Parenchymal dissection can be carried out by a blunt haemostat fracture technique or by the newer modalities of the Cavitron ultrasonic suction aspirator (CUSA) or high-speed jet disectors. Fibrin glues and the argon beam coagulator can be applied to raw liver surfaces to control minor oozing. In fact, combinations of these techniques have considerably reduced perioperative blood loss even with extended hepatic resections. The senior author performed one hundred consecutive hepatic resections (52 of which were extended lobar resections) for primary and metastatic liver lesions in one year at the Memorial Sloan Kettering Cancer Center, New York. The median blood loss was 1000 ml and 41 patients required no blood transfusion at all. Thirty patients required less than 2 units of blood during the perioperative period. Current morbidity rates for major hepatic resections are 18% to 24% and mortality rates 3% to 6%. (They are higher for patients having pre-existing biliary tract obstruction.)

Over the last decade, there has been an increase in the indications for hepatic resection, particularly in the surgical management of primary and secondary tumours of the liver. Hepatic resections are useful in symptomatic benign conditions such as giant haemangiomas, liver adenomas or focal nodular hyperplasia. Though there is a distinct geographical variation in the prevalence and causes of primary hepatocellular carcinoma, for these patients surgical resection is the only hope of cure. The results of operation are primarily dependent upon the presence or absence of cirrhosis. The resectability rate of hepatocellular carcinoma in non-cirrhotic livers is 10% to 28%, with an operative mortality of less than 5%; 30% to 35% survive 5 years. In patients with cirrhosis the resectability rate is about 10% and operative mortality 15% to 20%. The 5-year survival is still 30% (unpublished data).

In patients with hilar cholangiocarcinoma, endoscopic or radiological intubational methods are not effective and carry a substantial mortality. The experience with hepatic resection for proximal bile duct cancer is limited but better survival is seen after hepatic resections and biliary enteric anastomoses.

There is now substantial evidence that hepatic resection for colorectal metastasis can achieve a 5-year survival of 20% to 40% in selected cases. The single institution study from the Mayo Clinic and a multi-institutional retrospective study reported from the National Institutes of Health, USA consisting of patients who had undergone hepatic resections for colorectal metastases with curative intent have shown 5-year survival rates of 25% and 33%, with 25% showing no evidence of active disease at follow up. A number of factors affecting survival and recurrence are becoming clear. The number of metastases if confined to one lobe, the age of the patient, the size of the tumour and the interval between the original colonic operation and presentation with hepatic metastases are not important determinants of survival.
The most important determinants appear to be resection carried out with tumour free margins and the initial stage of the colonic cancer. Resections are now being done in the elderly with low mortality rates. Patients undergoing extended and non-extended hepatic resections for metastatic disease have a similar short-term survival. However, resection of metastases in both liver lobes remains controversial. The experience of hepatic resections for metastatic disease from non-colorectal primary lesions is small with inconsistent results. However, favourable results have been reported after the resection of metastatic endocrine tumours, carcinoids and hypernephromas.

It is clear that in selected patients with primary and secondary hepatic tumours, resection results in cure or prolongs survival. We need to develop more dedicated hepatobiliary units where safe hepatic resections are performed. Liver surgery will continue to evolve and specialty units in existence have the responsibility to make sure that patients are not deprived of effective treatment.

REFERENCES


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