of hepatic blood can not be considered. It is thought that a part of the portal blood flows into the liver and a part via the splenic vein into the inferior vena cava. On the other hand, in liver cirrhosis (E. K.) with high intra-hepatic pressures before the operation, the free portal pressure after the shunt formation become rather lower than the occluded hepatic portal pressure, and the retrograde flow of hepatic blood can be expected. In fact, in these cases the concentration of Evans blue which was placed in the portahepitis through the catheter obviously show higher value at a site of anastomosis than peripheral artery and the existence of inverse flow was made sure from this facts. As mentioned above, it was revealed that the hemodynamics after the splenocaval shunt, a clear deference in the direction of its flow is depended upon the deference in pressure between the portal and occluded pressure after operation.

But, instead of depending upon this fact, if the hepatic pressure before the shunt operation is known, the portal hemodynamics after the operation can be predicted to some extent and further it may be able to help to decide the indication of this operative procedure. We must check on this point further by studying many more clinical cases.

CONCLUSION

We devised a operative procedure, the spleno-caval shunt, to make less the shortcomings of and to make use of good parts of the splenorenal shunt which has been used for pre-hepatic portal obstructions including the so called Banti’s syndrome group. We applied this operative procedure on the clinical cases and obtained good results. We discussed this procedure and on its results in this paper.

REFERENCES


3. Surgical Treatment of the Intrahepatic Circulatory Disorders†

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THE SURGICAL treatment of the portal hypertension is appropriate for oesophageal bleeding, hyper-splenism and ascites, and our policy is, also, mainly to prevent the bleeding from the oesophageal varices.

Opinions on the porta-caval anastomosis are divided on the point whether it must be performed prophylactically or therapeutically to

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the bleeding, we select the indications to perform the porta-caval anastomosis from those who have had oesophageal bleeding, remaining doubts on the preventive shunt operation. Patients who have never had bleeding from the oesophageal varices will rarely suffer from hemorrhage after the operation. The porta-caval anastomosis elicits in considerable frequency electroencephalographic abnormalities without any clinical signs and symptoms. Our claim to select the indications carefully consists mainly in these facts.

Among 30 cases with side-to-side anastomosis there occurred 3 cases of Eck fistula syndrome, and 4 cases with abnormal EEG findings happened among 12 cases. And 11 cases of Eck fistula syndrome are observed among 42 with end-to-side anastomosis, and 6 with abnormal EEG among 10. The occurrence of Eck fistula syndrome was never related to the histological findings of the liver. The amelioration of oesophageal varices relating to the distant results was found in 14 among 15 with side-to-side anastomosis, and in 9 among 13 with end-to-side anastomosis; and the relapses of the bleeding were 0 among 30 with side-to-side anastomosis, and were 5 among 42 with end-to-side anastomosis.

Side-to-side anastomosis in patients with remarkable ascites could gain the excellent results against ascites and other symptoms; all 7 cases were relieved from ascites, 1 died from hepatic insufficiency 3 months later, and 1 exhibited a mild Eck fistula syndrome showing the clearance rate of radiogold at 11.9%.

Regarding to the postoperative portal pressure there were no differences between end-to-side and side-to-side anastomosis, but side-to-side anastomosis was thought to be superior in connection with amelioration of varices and with recurrence of bleedings. Postoperatively and later hepatic blood flow decreased obviously in some cases, decreased scarcely in other cases, and increased in some cases treated with side-to-side anastomosis; the grade of the decrease was similar to or less severe than end-to-side anastomosis. We sought after the causes of wide varieties of the changes in the hepatic blood flow; and as the manifestation of intrahepatic vascular shunt we estimated the hepatic clearance of radioactive colloidal gold employing the hepatic vein catheterization. In the normal control the clearance rate was 40–50%, and in patients with portal hypertension 6.4–47.6%. The clearance rate of Au^{198} was roughly correlated with the postoperative change rate of the hepatic blood flow. Postoperative course in side-to-side anastomosis was unevenful on the whole; 3 died from hepatic insufficiency several days later, 1 showed hepatic cirrhosis, 1 hepatic fibrosis histologically, and other 1 failed to show any disturbances in hepatic function. The clearance rate of Au^{198} in 1 patient of these 3 was 6.4%. In 2 patients among 3 with Eck fistula syndroms the clearance rate was as low as 16.8% and 11.9% respectively. Histologic features were not related to postoperative hepatic blood flow. Though the preoperative hepatic blood flow was of importance revealing the severity and prognosis of the proper disease, it was not reliable evidence of indication for side-to-side anastomosis except for the cases lower than 1/3 of normal range. As a result, the disturbance of hepatic functions within 30% of BSFP at 30 minutes failed to consult the direct prognosis of side-to-side anastomosis. In short, the most important thing in performing side-to-side anastomosis was the function of intrahepatic vascular shunts.

Vascular anastomosis between portal branches and hepatic vein branches was assumed functionally, as there were some cases in whom a retrograde portography via hepatic vein was easily gained, and as there were some cases in which the intrahepatic portal pressure decreased at obstructed part and increased thereafter. We were unable to get direct functional evidence for anastomosis between hepatic artery branches and portal branches, however, the intrahepatic vascular pressure changes following side-to-side anastomosis made us in some measure presume the formation of such anastomosis. In portal hypertension it looked likely that shunts between portal branches and hepatic artery branches took place besides the portal-hepatic vein-shuntings.

Intrahepatic vascular resistance following side-to-side anastomosis was believed to be lower than that following end-to-side anastomosis.
judging from the decrease in portal and hepatic wedge pressures, and the compensatory increase in hepatic artery inflow appeared considerably great. However, the amount and effectiveness of regurgitation from the liver remained obscure. Regarding the pressure gradient between the intrahepatic obstructive portal pressure and portal branch pressure as the amount of regurgitation, the pressure gradient had not evident correlation with the change in the postoperative hepatic blood flow. In some cases the effectiveness of the blood regurgitation from the liver was different from the expected result, and in other cases in which the regurgitated blood was least effective the postoperative hepatic blood flow decreased scarily.

After all, following side-to-side anastomosis in clinical patients there seemed likely to occur so complicated alterations in intrahepatic circulation as to get no clear and accurate interpretation, which requires more detailed and close investigations. On the basis of above-mentioned results, we take the hepatic clearance of radioactive colloidal gold as a tentative aim to perform side-to-side anastomosis for patients with portal hypertension. Except for the patients with poor prognosis showing severe hepatic insufficiencies and diminutions of hepatic blood flow, selection of the operative indication will be possible, at least in some degree, by way of the hepatic clearance of radiogold; that is to say, side-to-side anastomosis may be undertaken with relative safety when the radiogold clearance goes over 20%.

4. Surgical Treatment of Portal Hypertension†
— with Special Reference to the Feature of Intrahepatic Circulatory Disturbances —

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Two hundred and ninety cases of portal hypertension have been surgically investigated in our clinic. In these cases, esophageal varices, splenomegaly and/or intractable ascites were the indications for operative procedures. Based upon the features of the differences in the state of the intrahepatic circulation, these cases were divided into the following 4 groups by Imanaga;

Group I Extrahepatic obstruction of the portal vein
Group II Intrahepatic obstruction of the portal vein
Group III Intrahepatic obstruction of the hepatic vein
Subgroup 1 Intrahepatic obstruction of the hepatic vein only
Subgroup 2 Intrahepatic obstruction of the hepatic and portal veins
Group IV Extrahepatic obstruction of the hepatic vein

Ninety per cent of the patients with portal hypertension belong to Group II or III. The Group II differs remarkably from Group III in the state of the intrahepatic circulation. Notwithstanding the elevated portal vein pressure, the wedged hepatic vein pressure was within normal limit in Group II, whereas in Group III the elevation of the wedged hepatic vein pressure was closely related to that of the portal vein pressure. For a further analysis of the hepatic circulatory disturbances, we employed a new method of our own devise for the purpose of measuring the hepatic arterial and portal blood flow differentially. The following data were obtained; the ratio between the arterial and portal flow was 80 to 20 in Group II, 50 to 50 in the 1st Subgroup of Group III and 70 to 30 in the 2nd Subgroup of Group III, as compared with the normal ratio of 20 to 80.

In Group II esophageal varices and splenomegaly are to be corrected. Hepatic function was always within normal limit. Liver biopsy revealed at most fibrosis of varying degree. In

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