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The Surgeon's Role in the Management of Portal Hypertension

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Patients with portal hypertension are referred to surgeons for several reasons. These include the management of continued active variceal bleeding; therapy after a variceal bleed to prevent further recurrent bleeds; consideration for prophylactic surgical therapy to prevent the first variceal bleed; or, rarely, an unusual cause of portal hypertension which may require some specific surgical therapy. Injection sclerotherapy is the most widely used treatment for both acute variceal bleeding and long-term management after a variceal bleed. Unfortunately it has probably been overused in the past. The need to identify the failures of sclerotherapy early and to treat them by other forms of major surgery is emphasized. The selective distal splenorenal shunt is the most widely used portosystemic shunt today, particularly in nonalcoholic cirrhotic patients. The standard portacaval shunt is still used for the management of acute variceal bleeding as well as for long-term management, particularly in alcoholic cirrhotic patients. For acute variceal bleeding the surgical alternative to sclerotherapy or shunting is simple staple-gun esophageal transection, whereas in long-term management the main alternative is an extensive devascularization and transection operation. Liver transplantation is the only therapy that cures both the portal hypertension and the underlying liver disease. All patients with cirrhosis and portal hypertension should be assessed as potential liver transplant recipients. If they are candidates for transplantation, sclerotherapy should be used to treat bleeding varices whenever possible, as this will interfere least with a subsequent liver transplant.

DESPITE THE EXTENSIVE LITERATURE on portal hypertension and esophageal varices, few reports specifically analyze the role of the surgeon in portal hypertension management. Other than in centers with a specialized interest in portal hypertension, the majority of general surgeons only see these patients when they are referred by a gastroenterologist or a hepatologist for specific forms of surgical management. Because such referrals are infrequent it is important to review the surgical options so that they can be placed in perspective. This paper analyzes current surgical therapy and other procedures.

The patients referred for surgery fall into one of four broad categories. The patient may be referred as an emergency because of continued or recurrent acute variceal bleeding that has not responded to standard medical therapy. Such a patient may or may not have received one or more injection sclerotherapy treatments. These patients frequently pose complex and taxing problems. Several therapeutic options must be considered because no single

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treatment is ideal for all patients. The second category includes patients who have had a recent variceal bleed that has settled spontaneously or after some specific nonsurgical therapy. Here the referral is for a surgical procedure to prevent a recurrent variceal bleed with it's attendant high mortality. Although many patients may be referred to surgeons in centers with a specific interest in portal hypertension, the practicing surgeon outside of such centers should understand the options as well as the limits of his or her capabilities in managing these problems. The third category relates to prophylactic surgical measures aimed at preventing the first variceal bleed in patients who have portal hypertension and esophageal varices but who have not yet had a variceal bleed. This is currently the most controversial area. Mortality following the first variceal bleed varies considerably depending on the underlying etiology of the portal hypertension, the general fitness of the patient, and the availability of expertise in management. In this case, the form of therapy used must not only prevent the first variceal bleed but must do so with a lower morbidity and mortality than would simple observation and awaiting the first possible bleed. The fourth category includes patients with unusual causes of portal hypertension. In certain circumstances specific surgical therapies have been advocated. Although unusual in Western practice, these therapies are reviewed to provide surgical guidelines.

The division of patients into four categories is somewhat arbitrary because there may be some overlap of patient conditions and symptoms and the same management policy may deal with more than one group at the same time. For instance, a successful emergency portacaval shunt performed to control acute variceal bleeding also prevents recurrent variceal bleeds in surviving patients.

Surgical Options

Portosystemic Shunts

For three decades (mid 1940s to mid 1970s) portacaval shunts, particularly standard end-to-side or side-to-side shunts, were the main form of surgical therapy for patients with esophageal varices. However, controlled trials demonstrated problems and complications. This, together with the advent and subsequent widespread popularity of injection sclerotherapy during the last decade has led to a reduction in the use of shunts. Newer studies comparing portacaval shunts with other modalities of therapy in both acute variceal bleeding management and in long-term therapy after a variceal bleed have restimulated interest in shunts.

Portacaval Shunts

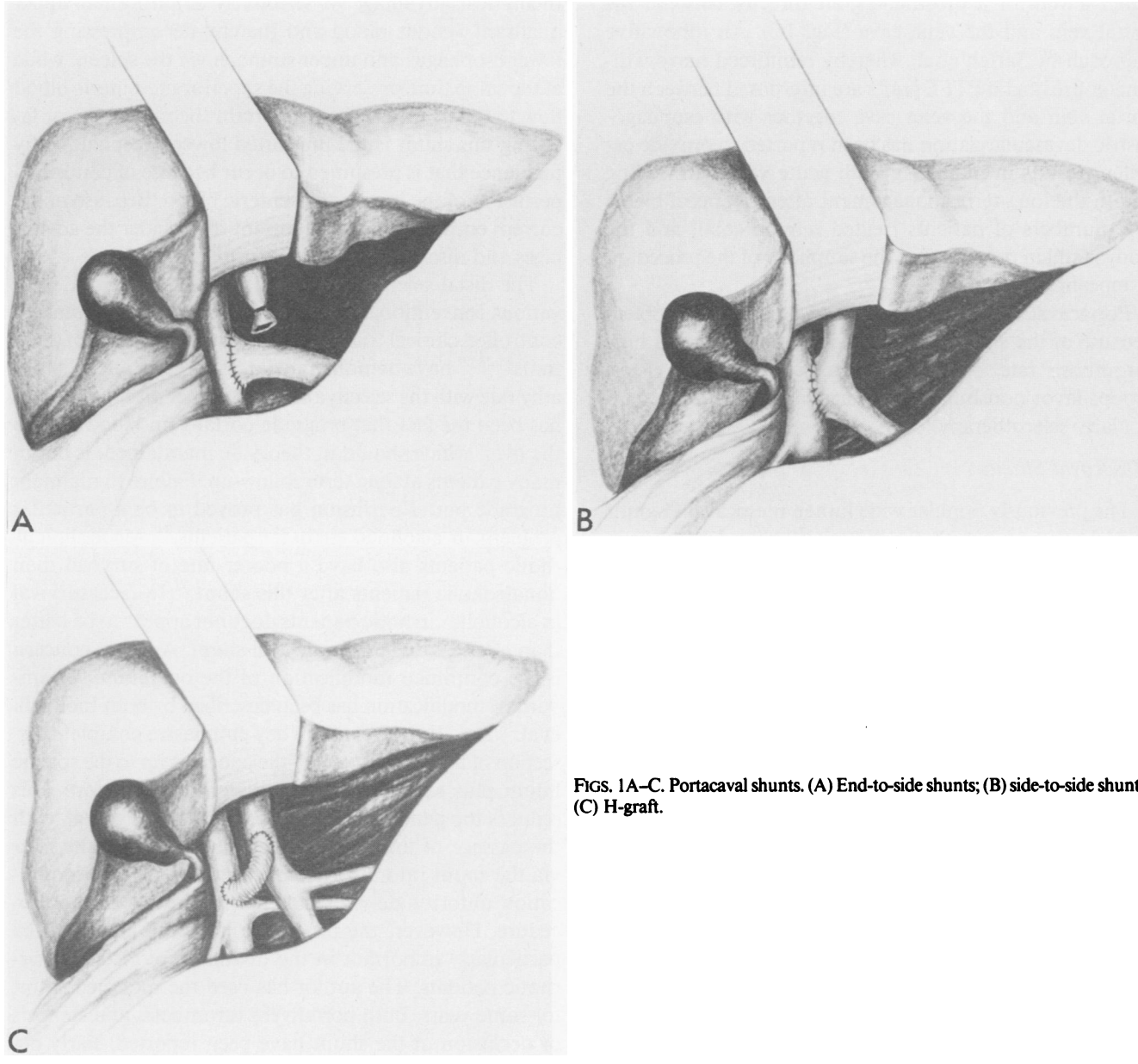
The three main types of portacaval shunts are shown in Figure 1. They are end-to-side and side-to-side shunts and the more recently described H-graft variants. The most widely used has been the original end-to-side shunt (Fig. 1A). The side-to-side shunt has been used less commonly but has a particular role in treating patients with severe ascites (Fig. 1B). The operative techniques are well described in standard texts.

Historically portacaval shunts have been the most widely studied with prolonged follow-up and therefore their effects and outcome have been evaluated the best. Portacaval shunts were introduced clinically in the mid 1940's.[1] Having lost favor in recent years, they are being re-evaluated as the problems and complications of the other types of shunts become evident with more prolonged follow-up.

There are four completed controlled trials comparing therapeutic portacaval shunts with conventional medical management.[2-5] All were performed several years ago and few patients had endoscopic confirmation of bleeding esophageal varices. The fact that these trials failed to provide a clear-cut survival advantage lead surgeons to question the value of the procedure. However, recent investigations have shown that other newer forms of therapy, particularly other shunts in alcoholic cirrhotic patients, seldom provide a survival advantage. This has lead to a revival of interest in standard portacaval shunts. Although a successful portacaval shunt effectively prevents recurrent variceal bleeding, this is traded for an unpredictable incidence of postshunt encephalopathy that can be severely debilitating.

The results of studies in which shunts were performed prophylactically to prevent the first esophageal variceal bleed were even more dramatic. Three of the four controlled trials comparing shunting with conventional medical management showed worse survival rates in the shunted patients.[6-8] These trials were also performed many years ago but have wisely led to the almost complete abandonment of prophylactic portacaval shunts. In the author's view, prophylactic shunts (or any other form of major surgery for prophylaxis) are unjustified on current evidence because the first variceal bleed can be successfully treated in most patients when it occurs. In addition, the low incidence of variceal bleeding in the control patients in the prophylactic trials, as well as the inability to identify patients who are vulnerable to a first bleed,[9-11] make prophylactic shunts unacceptable.

Although portacaval shunts were previously advocated as the definitive therapy for acute variceal bleeding, with the added advantage of successfully preventing recurrent bleeds in long-term management, the reported high mortality limited the use of emergency portacaval shunts to a few centers where enthusiasm has continued. Orloff has been one of the major proponents and has continued to advocate emergency shunts. He has documented an ever decreasing mortality as expertise has improved.[12] Nev-



FIGS. 1A–C. Portacaval shunts. (A) End-to-side shunts; (B) side-to-side shunts; (C) H-graft.

ertheless, this view has been criticized by many authorities. Recent studies of emergency portacaval shunts have revived interest.[13,14] The controlled trial of Cello et al. has been widely cited.[15] They compared emergency shunts with sclerotherapy in poor risk alcoholic cirrhotic patients. They documented that rebleeding from varices, the duration of rehospitalization for bleeding, and transfusions received were significantly greater in the sclerotherapy group. Furthermore, 40% of those patients discharged ultimately required surgical treatment. Costs and long-term survival did not differ significantly. They concluded that although sclerotherapy was as good as shunting in this setting, those sclerotherapy-treated patients in whom varices were not eradicated and who continued to bleed should be considered for elective shunt surgery. The author's group has reached a similar conclusion based on an assessment of their sclerotherapy patients.[16] The excellent paper by Cello et al. has been criticized because their criteria for classification as Child's C was less stringent than usual. Nevertheless, their findings are important.

Another study from Barcelona evaluated staple transection and shunts in low-risk patients and staple transection and sclerotherapy in high-risk patients. They concluded in favor of staple transection rather than shunts in low-risk patients and in favor of sclerotherapy in high-risk patients.[17] Unfortunately shunts were not evaluated in high-risk patients.

A technically simpler operation is the interposition of

either a vein or a prosthetic graft directly between the portal vein and the vena cava (Fig. 1C). An innovative approach by Sarfeh et al. whereby reinforced narrow diameter prosthetic PTFE grafts are interposed between the portal vein and the vena cava together with esophagogastric devascularization has been reported to provide excellent results in managing both acute variceal bleeding and in the long-term management after a variceal bleed. The numbers of patients treated remain small and the study is still in progress, but the simplicity of the procedure is appealing.[14]

Portacaval shunts in children pose a particular problem because of the small size of the anastomosis with a high thrombosis rate, other than in selected centers.[18] Most groups favor nonshunting management in children, particularly sclerotherapy.[19,20]

Mesocaval Shunts

The previously popular wide lumen mesocaval H-grafts (Fig. 2A) using prosthetic material[21] have largely been abandoned because of a high late thrombosis rate. These shunts have also been associated with as high and as unpredictable an encephalopathy rate as occurs with standard portacaval shunts. In addition, they do not provide selective shunting as was originally believed. The exceptions with regard to late thrombosis with prosthetic grafts are the C-mesocaval grafts of Cameron et al.[22] (Fig. 2B) and Sarfeh et al.'s narrow-diameter (8 mm) PTFE portacaval H-grafts (Fig. 1C), as already discussed. Trials by other groups are required to confirm the satisfactory results and long-term patency of the C-mesocaval shunts. In a mesocaval graft designed particularly for use in children, the vena cava is transected low down and turned up and anastomosed to the mesenteric vein end-to-side, thereby providing a wide anastomosis. Although used relatively commonly in the past[23] (Fig. 2C), it is seldom used today because of the success of sclerotherapy in childhood portal hypertension.

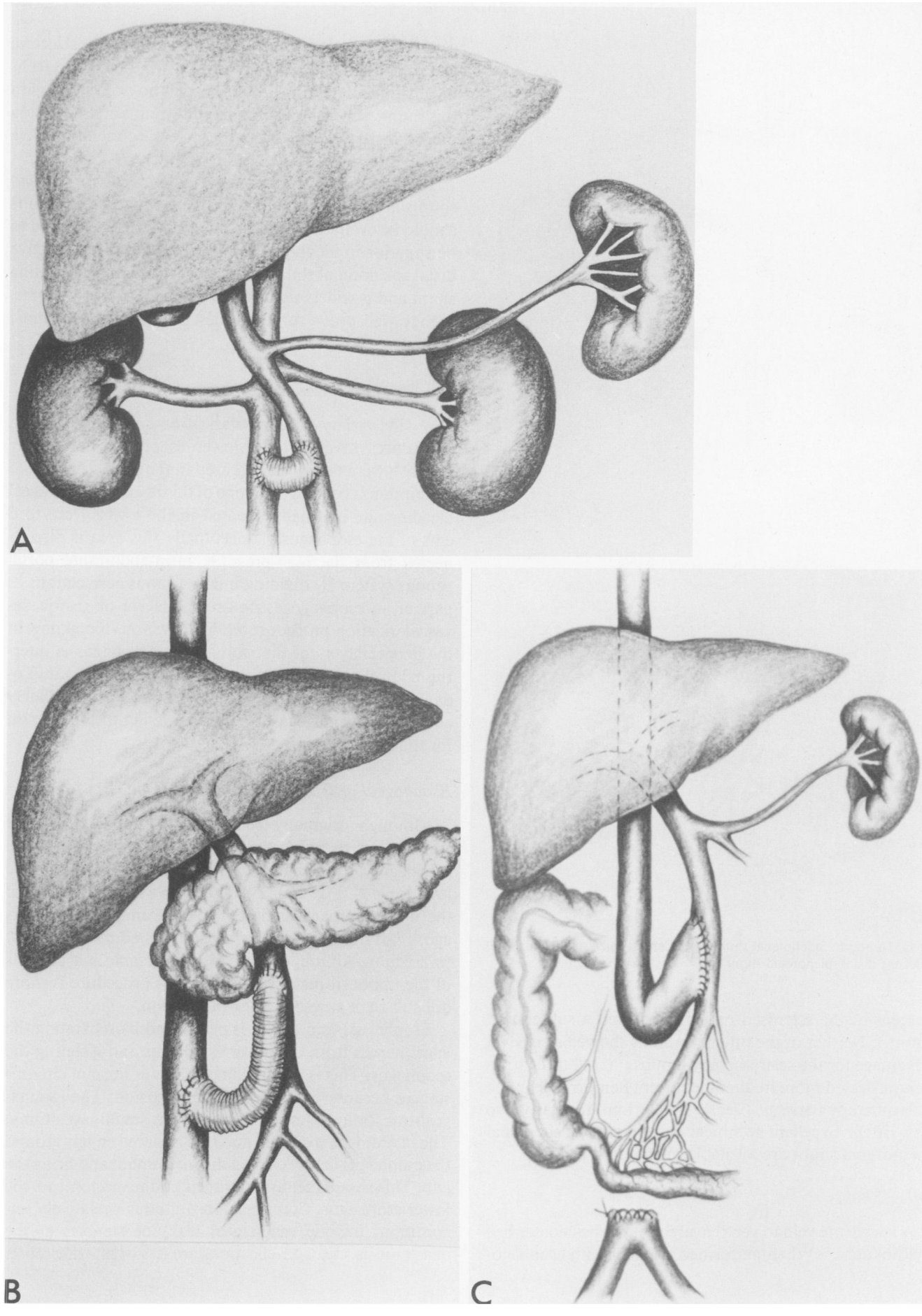
Splenorenal Shunts

The originally described central splenorenal shunt entailed removal of the spleen with anastomosis of the remaining splenic vein to the renal vein as an end-to-side procedure (Fig. 3A). Although thought to provide some degree of selective shunting, it usually becomes a total shunt with superior mesenteric blood flowing down the splenic vein and hence into the systemic circulation via the renal vein. It has been associated with a similar incidence of encephalopathy as the end-to-side shunt and probably has a higher thrombosis rate. It is less frequently used than the standard end-to-side portacaval shunt.

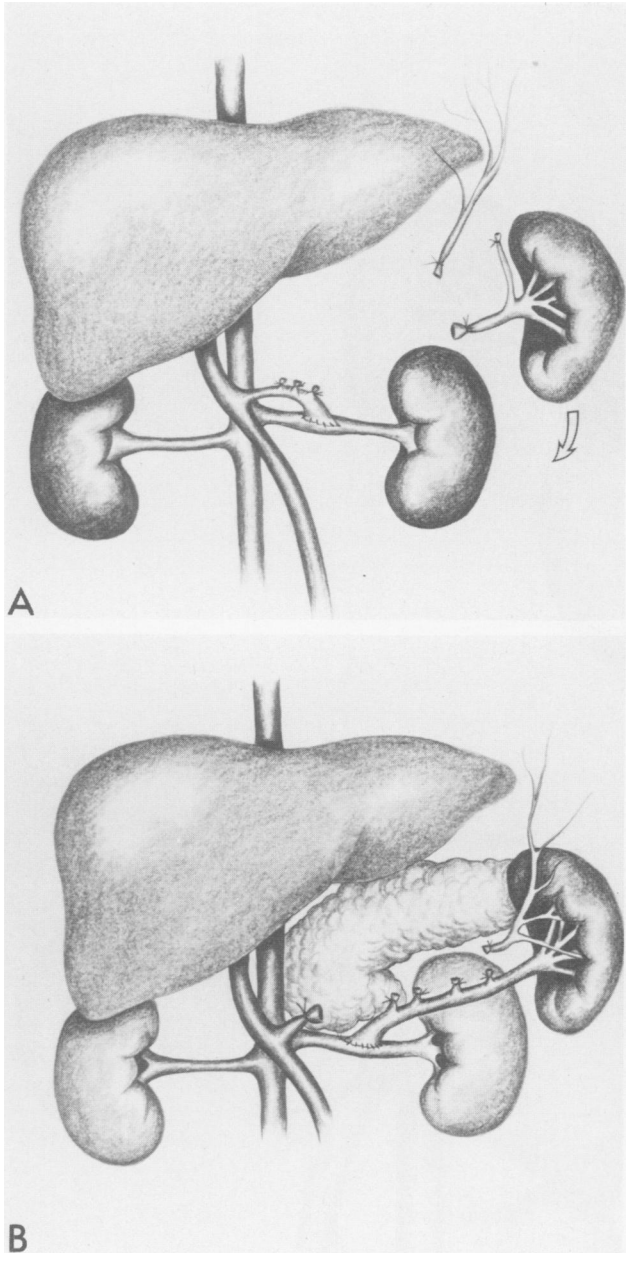
The shunt that has captured the imagination of surgeons since its introduction by Warren and Zeppa[24] has been the selective distal splenorenal shunt (Fig. 3B). It has the theoretical advantage of selectively shunting left upper quadrant venous blood and thereby decompressing the lower esophagus and upper stomach *via* the spleen, while at the same time preserving the superior mesenteric blood flow to the liver. Another important theoretical factor favoring this shunt is the purported lower encephalopathy incidence that is presumed to occur because of continued perfusion of the liver by mesenteric blood. Because of the current enthusiasm it is important to consider the advantages and disadvantages of this shunt.

The distal splenorenal shunt has been compared with various conventional shunts in six completed randomized controlled clinical trials.[25-30] However, only three of these trials[25,28,29] have demonstrated a lesser early encephalopathy rate with the selective shunt. Another disappointment has been the fact that prograde portal-vein blood flow to the liver, which should in theory be maintained, is not in many patients at long-term follow-up. Failure to maintain prograde portal perfusion has proved to be a particular problem in alcoholic cirrhotic patients.[31] Alcoholic cirrhotic patients also have a poorer rate of survival than nonalcoholic patients after this shunt.[32] In fact, survival in alcoholic cirrhotic patients does not appear to be better than after a standard portacaval shunt. Another concern is the continued modification of the operation. An important modification has been described by both Inokuchi et al.[33] and Warren et al.[34] They emphasize complete dissection of the splenic vein off the pancreas up to the splenic hilum plus extensive portal collateral obliteration. This reduces the pancreatic sump or siphon effect which, with the passage of time, deviates blood away from the liver via the shunt into the systemic circulation. This modification unfortunately extends the magnitude of the procedure. However, the procedure has been shown to be particularly important in the treatment of alcoholic cirrhotic patients. The author has used the modified shunt for some years. Both portal vein thrombosis and stenosis or occlusion of the shunt have been reported. Early occlusion should be treated by reoperation and stenosis should be treated by balloon dilatation gaining access to the shunt *via* the femoral vein.[35] The distal splenorenal shunt is technically more exacting than other standard shunts. It is also not suitable for all patients and is contraindicated where severe ascites coexists.

This shunt has also been compared with sclerotherapy in three controlled trials. The first was reported by Warren's group, who were the originators of the distal splenorenal shunt. They showed that liver function was less well preserved in shunted patients. Although the rebleed rate was higher, survival was significantly improved in patients treated initially with sclerotherapy. Note, however, that the treatment of the sclerotherapy group constituted a combination of sclerotherapy plus distal splenorenal shunt for the failures of sclerotherapy. Thirty-one



FIGS. 2A–C. Mesocaval shunts. (A) H-graft; (B) C-graft; (C) Clatworthy shunt.



FIGS. 3A and B. Splenorenal shunts. (A) Central splenorenal shunt; (B) selective distal splenorenal shunt.

percent of the sclerosed patients required a subsequent shunt.[36] Neither of the other two trials showed a survival advantage for the sclerotherapy groups.[37,38] All three trials demonstrated more frequent recurrent hemorrhage in the sclerotherapy patients. Clearly the bottom line has yet to be written. Excellent technical descriptions of the distal splenorenal shunt are available in standard texts.

Other Shunts

A left gastric vein to vena caval shunt has been described by Inokuchi.[39] When performed together with esophagogastric devascularization, this also provides selective shunting with reported good results, although it is a technically difficult shunt. The author has no experience with this shunt. Other forms of makeshift shunts anastomosing dilated mesenteric vessels to the systemic circulation have usually produced disappointing results.

The original end-to-side and side-to-side portacaval shunts are the gold standard against which other shunts should be evaluated. Other shunts still must be proved to be superior in alcoholic cirrhotic patients. The selective distal splenorenal shunt is the most conceptually exciting shunt and is widely used in all types of cirrhotic patients. It may well prove to be the best shunt in nonalcoholic patients.

Devascularization and Transection Operations

A wide variety of devascularization and/or transection procedures involving the lower esophagus and upper stomach were described and used in the past.[40] A detailed description is beyond the scope of this review. The variceal bleeding site is usually situated in the lower 4 cm to 5 cms of the esophagus. Conceptually this area is disconnected from the high-pressure, intra-abdominal portal venous system by dividing inflow venous connections as part of an esophagogastric or esophageal or gastric devascularization procedure while the venous blood flow in the deeper layers of the stomach or esophagus is interrupted by division and reanastomosis of either organ. Today most workers divide the lower esophagus immediately above the esophagogastric junction using the staple gun for the anastomosis.

Esophageal or Gastric Transection Alone

Although originally performed by hand, almost all transections today have a staple-gun transection of the esophagus immediately above the esophagogastric junction[42–44] (Fig. 4A). The alternative is a transection of the upper stomach as described by Tanner many years ago,[41] but this has been largely supplanted by esophageal transection. Although transection and staple anastomosis of the upper stomach is possible, this procedure is more difficult than an esophageal transection.

Esophageal transection is performed by separating the vagal nerves from the lower esophagus and isolating the esophagus. This is more difficult than in normal circumstances because of the portal hypertension. The esophageal-transection gun is inserted *via* a small gastrotomy. The instrument is opened and a tie is placed snugly around the esophagus before closing the instrument and firing the gun. This simultaneously transects and reanastomoses the lower esophagus. Complications, although relatively uncommon, include esophageal leaks or stenosis at the anastomosis site. Complications are less when transection

is performed alone than when it is combined with an extensive devascularization procedure.

Devascularization Alone

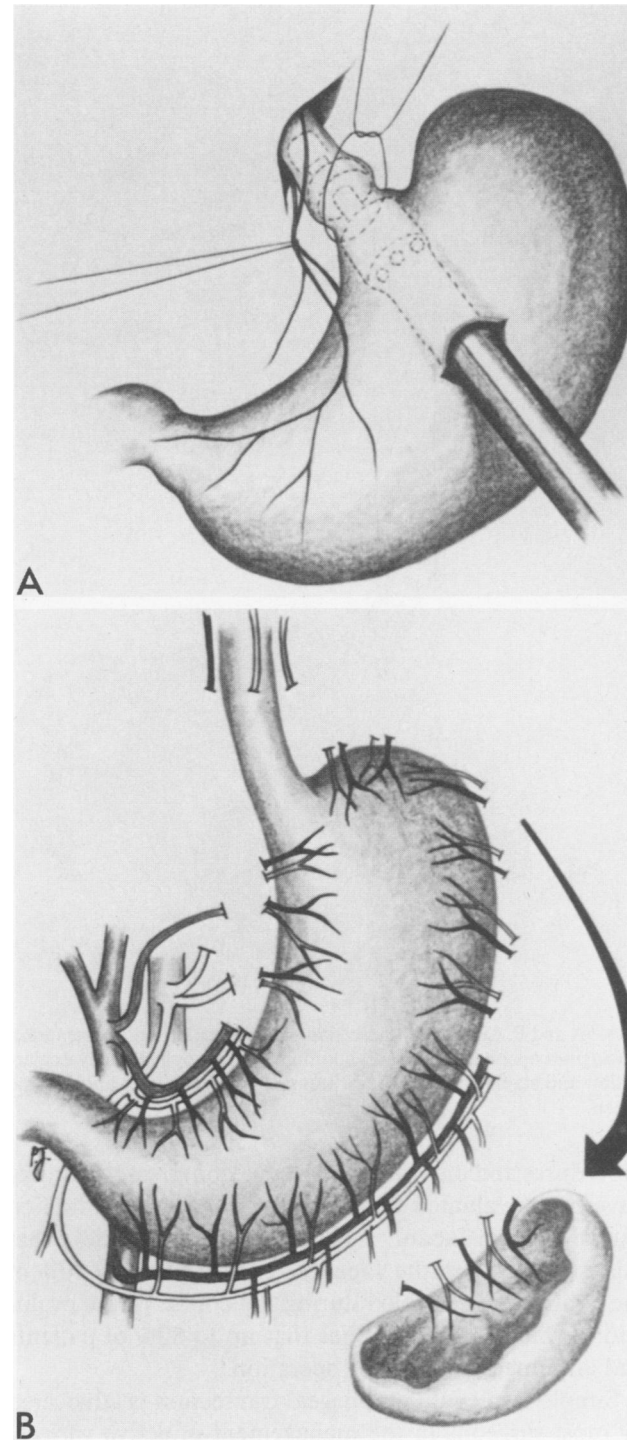
Various transabdominal devascularization procedures have been described. One of the most widely used in the past was the Hassab procedure, which is an upper gastric devascularization and splenectomy without transection.[45] Excellent results were reported in treating schistosomiasis. An alternative, and a very similar procedure, is the Womack operation that devascularizes the upper stomach and also includes splenectomy and oversewing of varices but without a transection.[46] A transabdominal devascularization procedure is depicted in Figure 4B. The classical descriptions above included splenectomy, although today it has been recognized that the spleen may be left *in situ.*

Current evidence is that a devascularization procedure alone without a transection is insufficient in Western patients presenting with cirrhosis. This is confirmed by the recent report of the long-term follow-up of the Womack-operation patients from Chappel Hill,[47] in whom this procedure was shown to be ineffective. A minimally invasive embolization and transcatheter thrombosis procedure performed *via* a mini-laparotomy has been reported. It is claimed to achieve similar devascularization without transection with apparently successful results.[48] Further evaluation is required.

Extensive Esophagogastric Devascularization with Transection

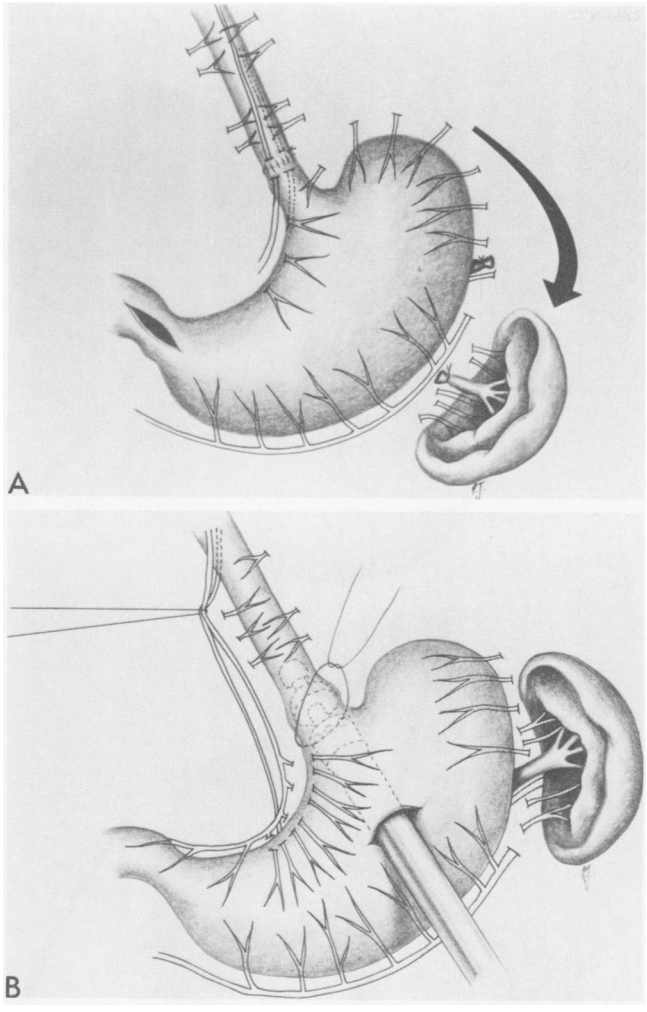
The extensive abdominothoracic procedure described by Sugiura[49] and its modifications[50] are widely used in Japan with excellent reported results (Fig. 5A). Results in the West, where the patient material is different, have been less favorable. A study from New York concluded that although the procedure stops acute bleeding reliably and prevents early rebleeding, it is a tedious, time-consuming operation with a high complication rate and a high rebleed rate. They point out that similar results can be achieved with simpler procedures.[51]

Most Western surgeons perform an extensive devascularization of the upper half of the stomach and of the lower 5 cm to 7 cm of the esophagus *via* the transabdominal route, and combine this with a low esophageal staple-gun transection. The author's technique is to perform a highly selective vagotomy along the lesser curve and then divide the greater curve short gastric vessels without removing the spleen. This is followed by an extensive devascularization of the lower 5 cm to 7 cm of the esophagus performed *via* the hiatus. The procedure is completed by an esophageal stapled transection (Fig. 5B). In a follow-up study of 13 patients undergoing a similar procedure in Sheffield, England, varices either disappeared or were reduced in number in all patients. No varices were present within 1 cm of the stapled anastamosis and a doppler study showed no flow in the residual varices. These changes were not always permanent but it could take many years for the varices to redevelop.[52]



FIGS. 4A and B. Transection or devascularization operations. (A) Esophageal transection with a staple gun; (B) gastric devascularization alone.

The extensive abdominothoracic devascularization



FIGS. 5A and B. Combined transection and devascularization operations. (A) Sugiura operation; (B) transabdominal gastroesophageal devascularization and staple-gun esophageal transection with preservation of the spleen.

procedures and other forms of nondecompressive surgery have been evaluated for prophylaxis to prevent the first varical bleed in Japan.[53] The author does not believe that this is justified. In the Japanese experience only 20% of the control patients bled during the course of the evaluation, which thereby implies that up to 80% of patients had an unnecessary major operation.

Simple staple-gun esophageal transection is advocated by most surgeons in the management of active variceal bleeding, particularly for the failures of sclerotherapy. For long-term management a more extensive procedure is usually recommended as an alternative to either shunts or sclerotherapy. The author prefers a transabdominal extensive esophagogastric devascularization plus staple-gun esophageal transection.

Sclerotherapy

Sclerotherapy of esophageal varices was first reported in a patient in 1939.[54] There was initial interest but this was largely supplanted by the newly introduced portacaval shunting operations. Interest in sclerotherapy resumed in the 1970s with reports of its successful use and with the commencement of controlled trials.

Today it is the most commonly used management for patients with portal hypertension and esophageal varices. As a result of the published controlled trials[55–59] initial enthusiasm for its use is being questioned. Thus sclerotherapy is beginning to find its correct place among other surgical procedures.

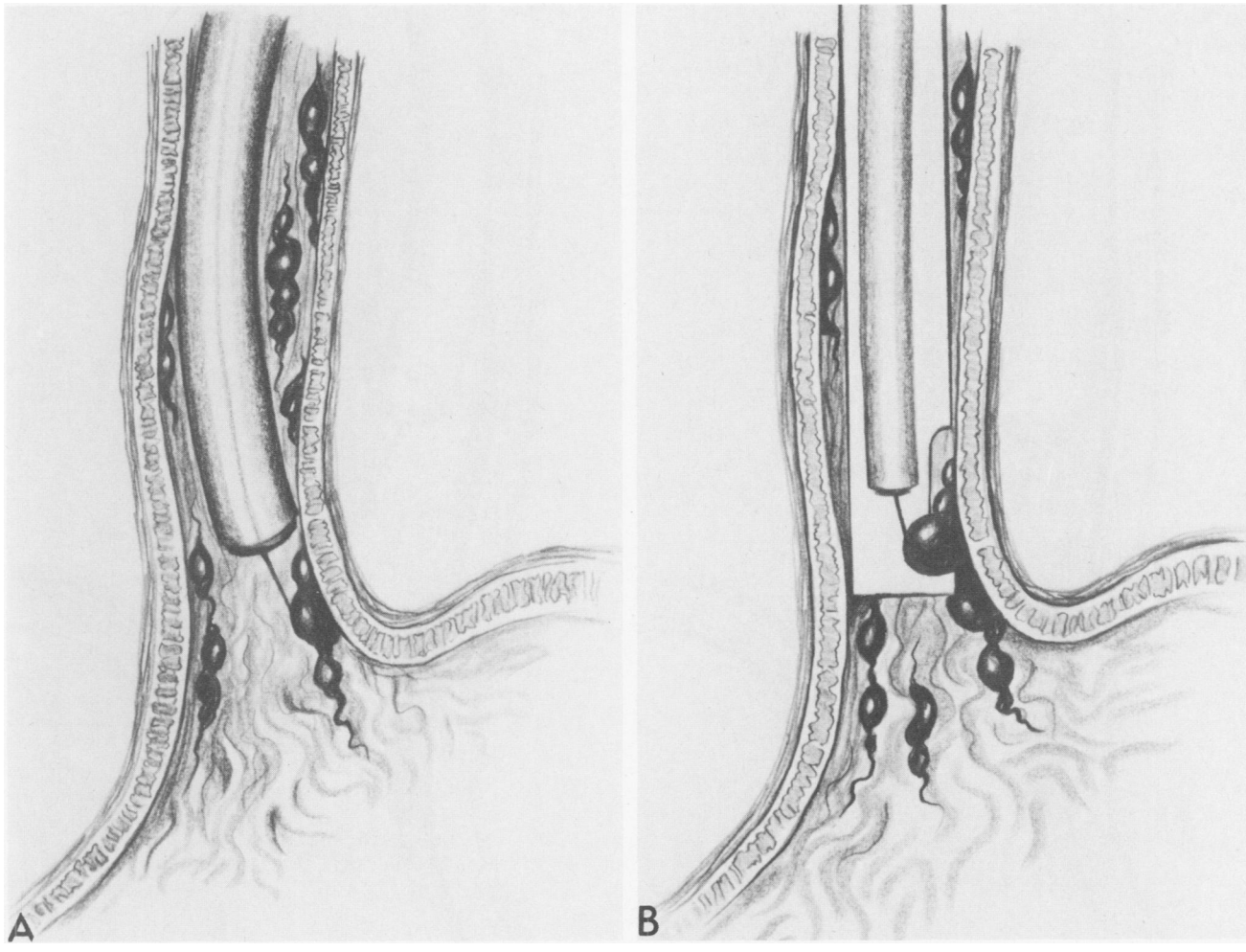
Although sclerotherapy is largely performed by physicians, usually gastroenterologists or hepatologists, the procedure is part of the surgical armamentarium in a number of units and will thus be presented and discussed briefly. Detailed reviews of its use are available.[60]

Technical Variants

There has been an almost complete shift from the original rigid endoscope techniques to the use of the flexible fiberoptic endoscope over the past ten years. This is supported by the results of a controlled trial.[61] The majority of North American studies have used a direct intravariceal injection of one of a variety of sclerosing agents (Figs. 6A and 6B). The concept of intravariceal sclerotherapy is that the variceal channels will be thrombosed and obliterated, thereby controlling acute variceal bleeding and preventing recurrent variceal bleeds.

The alternative paravariceal technique is shown in Figure 7A.[62] The concept is that in the acute bleed setting this procedure produces a bleb or swelling that compresses the adjacent varix and stops bleeding. In long-term management it produces thickening of the overlying mucosa, thereby theoretically reducing or preventing recurrent bleeds. A number of researchers, including those in the author's group, use a combination of intra- and paravariceal sclerotherapy techniques in the hope that this will result in a summation of the advantages of both techniques (Fig. 7B). The author's group use this combined technique particularly in acute variceal bleeding but subsequently use a predominantly intravariceal injection technique (Fig. 6A).

Several other technical details have been subjected to controlled trials. One trial compared intra- with paravariceal sclerotherapy using a relatively unusual agent, absolute alcohol, and demonstrated that the intravariceal technique was superior.[63] Controlled trials have compared different sclerosing agents. Ethanolamine oleate was shown to be superior to polidocanol[64] and sodium tetradecal sulphate (STD)[65] using one technique, while polidocanol was superior to absolute alcohol using a different technique.[66] Although animal models have been tested, further trials are required in humans. The author recommends the use of 5% ethanolamine oleate, based on personal experience and recent controlled trial evidence,



FIGS. 6A and B. Sclerotherapy. (A) Intravascular sclerotherapy using the flexible endoscope; (B) intravascular sclerotherapy using the rigid endoscope.

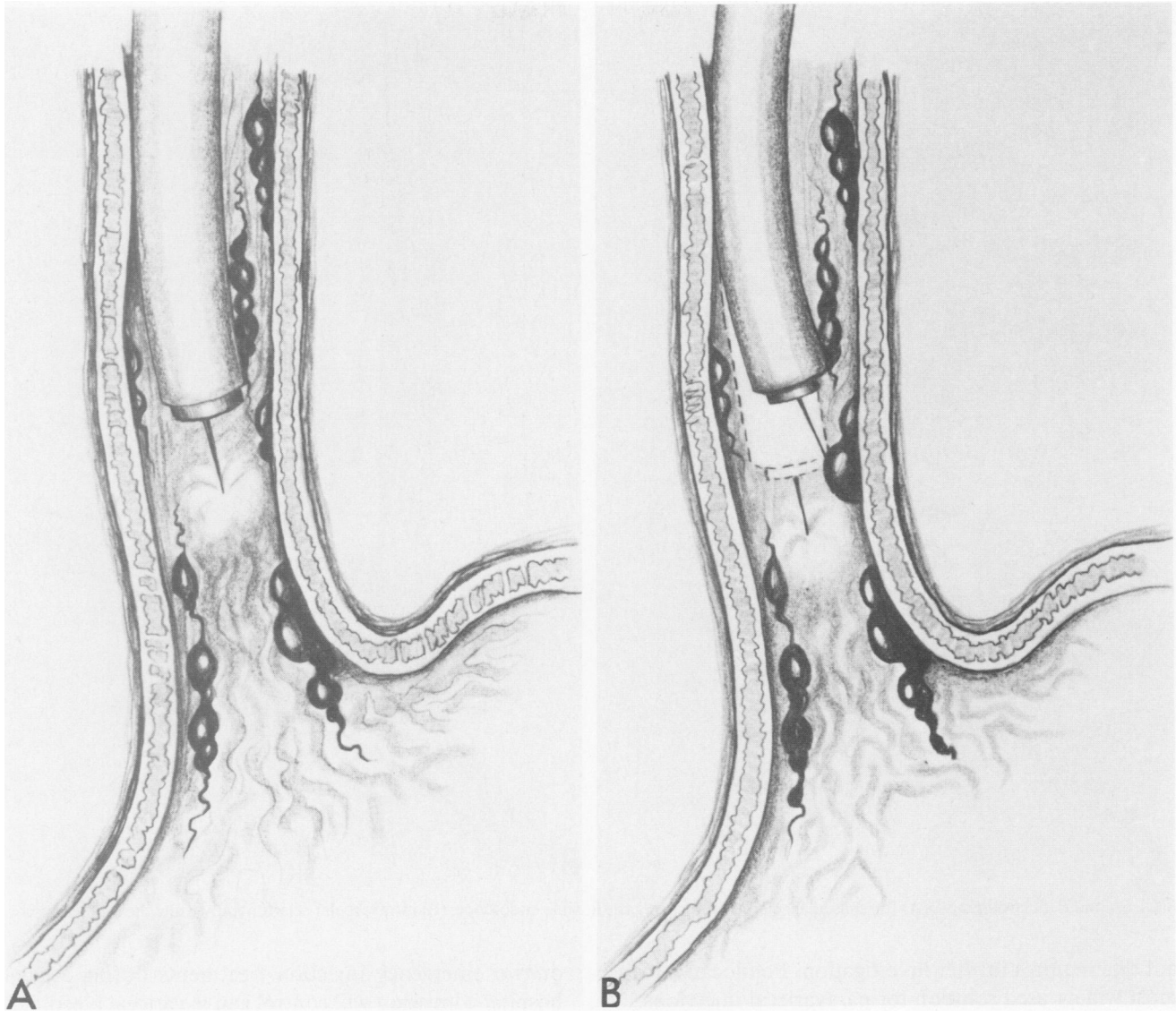
but this requires further investigation. Polidocanol is the most widely used solution for paravariceal injections.[62]

Uses and Results of Sclerotherapy

There is increasing interest in the use of sclerotherapy at the time of the first diagnostic endoscopy.[67–69] Although technically difficult, it is better to deal with the problem immediately rather than waiting, during which time the patient could bleed again. Acute bleeding can be controlled, although this is more difficult. Varices that have signs of recent bleeding (*i.e.*, a clot on a varix), but in which bleeding has stopped, can also be dealt with at the time of the first emergency endoscopy, if circumstances and expertise permit.

In most institutions urgent or emergency sclerotherapy has been used in all patients with severe active variceal bleeding that has not responded to conservative measures. Three controlled trials investigated emergency sclerotherapy and the results support its use.[70–72] Considerable evidence from uncontrolled studies also supports the use of sclerotherapy in managing acute variceal bleeding. One or two emergency injection treatments during a single hospital admission will control active variceal bleeding in more than 90% of patients.[73] The five to ten percent of failures pose a problem. Here balloon-tube tamponade is advocated and the patient should then proceed to more definitive emergency major surgery. Patients who require more than two injection treatments during a single hospital admission for acute variceal bleeding control have been shown to have a prohibitively high mortality.[16] Such patients require one of the more major surgical procedures.

Patients who have had a variceal bleed are frequently treated by repeated sclerotherapy to prevent recurrent bleeds. Repeated injection sclerotherapy has been shown to eradicate varices and to diminish or prevent subsequent variceal bleeds, particularly after varices have been eradicated. Several injection treatments are required to achieve eradication.[60] Controlled trials of intravariceal injections have shown that sclerotherapy treatments should be performed at least weekly rather than at longer intervals[74,75] until eradication is achieved. However, it is doubtful if survival is prolonged by repeated injection sclerotherapy.



FIGS. 7A and B. Sclerotherapy. (A) Paravariceal sclerotherapy; (B) combined paravariceal and intravariceal sclerotherapy.

Of the five completed randomized controlled clinical trials comparing sclerotherapy with conservative medical management,[55-59] only one[57] demonstrated a clearcut improvement in survival. A survival advantage must therefore remain in question, particularly in alcoholic cirrhotic patients. Thus although sclerotherapy provides a valuable alternative form of management for patients who have previously had a bleed from varices, there are complications. Lifelong follow-up is required with repeated injections, and varices recur in time. In the Cape Town experience, varices have been shown to recur at a mean time of between one and two years after eradication. Complications, although unusual,[76] are cumulative with time. The Cape Town group advocate weekly injections until the varices have been eradicated. Thereafter the first follow-up is at three months and subsequently at six to twelve monthly intervals. Whenever varices are diagnosed on endoscopy they are re-eradicated using the same protocol.

In using sclerotherapy for long-term management there is increasing evidence to suggest that those patients in whom varices are difficult to eradicate, or those patients who have repeated bleeds during the course of eradication, should be seriously considered for one of the alternative major forms of surgery at an early stage. In Warren's study, sclerotherapy was combined with shunting for the failures of sclerotherapy and this combined modality of treatment was shown to be superior to selective splenorenal shunting alone.[36]

The use of sclerotherapy as a prophylactic measure to prevent the first variceal bleed has been extensively investigated in controlled trials. Four major trials from Germany produced conflicting results.[77-80] Two recent North American studies that failed to show an advantage

for prophylactic sclerotherapy[81,82] have led to acceptance that prophylactic sclerotherapy is unjustified outside of controlled trials at present. A detailed analysis of the role of prophylactic sclerotherapy has appeared in a recent editorial.[9]

Injection sclerotherapy is the most widely used and probably the most successful therapy for acute variceal bleeding. However, the sclerotherapy failures should be identified early and treated by a more major surgical procedure. Sclerotherapy's role in long-term management after a variceal bleed remains under evaluation. It is the author's preferred therapy for the majority of patients, but both portosystemic shunts and devascularization and transection operations are acceptable alternative procedures. Prophylactic sclerotherapy is unjustified on currently available data.

Other Techniques

Older Techniques

A number of older techniques, including resection of the stomach and esophagus, under-running of varices using a direct suture technique, partial transection of the esophagus, and percutaneous transhepatic obliteration of varices[83] have been abandoned. History records that some of the great names of surgery were linked to operative procedures previously used in patients with portal hypertension.

New Procedures

Both laser coagulation, and electrocautery have been tested in small numbers of patients with esophageal varices. Neither has been widely accepted. A technique using elastic banding similar to that used for hemorrhoids has been described recently.[84] Although the results are encouraging the technique remains to be evaluated in other centers.

Pharmacological Therapy

The role of drug therapy in acute variceal bleeding remains controversial. This has been addressed in detail in a recent editorial.[85] A continuous infusion of vasopressin with or without added nitroglycerin is recommended by the author's group. The place of the synthetic analogue of vasopressin, glypressin, and of the inhibitory hormone somatostatin, has yet to be finally established. All of these agents are presumed to act by lowering portal pressure thereby assisting in controlling active variceal bleeding. An alternative approach whereby lower esophageal sphincter pressure is raised has been suggested,[86] and is under evaluation.

One study has shown a significant reduction in early recurrent rebleeding when propranolol was administered for fourteen days commencing 24 hours after the initial variceal bleed had been controlled.[87] This could have important implications because early rebleeding is associated with high mortality and because prolonged propranolol therapy has its own problems. Further trials are required.

The use of pharmacological therapy in long-term management remains highly controversial. Agents that raise lower esophageal sphincter pressure still have to be evaluated. Emphasis has been placed on agents that lower portal pressure, particularly beta blocking agents. Early results were conflicting but more recent trials have produced some support for the use of beta blockade.[88,89] Nevertheless the controversy continues and caution should be observed before beta blocking agents are prescribed particularly in high-risk cirrhotic patients. The author believes that their use should be restricted to major institutions with a special interest in portal hypertension until more trials have provided greater clarity.

All forms of prophylactic therapy aimed at preventing the first variceal bleed are unproved. This includes the use of pharmacological therapy such as beta blockade. Note that although the three published trials have demonstrated dimished first bleed rates, only one trial showed improved survival.[9] Prophylactic drug therapy remains unjustified outside of controlled trials.

Liver Transplantation

Hepatic transplantation is the only therapy that can cure both the portal hypertension and the underlying liver disease. The improved results of hepatic transplantation[90-91] have led to the commencement of a number of new transplant programs with increasing numbers of patients being treated definitively. It is the treatment of choice for patients who are otherwise fit and who have end-stage liver disease. Such patients frequently present with variceal bleeding.

The management of variceal bleeding in a patient who is a potential transplant recipient is important. The first aim is to keep the patient alive until a suitable donor is available. It is also important to use a form of therapy that will not interfere with the subsequent transplant. For this reason most studies advocate sclerotherapy as the treatment of choice. Where sclerotherapy fails, major surgery in and around the porta hepatis, particularly portacaval shunts, should be avoided because this makes the transplant procedure more difficult and potentially more hazardous. We advocate simple staple-gun esophageal transection for sclerotherapy failures in possible transplant recipients.

Management of Specific Conditions

Acute Variceal Bleed Management

Patients with suspected acute variceal bleeding must be admitted to the hospital, preferably to an intensive care unit, and resuscitated. The author believes that such

patients are better cared for in a specialist center because more than one form of complex therapy may be required. The diagnosis of a variceal bleed must be confirmed by emergency diagnostic fiberoptic endoscopy because many patients with suspected esophageal variceal bleeding will either not have varices at all or will be bleeding from a lesion other than their varices. The role of pharmacological therapy in controlling acute variceal bleeding remains unproved. Unless contraindicated, the author advocates the use of a continuous infusion of vasopressin, at 0.4 units per minute, with the addition of sublingual nitroglycerin, one tablet each hour for six hours. The nitroglycerin reputedly reduces the side effects of the vasopressin while potentiating its hemodynamic effects in the portal bed.[92]

A correctly used balloon tube will achieve tamponade and control active variceal bleeding temporarily in most patients.[73,93,94] Unfortunately the rebleed rate is high on removal of the tube, as is the subsequent mortality rate. Because the use of the balloon tube is associated with complications, it should only be used when required to control active variceal bleeding. Once a balloon tube has been inserted the patient requires subsequent additional therapy to prevent recurrent bleeding. Such therapy must be performed early within 6 to 12 hours to prevent local complications from the balloon tube.

The mainstay of subsequent emergency therapy is sclerotherapy although both shunts and devascularization and transection operations are playing a greater role in management today. The three published controlled trials,[70–72] as well as considerable data from uncontrolled studies, show that sclerotherapy controls acute variceal bleeding in 90% to 95% of patients. Sclerotherapy is used increasingly at the time of the initial emergency endoscopy, but this requires a high degree of skill and expertise.

The use of an emergency portosystemic shunt or simple staple-gun transection as an alternative to sclerotherapy is under evaluation. The evidence favoring major surgery in at least some categories of patients is presented earlier. Sclerotherapy failures are defined as those patients in whom bleeding recurs after two emergency injection treatments. Such patients should be controlled again with balloon tamponade and subjected to a shunt or a transection as a matter of urgency. The author predicts that emergency shunts or emergency transection procedures will be performed more frequently in future in managing severe acute variceal bleeding.

Long-Term Management

Repeated sclerotherapy remains the most widely used treatment for patients who have previously bled from esophageal varices. Whether one or other form of shunt or a devascularization or transection operation is preferable is under review with major surgery gaining popularity once again. Trials currently in progress should help, although published trials have provided conflicting data. The problem is that varices recur in time after sclerotherapy and that patients continue to bleed until their varices have been eradicated. Furthermore, variceal eradication has proved difficult in some patients. The author's group recommend that patients who have repeated bleeds or patients in whom varices are difficult to eradicate should be defined as failures of sclerotherapy and be treated by one of the major surgical procedures at an early stage. In nonalcoholic cirrhotic patients the selective distal splenorenal shunt is the most widely used procedure, although devascularization and transection may be as effective. The management decision in an alcoholic cirrhotic patient is more difficult. The author currently recommends an extensive transabdominal esophagogastric devascularization with staple-gun transection of the lower esophagus in alcoholic patients who are fit enough for an abdominal operation. Unfit patients are subjected to sclerotherapy. Certain high-risk patients, particularly those with end-stage alcoholic cirrhosis, should have no therapy at all. All patients who are otherwise fit and have end-stage liver disease should be evaluated as candidates for hepatic transplantation. Transplantation is the only treatment that cures both the underlying liver disease and the portal hypertension.

Prophylactic Management

Prophylaxis means treatment of a patient with portal hypertension who has not yet bled from his or her esophageal varices. The aim is to prevent the first variceal bleed. In the author's view all forms of prophylactic therapy are unjustified at present. Because of our inability to predict the chance of bleeding in an individual patient,[9–11] this is particularly true for major surgical procedures but also applies to sclerotherapy. In more recent trials sclerotherapy has been associated with a higher mortality than occurred with conservative observation. Long-term pharmacological therapy is also under review. Although beta blockade has been the most widely tested, the current results do not support its use outside of controlled trials.

Management of Other Causes of Variceal Bleeding

Schistosomiasis

Schistosomiasis is the most common cause of portal hypertension. Although the condition is rare in North America, it should be remembered that the prognosis is usually good with correct treatment. The acceptable options for treating hepatic schistosomiasis in patients with portal hypertension are an extensive esophagogastric devascularization operation with splenectomy, or a distal splenorenal shunt.[95]

Budd-Chiari Syndrome

The prognosis in patients presenting with the Budd-Chiari syndrome is variable. The outcome depends on the underlying cause of the hepatic vein block as well as the acuteness of presentation and the patient's prior management. Some patients with mild Budd-Chiari syndrome survive for prolonged periods without obvious adverse affects. Variceal bleeding may be controlled with sclerotherapy in such patients. On the other hand, patients with rapidly deteriorating liver function, particularly when the onset is acute, require either an urgent liver transplant or some form of specific shunt.[96,97] The author's group favour a side-to-side portacaval shunt when the inferior vena cava is patent. When the vena cava is either occluded or markedly narrowed, a mesoatrial shunt with a reinforced PTFE graft is indicated.[97] Long-term success has been reported and this has also been the experience of the author's group.

Portal Vein Obstruction

The prognosis for patients with primary extrahepatic portal vein obstruction is usually excellent with long-term survival regardless of the form of therapy used. On the other hand, patients who develop portal vein thrombosis secondary to underlying liver cirrhosis usually have a poor prognosis. The Cape Town group have documented that primary extrahepatic portal vein obstruction in adults can be treated very successfully with repeated sclerotherapy.[98] The same applies to children, in whom sclerotherapy is currently the most widely used management.[19,20] The problem with shunting in small children has been thrombosis of the shunts, although this is disputed by at least one specialized center in France.[18]

Noncirrhotic Portal Fibrosis

This condition is rare in North America and Europe but is one of the commonest causes of portal hypertension and bleeding of esophageal varices in India and Japan. Most patients have a good prognosis. Interestingly these patients fare poorly with total portacaval shunting.[50] They respond well to both major nondecompressive surgery[50] and sclerotherapy.[99]

Gastric Lesions in Portal Hypertension

Portal hypertensive gastropathy and the specific gastric mucosal lesions of portal hypertension appear to have been underdiagnosed in the past.[100–102] Fortunately both gastritis in patients with portal hypertension and the specific condition of portal hypertensive gastropathy can usually be successfully treated by simple conservative measures. In those patients who develop persistent bleeding from the gastric mucosa, current evidence suggests that a portacaval shunt is the definitive treatment, although the role of beta blockade still remains to be evaluated.

Gastric varices associated with esophageal varices are usually a direct continuation of the esophageal varices.[103] In the Cape Town experience they usually disappeared after successful eradication of esophageal varices by sclerotherapy.[55] With increasing experience various groups have noted gastric varices that bleed after successful sclerotherapy or esophageal transection. These patients are difficult to treat and the best management has yet to be defined. The author's group attempts sclerotherapy first and if this fails resorts to either a portosystemic shunt or a devascularization operation.

Segmental portal hypertension caused by splenic vein thrombosis causes isolated gastric varices. This is a rare condition. It may occur in association with pancreatic carcinoma when specific management becomes irrelevant. However, in the idiopathic cases and when it occurs after splenic trauma, the condition can be cured by gastric devascularization and splenectomy.[104] Gastric devascularization alone may be sufficient but has not been reported.

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