Atlas of
General Surgery

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Fourth Edition

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Dedicated to

Our wives and children for their patience and support
who missed us during the process of this work
Our parents for their blessings
Our teachers for their wisdom
Our students who inspire us daily
Our patients from whom we continue to learn

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Preface to the Fourth Edition

The *Atlas of General Surgery* has been one of the highly acclaimed and read books on operative surgery across the globe. It has transcended the borders of time, and it is a matter of great honor that the book we used to read as a student of surgery has been brought again in my hands by destiny to be revised and edited. The atlas has put the complex art of surgery into simple words and it has been our endeavor to maintain the tradition which makes the atlas a present favorite. The atlas has found place in hearts of practicing surgeons and students alike due to easy-reference and lucid explanations. To keep in touch with the rapidly changing surgical principles and technologies that have taken place over a decade, the mammoth task has been adequately accomplished to bring the world standard practice to you.

The atlas bears many additions to the list of contents which is reflective of the rapid progress that has been made by the surgical fraternity in the field of laparoscopy. Numerous chapters on laparoscopic management of surgical conditions have been added to cover this dynamically changing front. On the other hand, there has been a critically selected deletion of chapters on procedures that have taken a back seat in the modern era. The chapters have also undergone revisions based on the present foundations of diagnosis and management. We have made a sincere effort to give a new face to the atlas by adding intraoperative photographs and making all diagrams multicolored. Legends and labels have been added to all figures to make them easy to understand. We hope that our readers find the new edition useful for their daily practice and learning.

Sudhir Kumar Jain

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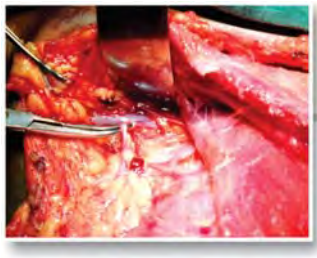

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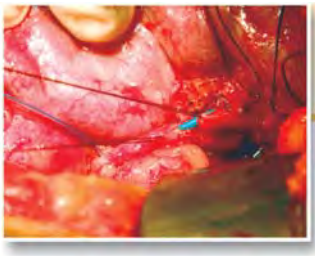

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CHAPTER

67 Portal Hypertension: An Overview

Subodh Varshney, Ajit Sewkani

INTRODUCTION

The portal vein provides the principal venous drainage for the splanchnic circulation, arises behind the head of the pancreas by the communion of the superior mesenteric and splenic vein. Its pressure is expressed conveniently as corrected portal pressure (portal pressure minus central venous pressure). The normal corrected portal pressure (<10 mm of mercury) increases in proportion to the resistance to the flow of blood from the splanchnic to the systemic venous circulation. Numerous anatomic connections between the portal and systemic circulations exist at the level of the hepatic sinusoids, the gastroesophageal junction, the hemorrhoidal plexus in the rectum, and the Retzius veins in the retroperitoneum. When portal pressure is elevated for a long time, a patent umbilical vein may direct portal blood into systemic veins within the abdominal wall, resulting in the physical findings of caput medusae and, often, a venous hum (Cruveilhier-Baumgarten syndrome). Increased splanchnic blood flow associated with a hyper-dynamic systemic circulation is commonly seen in portal hypertension. This increased flow is largely shunted through collateral vessels, bypassing the liver.

Portal hypertension is classified as presinusoidal or postsinusoidal on the basis of the anatomic location of the resistance to portal flow. Prehepatic obstruction of the portal vein results from congenital atresia, thrombosis, or extrinsic compression. Intrahepatic blockages occur in cirrhosis, inborn errors of metabolism, and Schistosomiasis. Schistoso-miasis and biliary cirrhosis produce a presinusoidal blockage, whereas alcoholic cirrhosis produces a resistance that is primarily intrasinusoidal or postsinusoidal. Posthepatic portal hypertension is associated with the rare Budd-Chiari syndrome.

The underlying cause of portal hypertension influences the options for therapy. The most urgent indication for the surgical treatment of portal hypertension is variceal hemorrhage. Portal pressure must be elevated above a threshold-about 12 mm of mercury—after which wall tension and local structural factors probably interact to produce hemorrhage. Ascites which is another complication associated with raised portal venous pressure is produced by the transudation of fluid from serosal surfaces of bowel and liver capsule resulting from the altered Starling forces within the hypertensive portal circulation. It can be complicated further by primary or secondary bacterial peritonitis. Patients with portal hypertension with liver damage can be stratified according to the child class and MELD score to predict mortality for shunt and nonshunt operations.

Operations to Reduce Portal Pressure

The portal pressure can be reduced below the critical threshold by various shunt operations. All shunts aim to reduce variceal pressures sufficiently to arrest or prevent bleeding. Surgical shunts are classified based on their specific hemodynamic properties as:

- Total
- Selective
- Partial shunts.

An angiographically placed stent, or transjugular intrahepatic portacaval shunt (TIPS), is another option that has recently become available in some centers.

Total Shunts

Total shunts completely divert the Portal blood flow to the inferior vena cava. They are able to arrest hemorrhage in about 95% of cases but at the price of a 40 to 50% incidence of hepatic encephalopathy. Therefore, while there is hardly any place of total shunting in elective surgery, in emergency situations, when bleeding cannot be controlled by less invasive means, total shunts may be lifesaving and encephalopathy becomes a secondary consideration. Portocaval shunts are a yardstick with which all other operations and nonoperative measures for the treatment of portal hypertension should be compared. Whereas shunting decreases the risk of death from hemorrhage, deaths from liver failure overshadow this advantage. Commonly employed total shunts are:

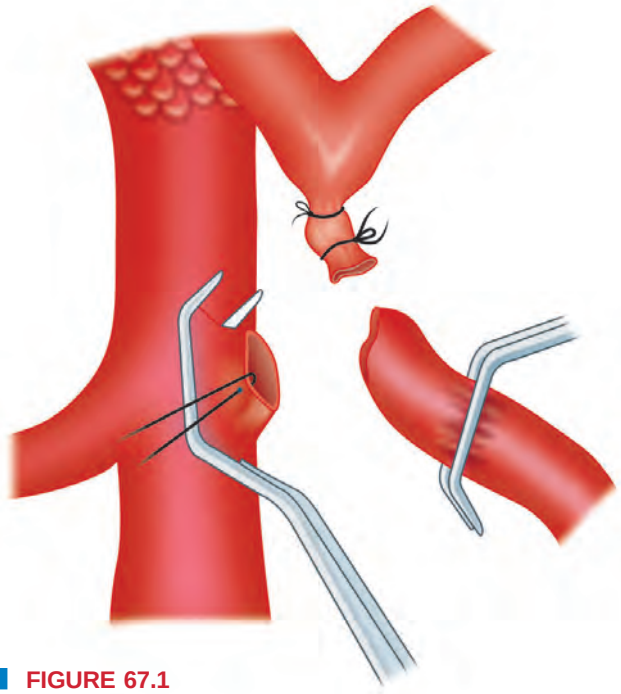

FIGURE 67.1
End-to-side portacaval shunt

Surgical Insight ...

End-to-side portacaval shunt (Figure 67.1): Shunting is performed by transecting the portal vein at its bifurcation within the porta hepatis and creating an anastomosis between the end of the portal vein and the side of the inferior vena cava. All portal flow is diverted around the liver, and the splanchnic system is totally decompressed.

Surgical Insight ...

Side-to-side portacaval shunt (Figure 67.2): Side to side shunts differ from the end-to-side shunt is that the portal vein is not transected completely. The shunt can be direct vein to vein shunt or a short graft may be placed in between the two veins. These shunts have an intact upper end of the portal vein which decompresses the sinusoids in addition to controlling bleeding and ascites. A variation of this shunt is the large-diameter portacaval H-graft in which a prosthetic graft about 16 mm in diameter is used to shunt blood from the portal vein to the cava.

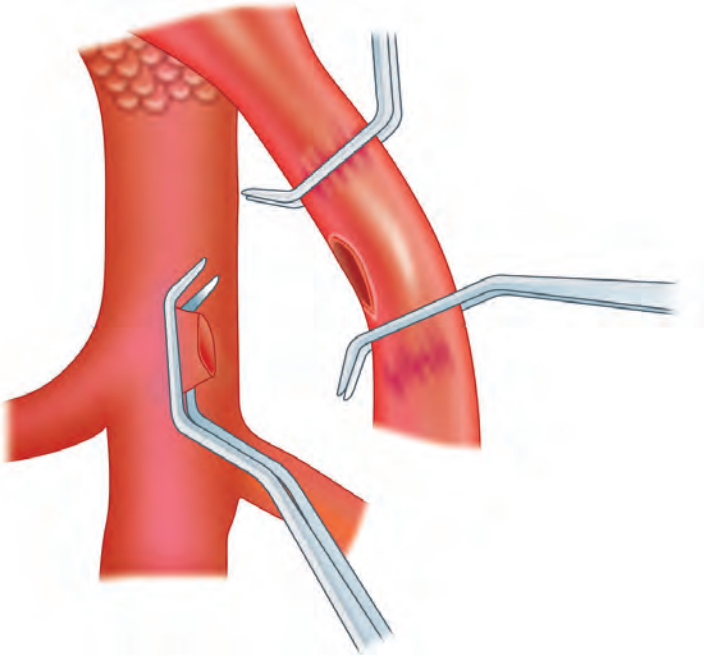

FIGURE 67.2
Side-to-side portacaval shunt

Mesocaval shunt: The inferior vena cava is divided and anastomosed end-to-side to the superior mesenteric vein. Alternatively, a prosthetic graft is positioned between the superior mesenteric vein and the inferior vena cava. The technique is similar to the portacaval H-graft. An advantage is that the shunt is far enough from the porta hepatis that the required dissection adds little difficulty to subsequent liver transplantation. A disadvan-tage of the mesocaval H-graft is that the graft is relatively long, so there is a greater risk of graft occlusion by kinking or thrombosis. Results are comparable with other total shunts.

Selective Shunts

1. ***Distal splenorenal shunt:*** The distal splenorenal shunt was developed to avoid the high rate of encephalopathy associated with the use of total shunts as a result of portoprival syndrome. Anastomosing the distal splenic vein to the left renal vein selectively decompresses the gastric and splenic veins while maintaining relatively high pressures in the mesenteric and portal veins. Dividing the left gastric (coronary) vein and disconnecting the gastrosplenic and porto-mesenteric compartments by collateral ligation remain an important part of the procedure. Hepatopedal blood flow is preserved initially, with a low incidence of encephalopathy. However in patients with alcoholism, collateral channels tend to dilate over time, eventually converting the selective shunt to a total one. This shunt usually not used in emergencies because portal decompression is selective, requiring time for bleeding to stop, and the procedure itself is time-consuming. Many surgeons advocate adequate control of hemorrhage with the use of this shunt which is nearly equivalent to that for total shunts (about 85%), and the incidence of encephalopathy is rare (<10%). As an elective procedure in patients with portal hypertension from causes other than alcoholic cirrhosis, the Warren shunt is an effective and durable operation with extensive application worldwide. The Warren distal splenorenal shunt is particularly well suited for managing patients with extrahepatic portal vein thrombosis, of whom about 80% will have a patent splenic vein and thus be candidates for this procedure.
2. ***Partial shunts:*** The use of Partial shunts was first proposed by Bismuth and associates. Partial decompression of the portal vein to a pressure less than the critical threshold should stop variceal hemorrhage which occurs above a corrected portal pressure threshold of 12 mm of mercury. while preserving hepatopedal blood flow and preventing encephalopathy. Partial shunts preserved hepatopedal flow in 90% of patients and had a notably reduced incidence of encephalopathy. Its Long-term patency rates exceed 95%.
Present recommendation is using small-diameter H-grafts for patients with Child class A or B alcoholic cirrhosis and at least one previous episode of variceal hemorrhage. Although this procedure has succeeded for the emergency control of bleeding and in patients with Child class C cirrhosis, the associated high mortality (around 50%) is unacceptable. In class C cirrhosis that cannot be improved by medical management, a rational alternative is TIPS followed by liver transplantation.
3. ***Transjugular intrahepatic portacaval shunt:*** This procedure is done by means of a percutaneous puncture of the right internal jugular vein under fluoroscopy and ultrasonography guidance. Using a modification of the Seldinger technique, a guide wire is inserted into an intrahepatic branch of a hepatic vein. A needle is advanced over the guide wire through the substance of the liver into a nearby branch of the portal vein.The resulting tract is dilated with a balloon and an expandable stent of 8 to 10 mm in diameter is positioned to maintain patency of the communication between hepatic and portal veins.

A patent portal vein is necessary for the performance of TIPS. The advantages of TIPS include immediate portal decompression, the avoidance of general anesthesia, and a lack of intrusion into the portal hepatis. Disadvantages include technical failure, shunt stenosis or thrombosis in 30 to 50%
of patients at one year, with the possibility of rebleeding and other complications such as shunt migration or intra-abdominal hemorrhage. The reported early mortality for emergency TIPS ranges from 30 to 56%.

Esophageal Transection and Devascularization Surgery for Bleeding Varices

Sugiura and Futagawa described a complex procedure for the control of variceal bleeding, consisting of dividing and reanastomosing the gastroesophageal junction, followed by suture ligating the remaining collaterals on the surface of the stomach. Sugiura's original operation requires doing both a laparotomy and a thoracotomy and aims at directly obliterating varices to occlude their inflow through dilated collateral vessels. Rebleeding rates after this procedure vary widely. Mortality is related to the

severity of underlying liver disease and to the urgency of the procedure as with other shunt procedures. Substantial complications can include anastomotic leaks and stenosis, but the rates of encephalopathy are uniformly low, around 5 to 10% overall.

A less complicated modification involves simultaneous transection and reanastomosis of the distal esophagus using a surgical circular stapler introduced into the esophageal lumen through an incision in the stomach which can also be combined with suture ligation of the left gastric vein. The aim is to interrupt inflow to the varices without obliterating them directly. For patients for whom medical therapy fails, but who cannot be shunted (because of portal vein thrombosis, for example), esophageal transection and reanastomosis is a satisfactory option.

Surgical Treatment of Ascites

For the specific control of ascites, two types of peritoneovenous shunts are available. The LeVeen shunt and Denver shunt. The LeVeen shunt consists of a silicone conduit with a passive, pressure-actuated, one-way valve. One end of the shunt is placed in the peritoneal cavity by a minilaparotomy. The shunt is tunneled subcutaneously to the neck where the other end is secured in the internal jugular vein. The Denver shunt is similar except that its one-way valve is placed over a rib where it can be actively pumped by external compression. These shunts aim to immediately recirculate ascites fluid into the vascular compartment. Ascites is gradually abolished, but the potential for variceal hemorrhage may be increased due to hypervolemia and coagulopathy. As a last resort, peritoneovenous shunts may improve the quality of life for patients with refractory, disabling ascites but with considerable risk. Other associated complications include congestive heart failure from volume overload, infection, venous thrombosis, and eventual occlusion.

Liver Transplantation

Liver transplantation has become increasingly successful in recent years because of improvements in organ preservation, surgical technique, critical care, and immunosuppression. Transplantation corrects portal hypertension along with restoration of hepatic function. Patients with variceal bleeding who have adequate hepatic reserve or reversible liver failure are shunted instead. Those with end-stage liver failure (manifested by persistent jaundice, encephalopathy, and inadequate synthetic capacity) are considered for transplantation. Portal vein thrombosis, until recently an important obstacle to transplantation, can now be dealt with using techniques to bypass or reconstruct the obstructed portal vein. Mesocaval shunts, the distal splenorenal shunt, and TIPS are considered less likely to cause difficulty for a transplantation surgeon when compared with other shunt procedures. It is important to weigh the likelihood of a future need for transplantation against the immediate need for controlling hemorrhage when choosing initial therapy for variceal bleeding.