

THE SELECTION OF PATIENTS FOR PORTACAVAL SHUNTS

WITH A SUMMARY OF THE RESULTS IN 61 CASES*

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MASSIVE BLEEDING from esophageal varices, secondary to portal hypertension, the result of cirrhosis of the liver, or the so-called Banti's syndrome, is a serious threat to a patient's life. Medical therapy has little to offer these patients, as is shown by the following statistics: In 108 cases of cirrhosis of the liver and 20 cases of Banti's syndrome admitted to the Massachusetts General Hospital from 1934 to 1945, and reviewed by Shull,¹¹ there were 99 patients who died and 46, or 46 per cent of them, died directly as the result of bleeding from the esophageal varices; 90 of these had cirrhosis of the liver and 41, or 45 per cent, of them succumbed to hemorrhage. There were seven patients with Banti's syndrome, and five, or 71 per cent, of these died from the same cause. These figures demonstrate more clearly than words can express the terrific mortality rate in this group of patients, from hemorrhage alone, and it is believed, in addition, that many of them succumbed from liver failure precipitated by severe and repeated hemorrhages.

Sufficient experience has been accumulated now, it is believed, to demonstrate that the best treatment of portal hypertension, complicated by bleeding esophageal varices, is by the construction of some form of a portacaval shunt. Many surgical procedures^{1-6, 9, 10, 12} have been recommended and new ones are being devised in an attempt to eradicate this bleeding source in the esophagus but most of them are prob-

ably makeshift procedures, since they do not reduce materially the portal hypertension. Since a portacaval shunt is the only method which reduces satisfactorily the portal hypertension by shunting the portal blood directly into the systemic venous system, thereby reducing the pressure in the esophageal varices and the danger from hemorrhage from them, it seems pertinent at this time to review the indications for this type of surgery and the results in a series of 61 patients operated upon at the Massachusetts General Hospital during the past six years.

In general it can be stated that there are two types of diseases which produce portal hypertension with esophageal varices that should be considered for this type of surgery. These are (1) portal cirrhosis of the liver, with an intrahepatic type of portal bed block, and (2) the so-called Banti's syndrome with an extrahepatic block. Since portal cirrhosis manifests itself in a number of disease complexes, it seems advisable to classify them into the following categories:

I. INTRAHEPATIC PORTAL BED BLOCK

A. PORTAL CIRRHOSIS WITHOUT ESOPHAGEAL VARICES AND ASCITES. Although accurate statistics are not available there are a number of instances in which a diagnosis of portal cirrhosis is made without ascites and careful roentgenologic examination of the esophagus fails to reveal the presence of esophageal varices. Confronted with such a patient, it is believed that at the present time here is no true indication for

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the construction of a portacaval shunt. There are undoubtedly varying degrees of portal bed block in portal cirrhosis, and the absence of esophageal varices undoubtedly indicates little, if any, portal hypertension. Furthermore, since there is very little evidence, if any, that that construction of a shunt improves the function of the liver, in the absence of bleeding esophageal varices, it is believed that this group of patients should not be considered suitable candidates for this type of surgery, and for that reason medical measures should be resorted to for these cases.

B. CIRRHOSIS OF THE LIVER WITH ASCITES AND WITHOUT ESOPHAGEAL VARICES. There are a large number of patients with portal cirrhosis and chronic persistent ascites, but without esophageal varices. In the past they have been treated by repeated abdominal paracentesis and medical therapy. It was the hope, and it is still the belief, of a good many physicians and surgeons, that the ascites might be controlled, or prevented, by reducing the portal venous pressure, by the construction of a portacaval shunt. Unfortunately, however, portal hypertension is only one of the factors in the formation of ascites, and it is probably of much less importance than the plasma protein and albumin levels which are little, if at all, affected, by the construction of a shunt. Furthermore, the portal venous pressure in these patients without esophageal varices, in many instances, may not be greatly elevated, so that the formation of ascites would not be affected to any degree by the construction of the shunt. In addition, experience has shown that the presence of long-standing ascites frequently produces a phlegmonous-like vascular fibrotic response in the retroperitoneal tissues, so that it is extremely difficult, and in some cases impossible, to construct a portacaval shunt because of the inability to isolate the portal or splenic veins in these cases. The mortality rate in this group also is apt to be very high because of the de-

pleted condition of the patient. For these reasons, in our clinic, shunts are not attempted in this group of patients.

C. CIRRHOSIS OF THE LIVER WITH BLEEDING ESOPHAGEAL VARICES AND ASCITES.

1. *Chronic Ascites.* This type of patient presents a real challenge to the internist and the surgeon. The fact that the bleeding esophageal varices are present means that sooner or later the patient will die from hemorrhage, or liver failure, hastened by repeated bleedings. On the other hand, if the ascites is chronic and of long standing, the technical difficulties and the fact that the patient is a poor risk because of protein imbalance, are almost sufficient to contraindicate a shunt procedure. It is believed, however, that after careful preparation the operation is justifiable, if done by a surgeon experienced in this branch of surgery, since the mortality rate, according to Shull,¹¹ may be as high as 54 per cent within one year, if only medical measures are carried out. At the present writing it is our opinion that this type of case may best be handled by a two-stage procedure. The first consists of the suture of the bleeding esophageal varices, accomplished by performing an esophagotomy through a left thoracic approach as recently suggested by Crile.⁴ In this manner it may be possible to control the esophageal varices for a sufficient period to permit improvement in the general condition of the patient so that later, at a second stage, the shunt operation can be performed more safely.

2. *Acute Ascites.* Massive bleeding from esophageal varices not infrequently results in the formation of ascites, due to the lowering of the plasma protein level with a resulting drop in its osmotic pressure. It is recommended, therefore, that any cirrhotic patient with ascites and bleeding esophageal varices, providing the latter have ceased to bleed, should be put on a strict medical regimen, this to include a low sodium diet high in protein and carbohydrate, mercurial diuretics, repeated transfusions

to restore the normal hemoglobin level and to aid in restoring the normal plasma proteins. The use of human albumin in these patients has been disappointing in its effects, and great care must be exercised in its use, since if given in large amounts or too rapidly, an increase in the blood volume may result precipitating further hemor-

the liver is probably not too severely damaged, so that the patients will withstand this long and frequently difficult surgical procedure. They represent the majority of cases in this series of cirrhosis reported here, as 21, or 60 per cent, are so classified. The absence of ascites as a rule indicates a fairly well compensated cirrhosis from the protein

TABLE I.—Correlation of Liver Function Tests with Postoperative Deaths in 75 Operations for Bleeding Esophageal Varices, Massachusetts General Hospital, 1945-1951 (March).

Test	Number of Survivals	Number of Deaths	Mortality Rate
Plasma albumin.....Less than 3 Gm. %	1	5	83%
More than 3 Gm. %	63	6	9%
Ascites.....Failed to respond medical treatment	5	4	44%
Disappeared on medical treatment	5	2	28%
None	54	5	8%
Prothrombin time.....More than 4 seconds	25	9	27%
Above normal.....Less than 4 seconds	39	2	5%
Cephalin flocculation.....3 + - 4 +	25	11	31%
1 + - 2 +	39	0	0
Bromsulfalein.....More than 10%	39	9	19%
Retention 5 mg./kilo.....Less than 10%	22	0	0
van den Bergh.....More than 1.0	30	6	17%
Bilirubin mg./100 cc.....Less than 1.0	32	4	11%

rhage. In a relatively large number of patients in this group it has been found that under the above medical regimen the ascites will disappear, and if this is the case they frequently prove to be excellent candidates for shunt surgery. It is our opinion at the present time that it is probably only those cases of portal cirrhosis with ascites and bleeding esophageal varices in which the ascites can be controlled by adequate medical measures that should be considered suitable cases for portacaval shunts, since the mortality rate in the chronic uncontrollable cases is so high (Table I).

D. CIRRHOSIS WITH BLEEDING ESOPHAGEAL VARICES WITHOUT ASCITES.

Patients in this group are the most suitable cases for shunt surgery, since the presence of bleeding esophageal varices indicates that the life expectancy for the majority of them is probably less than one year, and the absence of ascites is indicative that

metabolic viewpoint. Other liver function tests, including the cephalin flocculation, the quantitative van den Bergh, and the prothrombin time, are also usually within the normal range. In a few instances, the bromsulfalein retention test may be well above the normal value, but apparently this is not a serious contraindication to surgery. The good results obtained in our patients in this group have demonstrated the value of shunt surgery in the prevention of further bleeding from the esophageal varices, so that it is definitely indicated in this group of patients.

E. CIRRHOSIS OF THE LIVER WITH ESOPHAGEAL VARICES WITHOUT BLEEDING. Without a history of hematemesis or melena a diagnosis of esophageal varices is not frequently made, since most of the patients seek medical and surgical attention only after a severe bout of bleeding. However, esophageal varices are demonstrated in a number of patients during investigation for

cirrhosis of the liver. In a few instances, patients have been followed in our clinic for a number of years, after varices have been demonstrated, without evidence of bleeding from them. At the present time it is our policy not to operate upon patients of this type. Instead, we have only chosen those cases that have bled in order to enable us to determine the effectiveness of this method of therapy in controlling the bleed-

life, it is believed, from omphalitis with secondary thrombosis of the ductus venosus, and extension of the process into the left branch of the portal vein. Portal venous thrombosis may also occur later in life, either spontaneously or from infection in the portal bed, or in the rare instance it may result from trauma. It is of extreme significance that the liver in this type of case is essentially normal early in the course of

TABLE II.—*Liver Function Tests in 11 Postoperative Deaths in 75 Operations for Bleeding Esophageal Varices, Massachusetts General Hospital, 1945-1951 (March).*

Patient	Age	Alb.	Ceph. Flocc.	Pro-Time*	BSP.	van den Bergh	Ascites
I. Liver Failure Deaths							
C.P.	46 M	4.2	3+	5	.	N.	0
A.C.	55 M	2.4	4+	17	20	0.8	3+
E.B.	52 M	2.6	4+	4	35	...	3+
E.C.	32 F	2.6	4+	9	38	2.0	0
N.P.	68 F	1.9	3+	3	43	3.3	0
II. Postoperative Hemorrhage Deaths							
M.F.	42 M	3.6	4+	6	36	N.	0
B.M.	54 M	3.4	3+	4	56	1.7	3+
G.R.	48 F	2.7	4+	4	..	18.4	/+
F.W.	55 F	3.9	3+	3	17	0.8	0
S.T.	41 M	4.1	3+	8	30	3.4	0
C.K.	49 M	3.4	4+	4	14	1.8	0

* Number seconds above normal.

ing esophageal varices. As our experience increases and the mortality rate of the operation is reduced, it is probable that shunt surgery will be recommended in such cases, since in all probability the majority of them will hemorrhage sooner or later from the esophageal varices, and in a patient with a well compensated cirrhosis, the mortality rate from shunt surgery will be much less than from the natural course of the disease.

II. EXTRAHEPATIC PORTAL BED BLOCK

Although there is no unanimity of opinion in regard to the condition generally known as Banti's disease or syndrome, there seems little doubt that a certain group of patients with esophageal varices are encountered that have little or no evidence of cirrhosis. It is this type of case that falls into the group of patients with an extrahepatic type of portal bed block. In most instances the cause of the block is secondary to a thrombosis of the portal vein or its radicals. This condition may develop early in

the disease, and almost without exception the first indication that such a serious condition exists is the occurrence of massive hematemesis or melena. The finding of an enlarged spleen and the blood picture of hypersplenism or congestive splenomegaly is frequently corroborative evidence of this diagnosis. The life expectancy in this disease is much greater than in cirrhosis of the liver, presumably because of the normal condition of this organ. Quoting Shull¹¹ again, he found that in 19 patients with so-called Banti's disease, 18, or 95 per cent, of them were still alive at the end of two years. The indications of shunt surgery, however, in most of these cases, are clearcut because repeated esophageal hemorrhages result in a chronic state of invalidism and a very high morbidity in many of the patients. Furthermore, because of an essentially normal liver, the risk of operation in this group of patients is relatively small, and the operative mortality is low. In our series of 24 patients with this type of disease, 26 shunts

were performed with one death, an operative mortality of 3.8 per cent. From these data there seems little question but that the construction of some type of portacaval shunt is the treatment of choice in this group of patients. In many instances in our patients, chronic invalids have been restored to a normal, healthy existence.

K therapy and the presence of ascites, and whether it responds to medical therapy or not, are used to test its ability to synthesize. The cephalin flocculation test has been most useful in determining the degree of liver damage. The alkaline phosphatase and the thymol turbidity have also been used but have been found to be of less practical

TABLE III.—*Postoperative Deaths in 65 Shunt Operations in 61 Patients for Bleeding Esophageal Varices, Massachusetts General Hospital 1945-1951 (March).*

Type of Shunt	Number Patients	Number Shunts	Operative Hemorrhage	Liver Failure	Sepsis	Operative Deaths	Operative Mortality
Extrahepatic							
Splenorenal..... ..	..	19	1	0	0	1	.....
Portacaval..... ..	..	4	0	0	0	0	.....
Others..... ..	..	3	0	0	0	0	.....
Total..... ..	24	26	1	0	0	1	3.8%
Intrahepatic							
Splenorenal..... ..	..	27	5	0	1	6	.....
Portacaval..... ..	..	11	1	2	0	3	.....
Others..... ..	..	1	0	1	0	1	.....
Total..... ..	37	39	6	3	1	10	25.6%
Totals..... ..	61	65	7	3	1	11	17.0%

III. LIVER FUNCTION TESTS

A thorough investigation of the liver function is essential in all cases of bleeding esophageal varices prior to subjecting the patient to shunt surgery, since the operative mortality is increased greatly if severe liver disease exists. Many liver function tests have been devised and they fall into three categories as described by Hims-worth:⁷

1. Tests of excretory function.
2. Tests of the ability of the liver to synthesize.
3. A group of empirical tests for liver damage.

From the practical aspect, the following have been found to be of most value in estimating the condition of the liver. The quantitative van den Bergh test and the bromsulfalein dye retention test are used routinely to check the excretory function. The plasma albumin level, the response of the prothrombin time if elevated, to vitamin

value. In many of our cases, punch biopsies of the liver have been done prior to surgery to determine more accurately the state of the liver cells. An acute process may be detected by this method, which is an indication for further medical treatment before subjecting the patient to surgery.

An analysis of these liver function tests in relation to the operative mortality following 75 operations on 68 patients for bleeding esophageal varices reveals some interesting data (Table I). Not all of the surgical procedures were shunt operations, since some of the patients were considered too serious a risk to put them through such a long operative procedure. They are included, however, in the following statistics for completeness of the analysis of this group of patients with severe liver disease undergoing major surgery. From the data obtained in these patients, it should be noted that the finding of a plasma albumin level below 3 Gm. per 100 cc. appears to be of

extreme significance, since in six operations in patients with this low albumin level, five, or 83 per cent, died postoperatively from hemorrhage or liver failure, whereas in 63 operations when the albumin level was above 3 Gm. per 100 cc., only six patients died, an operative mortality of 9 per cent. The presence of ascites, especially if it

TABLE IV.—*Summary of Post-shunt Bleeding in 50 Survival Cases of Bleeding Esophageal Varices, Massachusetts General Hospital 1945-1951 (March).*

Type of Shunt	Number Patients	Number Shunts	Number Post-shunt Bleeding	
			Minor	Major
Extrahepatic				
Splenorenal..... ..	..	18	1	2*
Portacaval..... ..	..	4	0	0
Others..... ..	..	3	1	2
Total..... ..	23	25	2	4
Intrahepatic				
Splenorenal..... ..	..	21	1	2*
Portacaval..... ..	..	8	0	0
Others..... ..	..	..	..	..
Total..... ..	27	29	1	2
Totals..... ..	50	54	3 (6%)	6 (12)

* These four patients have had secondary portacaval shunts with relief of bleeding.

fails to respond to medical therapy, is also shown to be of extreme prognostic importance, since four, or 44 per cent of nine patients with this finding, died as a result of surgery. There were seven additional cases in whom the ascites disappeared on medical therapy prior to operation, and of these, two, or 30 per cent died, demonstrating a lower, but nevertheless a high, mortality rate. The absence of ascites on the other hand does indicate that the patient is a safer risk, since in 59 patients five died in this group, a mortality rate of 8 per cent. The prothrombin time also was found to indicate serious risk patients when it failed to respond to adequate preoperative vitamin K therapy. In 25 patients in this category in whom the prothrombin time remained four seconds or more greater than

normal value, there were nine deaths, or a mortality of 27 per cent, whereas in 39 patients in whom the response was more satisfactory so that the prothrombin time was reduced to within four seconds or less of normal, there were only two deaths or a mortality rate of 5 per cent. The cephalin flocculation test in our series indicates that it is of great prognostic value, since when it demonstrated severe liver disease with a 3+ or 4+ flocculation, the mortality rate was high, and in fact, all the 11 patients that died in this series fell into this group. There were 36 patients with this degree of liver damage and 11, or 31 per cent, died postoperatively, whereas in 39 patients with a 1+ or 2+ cephalin flocculation, there were no postoperative deaths. These findings thus demonstrate that slight liver damage as shown by this test indicates that the patient is a fair to good operative risk, whereas with the more pronounced disease they are a serious surgical risk. The bromsulfalein retention test, when it was less than 10 per cent after one-half hour following the injection of 5 mg. per kilogram, was of prognostic value, since in 22 instances falling into this group there were no deaths. In 39 patients that it was found to be above this value, indicating more severe liver disease, 9, or 17 per cent, of these patients died postoperatively. It is to be noted, however, that in a number of patients with a very high retention, in some cases over 50 per cent, the convalescence following shunt surgery was remarkably uneventful. However, these observations would appear to indicate that those patients with a normal dye retention were good surgical risks, whereas those with abnormal retention were on the whole not as good, but even with high retention, providing the other liver function tests were not impaired to the same degree, a patient should not be refused surgery. The serum bilirubin level is an indication of the excretory function of the liver and this was studied by obtaining

quantitative van den Bergh determinations of the blood serum. Except in a few instances of moderate elevation in the serum bilirubin, this test was not of great value. In 32 instances when the bilirubin level was below 1 mg. per 100 cc. there were four postoperative deaths, or a mortality of 11 per cent. In 30 others, an almost equal number, with the level above this figure, there were six deaths, or a mortality of 19 per cent.

It is our opinion from these observations on the postoperative deaths in this group

TABLE V.—*One Month to Six-year Survivals in 50 Patients Following Shunt Surgery for Bleeding Esophageal Varices, Massachusetts General Hospital 1945-1950 (March).*

	Number Patients	Number Post-shunt Bleeding		Number Deaths	Number Alive
		Minor	Major		
1 mo.-1 year	13	..	..	1	12
1-2 years....	14	1	3	2	12
2-3 years....	4	..	1	..	4
3-4 years....	9	..	..	..	9
4-5 years....	5	1	..	..	5
5-6 years....	5	1	2	..	5
Total.....	50	3 (6%)	*6 (12%)	3 (6%)	47 (94%)

* Four of these patients have had secondary portacaval shunts with relief of bleeding.

of patients (Table II) that the following liver function tests indicate that a patient may be a serious operative risk for shunt surgery in the order of their importance: (1) A plasma albumin level below 3 Gm. per 100 cc., (2) ascites which fails to respond to medical therapy, (3) a 3+ or 4+ cephalin flocculation, (4) a prothrombin time which remains prolonged more than four seconds above normal after adequate vitamin K therapy, (5) an elevated serum bilirubin, and (6) a bromsulfalein retention test showing more than 10 per cent dye retention after 30 minutes. Conversely, from the data obtained from these patients, it can be stated that the following values in these liver function tests indicate that a patient may be a good operative risk in the

following order of their importance: (1) a 1 to 2+ cephalin flocculation test, (2) a bromsulfalein retention below 10 per cent after one-half hour, (3) a prothrombin time within four seconds of normal, (4) a plasma albumin level greater than 3 Gm. per 100 cc., (5) the absence of ascites, and (6) a serum bilirubin level below 1 mg. per 100 cc. Finally, it should be pointed out that the criteria of operability should not rest with one test only, but a careful evaluation of the patient should be made after obtaining the result of all these tests. The most serious risk will be that patient with a plasma albumin below 3 Gm. per 100 cc. with ascites that fails to respond to medical therapy and with a 3 or 4+ cephalin flocculation and a prothrombin time that does not respond to vitamin K therapy. On the other hand the good risk patient is the one with a 1 to 2+ cephalin flocculation, a plasma albumin greater than 3 Gm. per 100 cc., the absence of ascites, a bromsulfalein retention test below 10 per cent after one-half hour and a prothrombin time within four seconds of normal.

IV. THE RESULTS OF 65 SHUNT OPERATIONS FOR BLEEDING ESOPHAGEAL VARICES IN 61 PATIENTS

Since Whipple¹³ and Blakemore² in 1945 reported the feasibility of portacaval venous shunts in the treatment of portal hypertension with bleeding esophageal varices, a group of 61 patients have been treated at the Massachusetts General Hospital during the past six years for this condition. The most common shunt utilized in this group has been an end-to-side splenorenal type with preservation of the kidney after performing a splenectomy as first described in 1947.⁸ This type has been preferred because, in the majority of cases, it reduces satisfactorily the portal hypertension and at the same time it does not necessarily cause all the portal blood to by-pass the liver as in the case with an end-to-side portal vein to inferior vena cava shunt. Because of the

extreme vascularity in the gastrohepatic ligament, in cases of extrahepatic block, it frequently is impossible to isolate the portal vein, so in this group of patients this has been an additional indication for the splenorenal shunt. The side-to-side portal vein to inferior vena cava anastomosis is another type that has been used, but frequently it is not possible to construct because the two vessels are not in close enough proximity or the caudate lobe of the liver may lie between them preventing their approximation. In a few instances in patients who had had previous splenectomies and in whom the portal vein could not be isolated because of the vascularity of the field, an anastomosis between the superior mesenteric vein and the inferior vena cava, or the inferior mesenteric vein to the left ovarian vein or the left adrenal vein were used. These latter three types are considered, however, to be makeshift shunts, and except for one patient with a superior mesenteric vein to the inferior vena cava who has been relieved of bleeding for five and one-half years, they have not proved too satisfactory.

An analysis of our cases reveals that 24, or 40 per cent, of the patients had an extrahepatic portal bed block, and 37, or 60 per cent, had an intrahepatic block, secondary to cirrhosis of the liver (Table III). In both these groups of cases, a total of 46, or 71 per cent, had splenorenal shunts, 15, or 23 per cent direct portacaval anastomoses, and four, or 6 per cent, other types of venous shunts. In the extrahepatic group there were 19 splenorenal, four direct portacaval, and three other types of shunts performed, making a total of 26. Because of postshunt bleeding following splenorenal anastomoses in two patients, the portacaval ones were performed successfully at a later date. There was one postoperative death from hemorrhage, occurring from the field of operation, a mortality rate of 3.8 per cent. In the intrahepatic group, 39 shunts were performed on 37 patients, including 27

splenorenal, 11 direct portacaval, and one other. Because of postshunt bleeding following splenorenal anastomoses in two patients, it was necessary to perform portacaval shunts as secondary procedures. In this series of 39 operations in the intrahepatic group, there were ten postoperative deaths, or a mortality rate of 25.6 per cent (Table III). Operative hemorrhage was the cause of death in six patients, five following splenorenal and one after a portacaval anastomosis. Liver failure caused the deaths of three patients, two after portacaval and one after a superior mesenteric to inferior vena cava anastomosis. A septic pyelophlebitis of the portal venous system was the cause of death in one patient. The operative mortality for the entire series of 65 operations was 11, or 17 per cent. Esophageal bleeding following the shunt operations has occurred in nine, or 18 per cent, of the patients (Table IV). It was minor in three and major in six. This secondary hemorrhage occurred in the splenorenal types of anastomosis mostly, and not in the direct portacaval ones. In two cases it occurred following makeshift shunts of the inferior mesenteric vein to the left ovarian and left adrenal veins. In four of the cases with major bleeding, secondary portacaval shunts have been performed, with control of the bleeding to date.

There were 50 patients who survived the shunt operations and they have been followed for periods of one month to six years (Table V). Three, or 6 per cent, have died, two from liver failure at eight and 19 months, and one from cerebral hemorrhage after 19 months. *None has succumbed to esophageal hemorrhage.* Twenty-three, or 96 per cent, of the 24 patients with extrahepatic block and 24, or 65 per cent, of the intrahepatic group, making a total of 47, or 77 per cent, of the 61 patients who had shunts performed are still alive and most of them living essentially normal lives.

CONCLUSIONS

1. The establishment of a splenorenal or a direct portacaval shunt is considered the best method of treating bleeding esophageal varices secondary to portal hypertension.

2. It is recommended that a careful evaluation of the patient by liver function tests be done before subjecting patients to these surgical procedures.

3. Portacaval shunts are of chief value in the surgical treatment of bleeding esophageal varices and this method is not recommended for the treatment of ascites alone.

4. The results to date, in a series of 50 patients in whom portacaval shunts were constructed for bleeding esophageal varices and who survived the operation during the past six years at the Massachusetts General Hospital, reveal that no patient has died from esophageal hemorrhage and 47 of them are alive and well.

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DISCUSSION.—DR. ARTHUR H. BLAKEMORE, New York: The status of the liver as it influences operative risk in cases of cirrhosis of the liver has been discussed by Dr. Linton. To correlate and emphasize the importance of this, I wish to report a 20 per cent postoperative mortality in 108 cases of cirrhosis of the liver. But, of importance, 58 cases, or nearly 54 per cent of the 108 cases were, on the basis of liver function and chemistry studies, classified as good risk patients. In this group there were six postoperative deaths.

Again and again in our case histories the point of progressive liver deterioration in cases having severe portal hypertension of long standing gave promise that, with due emphasis, in the future cases may be referred earlier for the shunting operation. Dr. Linton has shown you what can

be accomplished by shunting in an impressive series of cases having portal hypertension.

DR. ALFRED BLALOCK, Baltimore: My main reason for arising is to introduce a slightly skeptical view into the discussion. While agreeing in full that the procedures popularized by Drs. Blakemore, Whipple, Linton and others are the soundest from a physiologic viewpoint of any that have been employed in the treatment of varices, nevertheless, the subject is not a closed one. Mr. Allison of Leeds has remarked that most of the various methods that have been employed have appeared to result in a cessation of bleeding for a period of a year or so. He is skeptical of the value of portacaval or splenorenal shunts. He has examined the esophagus