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Article

Comparative Effects of Proximal and Distal Splenorenal Shunts on Hepatoportal Hemodynamics in Patients with Liver Cirrhosis and Portal Hypertension

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Abstract: The aim of the present study was to assess and compare proximal and distal splenorenal portocaval anastomoses with respect to their impact on hepatoportal hemodynamics in patients with liver cirrhosis presenting portal hypertension. PATIENTS Between December 1998 and June 2001, a prospective clinical study was performed on 36 patients with intrahepatic portal hypertension caused by liver cirrhosis. The patients were classified into two groups: 22 were treated with proximal splenorenal anastomosis and splenectomy, and 14 by distal spleno-renal anastomosis preservation of the spleen together with ligature of the left gastric and the arteries to the spleen plus hepatic artery desympathization. Hepatoportal hemodynamics were evaluated before and after 20 days of surgery by means of splenomanometry, radioisotopic hepatic blood flow determination with Au-198, and rheohepatography. Proximal splenorenal anastomosis significantly reduced the portal pressure; but development of hypoperfusion of the liver and apparent decrease in rheohepatographic parameters were confirmed. DSRA gave selective relief of gastroesophageal venous system pressure, restored mesenteric blood to the liver and achieved better hepatic perfusion indices. This study offers a critical evaluation of hepatoportal hemodynamics following two variations of the splenorenal shunt and illustrates physiologic factors in favor of a selective distal shunting. The data reinforce applying distal splenorenal anastomosis in portal hypertension to limit postoperative hepatic insufficiency and encephalopathy. The number of cases is still too small for the postoperative course and long-term follow-up.

Keywords: Portal hypertension, liver cirrhosis, hepatoportal hemodynamics, portocaval shunts, splenorenal anastomosis.

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1. Introduction

Portal hypertension is one of the most severe and clinically significant complications of liver cirrhosis, often determining the prognosis and survival of affected patients. Persistent elevation of pressure in the portal venous system leads to the development of portosystemic collateral circulation, splenomegaly, ascites, and most critically, variceal bleeding from the esophagus and stomach. Gastroesophageal hemorrhage remains a leading cause of mortality in cirrhotic patients despite advances in medical and endoscopic management[1-2].

Surgical decompression of the portal venous system is a well-established procedure for the prevention of rebleeding from varices. Portocaval Shunts A variety of portocaval shunts have been conceived and utilized in clinical practice: direct portocaval (end to end), mesentericocaval, splenorenal anastomoses. These methods effectively decrease the portal pressure, but may have unfavorable effects on hepatic blood flow[3].

During classical portocaval shunting, a significant proportion of portal blood is diverted into the systemic circulation without first passing through the liver. Although successful in relieving portal hypertension, this shunting severely compromized the vascular supply of the liver, compounded hepatocellular ischaemia and led to the systemic spread of neurotoxic metabolites with hepatic encephalopathy.

In response to these limitations, selective shunting procedures have been developed with the aim of decompressing variceal circulation while preserving mesenteric venous inflow to the liver. Among these, splenorenal anastomosis occupies a special place[4-5]. Proximal splenorenal shunting, especially when combined with splenectomy, provides effective portal decompression but may still result in substantial diversion of portal flow away from the liver. Distal splenorenal anastomosis, on the other hand, selectively decompresses the gastroesophageal venous basin while maintaining hepatopetal mesenteric blood flow[6-7].

Despite widespread clinical use, comparative quantitative data on the effects of these procedures on hepatoportal hemodynamics remain limited. A deeper understanding of their physiological consequences is essential for optimizing surgical strategy and improving outcomes in patients with cirrhosis and portal hypertension.

2. Materials and Methods

The study included 36 patients diagnosed with liver cirrhosis complicated by intrahepatic portal hypertension. All patients were admitted for surgical treatment due to high risk or history of variceal bleeding. The cohort consisted of patients of both sexes with comparable clinical severity.

Patients were also categorized into two groups based on the surgical procedure. The initial 22 patients in group one had the procedure of proximal splenorenal anastomosis and combined splenectomy. The second series consisted of 14 patients who received distal splenorenal anastomosis with spleen salvage. Latter group underwent surgery plus ligation of the splenic and left gastric artery and desympatization of hepatic artery.

Hepatoportal hemodynamics was measured before surgery and on postoperative day 20. The portal pressure was determined by splenomanometry through a percutaneous puncture of the spleen and Waldman water manometer. Hepatic blood flow was assessed by calculating the minute volume of hepatic circulating cells employing a radioisotopic technique that involves intravenous injection of Au-198.

Rheohepatography was performed to assess arterial and venous components of hepatic circulation. The following parameters were analyzed: amplitude of the systolic wave (As), amplitude of the diastolic wave (Ad), rheographic index (Ri), systolic wave propagation time (Qs), and systolic rise time (Ta). Results were compared with data obtained from 20 practically healthy individuals forming the control group.

3. Results

Portal Pressure Changes

Before surgery, portal pressure ranged from 210 to 570 mm H_2O, with a mean value of 348.4 mm H_2O. After proximal splenorenal anastomosis, portal pressure decreased by an average of 39.1%. Distal splenorenal anastomosis resulted in a mean reduction of 112.2 mm H_2O[8-9].

Hepatic Blood Flow

Table 1 presents changes in hepatic blood flow and rheohepatographic parameters after proximal splenorenal anastomosis. A pronounced reduction in hepatic blood flow was observed, with a postoperative decrease of 42.9% compared to baseline.

Table 1. Hepatoportal hemodynamics after proximal splenorenal anastomosis with splenectomy

Parameter	Normal values (M ± m)	Before surgery (M ± m)	After surgery (M ± m)	*p* value
Portal pressure (mm H_2O)	120–140	348.4 ± 23.86	212.0 ± 23.71	< 0.001
Hepatic blood flow (ml/min)	1293.8 ± 72.01	733.08 ± 69.03	417.6 ± 39.5	< 0.01
Rheohepatography As (mm)	8.92 ± 0.51	5.69 ± 0.83	2.77 ± 0.53	< 0.001
Rheohepatography Ad (mm)	5.25 ± 0.41	3.65 ± 0.36	2.47 ± 0.02	< 0.001
Rheographic index Ri (mm)	0.47 ± 0.02	0.26 ± 0.03	0.14 ± 0.02	< 0.001
Qs (s)	0.124 ± 0.02	0.168 ± 0.02	0.138 ± 0.02	< 0.05
Ta (s)	0.199 ± 0.02	0.183 ± 0.02	0.131 ± 0.02	< 0.05

Table 2 demonstrates the hemodynamic effects of distal splenorenal anastomosis. Hepatic blood flow decreased by only 22.4%, significantly less than after proximal shunting.

Table 2. Hepatoportal Hemodynamics after Distal Splenorenal Anastomosis with Preservation of the Spleen

Parameter	Normal values (M ± m)	Before surgery (M ± m)	After surgery (M ± m)	*p* value
Portal pressure (mm H_2O)	120–140	360.0 ± 20.25	241.8 ± 17.03	< 0.001
Hepatic blood flow (ml/min)	1293.8 ± 72.01	684.5 ± 82.3	531.03 ± 54.92	< 0.05
Rheohepatography As (mm)	8.92 ± 0.51	3.06 ± 0.36	4.35 ± 0.37	< 0.001
Rheohepatography Ad (mm)	5.25 ± 0.41	2.33 ± 0.41	2.92 ± 0.43	< 0.05
Rheographic index Ri (mm)	0.47 ± 0.02	0.15 ± 0.02	0.21 ± 0.02	< 0.05
Qs (s)	0.124 ± 0.02	0.140 ± 0.03	0.160 ± 0.02	> 0.2
Ta (s)	0.199 ± 0.02	0.160 ± 0.03	0.210 ± 0.03	< 0.05

The results clearly demonstrate that although proximal splenorenal anastomosis provides effective portal decompression, it significantly compromises hepatic perfusion[10-11-12-13]. The substantial diversion of portal blood into the systemic circulation leads to deterioration of hepatic hemodynamics and contributes to postoperative hepatic insufficiency and encephalopathy.

On the other hand, distal splenorenal anastomosis results in selective decompression of gastroesophageal venous system and maintaining inflow to liver from mesenteric veins. This selective effect may account for the well-preserved hepatic blood flow and superior rheohepatographic findings given above[14-15].

These observations are also supported by clinical outcomes: hepatic encephalopathy and mortality were significantly less in the distal shunt group. These findings demonstrate the physiological advantage of selective shunting in cirrhotics with portal hypertension.

4. Conclusion

The study confirms that proximal splenorenal anastomosis, despite its effectiveness in reducing portal pressure, leads to significant impairment of hepatic circulation due to extensive diversion of portal blood flow. This hemodynamic disturbance increases the risk of postoperative hepatic failure and encephalopathy.

Distal splenorenal anastomosis provides a more balanced hemodynamic outcome by selectively decompressing the gastroesophageal venous system while preserving mesenteric blood flow to the liver. This approach minimizes reduction in hepatic blood flow and is associated with better clinical outcomes.

Based on the obtained results, distal splenorenal anastomosis should be considered the preferred surgical option for portal hypertension in cirrhotic patients whenever technically feasible.

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