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Original Article

Selective surgical shunts for treating complications of portal hypertension: 10-year experience in a single institution in eastern Taiwan

Yen-Cheng Chen [a,†], Guan-Jin Ho [a,†], Ying-Chin Yang [a], Ming-Che Lee [a,b,*]

[a] Department of Surgery, Buddhist Tzu Chi General Hospital, Hualien, Taiwan
[b] Department of Surgery, Tzu Chi University, Hualien, Taiwan

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ABSTRACT

Objective: Surgical portosystemic shunts are safe and effective for treating rebleeding gastric varices (GV) in portal hypertensive patients with well-preserved liver function. The aim of this study is to investigate the clinical outcomes of using selected surgical shunts for managing rebleeding GV at a single institution in eastern Taiwan.
Materials and Methods: We retrospectively recruited 12 patients who received distal splenorenal shunts (DSRS) following the indication of rebleeding GV or hypersplenism from January 2001 through December 2010. Their demographic data, etiology of portal hypertension, associated treatments, perioperative complications and clinical outcomes were reviewed.
Results: All patients received DSRS, including 10 adults and two children, and were examined for a median follow-up period of 53 months. No postoperative encephalopathy, major complications, or surgical mortality occurred. Two of the patients were waiting for liver transplants. Late rebleeding in esophageal varices developed in two patients who were successfully managed using endoscopic treatment. The etiology of portal hypertension had no significant impact on the postoperative complications.
Conclusion: Although there were a limited number of cases in this series, our results indicate that the DSRS is an effective treatment for rebleeding GV, especially for patients with well-preserved liver function and taking into account the realities of organ shortages.

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1. Introduction

The management of patients with variceal bleeding that results from portal hypertension can be divided into two steps: control of acute bleeding episodes and prevention of recurrent variceal hemorrhage. Surgical portosystemic shunts for portal decompression are generally applied to treat repeated episodes esophagogastric variceal bleeding that is not amenable to medical or endoscopic therapies. The concept of selective portosystemic shunting is based on the principle that the selective deviation of venous blood from the esophagogastrosplenic area to systemic circulation keeps the mesoportal blood flow intact. This concept was developed in the 1960s by Warren et al [1]. The clinical results of using the distal splenorenal shunt (DSRS), a favorable type of selective portosystemic shunt, are almost universally reproducible, and many centers have shown encouraging results [2–5]. Over the past three decades, the roles of pharmacotherapy, endoscopic therapy, transjugular intrahepatic portosystemic shunting (TIPSS), and liver transplantation (LT) for treating patients with portal hypertension have been defined. Within this set of therapies, preference for one therapy over another is obvious in some groups and institutions. To date, all types of treatments for portal hypertension have been performed at our institution. The aim of the present study is to investigate the clinical outcomes of using selective portosystemic shunting for treating recurrent bleeding GV in portal hypertensive patients with well-preserved liver function over the last decade.

2. Materials and methods

Between January 2001 and December 2010, 12 patients underwent DSRS by hepatobiliary and liver transplantation surgeons at the Buddhist Tzu-Chi General Hospital in Hualien, Taiwan. Patients with well-compensated liver function or Child-Turcotte-Pugh class

A or B were offered the procedure to treat recurrent bleeding GV after the failure of endoscopic sclerotherapy. The approval of the research ethics committee of our institution was obtained for this retrospective review of the medical records of this cohort of patients (IRB100-08). Medical records were examined to determine patient demographics, cause of portal hypertension, documented variceal type, Child–Turcotte–Pugh class of liver cirrhosis, perioperative complications, 30-day mortality, late rebleeding (>3 months), and long-term outcomes. Descriptive analyses of the data were performed using Microsoft Office Excel.

2.1. Surgical technique

All patients with preserved liver function underwent elective DSRS operations following more than one episode of variceal bleeding, except for one patient who had severe thrombocytopenia. Preoperative dynamic abdominal computed tomography was arranged in order to determine that: (1) the splenic vein was of an adequate diameter without spontaneous portosystemic shunts, (2) the ascites was fully controlled, and (3) there were no hepatic or pancreatic lesions. We preferred the use of the Citron incision for the upper abdominal laparotomy followed by exposure of the splenic vein via the lesser sac by lifting the pancreas. We dissected the splenic vein from the level of confluence of the superior mesenteric and portal vein (SMPV) to the distal pancreas more than 6 cm in length. The inferior mesenteric vein was ligated if it drained into the splenic vein. The left renal vein was dissected and exposed from the avascular window of the transverse mesocolon. The splenic vein was transected at the level of SMPV for DSRS. We performed end-to-side anastomosis of the splenic vein and left renal vein using 4-0 Prolene sutures (Ethicon, Inc.) continuously with half the diameter of anastomosis as growth factor, as shown in Fig. 1. Starting in 2006, we performed DSRS with splenopancreatic disconnection to further maintain the selective shunting.

3. Results

Twelve consecutive patients were recruited, including eight men, two women, and two pediatric patients. The mean age of the adults was 49.5 years. Liver function was classified as Child–Turcotte–Pugh class A in six of the eight patients with cirrhosis and as class B in the remaining two patients. The two pediatric patients were diagnosed with idiopathic prehepatic portal hypertension. Except for one patient with hypersplenism, all patients had had at least one episode of rebleeding GV after the first
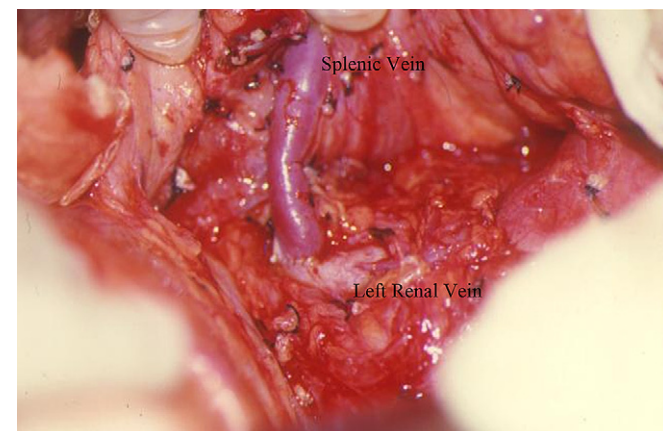

Fig. 1. Distal splenorenal shunt and anastomosis between the proximal splenic vein and left renal vein.

endoscopic treatment, and that in combination with bleeding esophageal varices (EV) occurred in seven patients. All patients received the DSRS operation. Starting in 2006, we also performed splenopancreatic disconnection (7 patients). The median follow-up period was 53 months (range: 7–115 months). The clinical profiles are shown in Table 1.

There was no 30-day or in-hospital mortality in any of these 12 patients. No hepatic insufficiency, shunt occlusion, pancreatic leakage, pneumonia, acute kidney injury, or wound infection was identified during the perioperative period. The perioperative results are shown in Table 2. Postoperative deterioration of liver function occured in three of the 12 patients (25%), in terms of Child–Turcotte–Pugh class, but all patients recovered without additional events.

No clinical symptoms or signs of hepatic encephalopathy developed in any patients during hospitalization or the follow-up period. No perioperative rebleeding was noted in this series of patients, but late rebleeding EV was identified in two patients. The first patient presented with bleeding EV at 3 months postoperatively, which further progressed the patient's portal hypertension following limited proportional portosystemic shunt; this might have led to rebleeding because of the artificial conduit (8-mm polytetrafluoroethylene [PTFE] IMPRA CenterFlex Graft, C. R. BARD, Inc.) that was placed between the splenic and renal vein. The second pediatric patient developed bleeding EV 3 years postoperatively because of the relatively inadequate shunting with his growth. These bleeding varices were confined to the distal esophagus and successfully managed by endoscopic treatments.

Two patients died during the follow-up period. One patient died from pulmonary malignancy 23 months postoperatively and the other patient died from pneumonia 45 months postoperatively. One patient developed hepatocellular carcinoma, underwent local ablation therapy, and is now listed to receive a liver transplantation. Two of the 12 patients are presently on the waiting list for liver transplantation.

4. Discussion

Many randomized controlled trials comparing DSRS with endoscopic sclerotherapy and/or TIPSS for treating variceal rebleeding have confirmed the efficacy of DSRS [6–10]. The variceal rebleeding rate of DSRS has been shown to be <10%, which is similar to the results of TIPSS and less than endoscopic or pharmacologic treatments, which is as high as 47% [11]. The efficacy of pharmacologic treatment for variceal rebleeding, especially of the GV, is not satisfactory and is restricted by the adverse effects such as cardiac failure, asthma and symptomatic bradycardia. In our series, two patients experienced late variceal rebleeding under the status of shunt patency that was proven by color Doppler ultrasonography and contrast-enhanced computed tomography. A possible cause is inadequate portosystemic shunting due to a low hepatic venous pressure gradient (HVPG). The 8-mm PTFE Gore-Tex graft is the largest artificial conduit available at our institution, but this is still smaller than the splenic and renal vein diameters and can adequately divert portal blood flow. Portal blood flow is proportional to cardiac output and increases with age and body surface area. This limited and relative inadequate conduit, in terms of material and size, might have led to late bleeding in our two patients. No episodes of variceal rebleeding or variceal enlargement were noted in the other 10 patients on follow-up with endoscopy. HVPG measurement is a good way to evaluate therapeutic effects and predict rebleeding after a shunt operation [12]. Regrettably, HVPG measurement is an invasive procedure and was not available at our institution. In reality, HVPG measurement is not incorporated into daily practice at the vast majority of institutions.

Table 1
Patient demographic data and clinical profiles.

Pt. No.	Age (y)	Gender	Etiology	CTP	MELD	Surgical Indication	Operation	Complication	Late rebleeding	Follow-up (mo)
1	30	M	Alcohol	B	N/A	GV rebleeding	DSRS	No	N/A	N/A
2	51	M	Alcohol	A	10	GV rebleeding	DSRS	No	No	115
3	53	F	HCV	A	10	Hypersplenism	DSRS	No	No	26
4	54	M	HBV/HCV	A	9	GV rebleeding	DSRS	No	No	94
5	4	M	Idiopathic	—	—	GV rebleeding	DSRS	No	Yes	73
6	46	F	HBV	B	9	GV rebleeding	DSRS + SPD	No	No	68
7	58	M	Idiopathic	A	9	GV rebleeding	DSRS + SPD	No	No	68
8	60	M	HCV	A	8	GV rebleeding	DSRS + SPD	No	No	31
9	43	M	HBV/Alcohol	B	12	GV rebleeding	DSRS + SPD	No	Yes	46
10	11	M	Idiopathic	—	—	GV rebleeding	DSRS + SPD	No	No	35
11	54	M	Pancreatitis	—	—	GV rebleeding	DSRS + SPD	No	No	25
12	46	M	HCV/Alcohol	A	11	GV rebleeding	DSRS + SPD	No	No	7

CTP: Child-Turcotte-Pugh; DSRS: Distal Splenorenal Shunt; EV: Esophageal Varices; GV: Gastric Varices; MELD: Mode for End-Stage Liver Disease; N/A: Not Available; SPD: Splenopancreatic Disconnection.

Gastroesophageal variceal rebleeding is considered the most life-threatening complication that can occur after endoscopic therapy, especially bleeding GV, and can manifest in large varices with a difficult clinical approach. Compared with DSRS, TIPSS shows similar results for the prophylaxis of variceal rebleeding, but leads to a greater risk of encephalopathy and requires frequent interventions in order to maintain patency [9,11]. TIPSS also has a 75% incidence of shunt dysfunction or thrombosis within 6 months to 1 year that can be detected by duplex ultrasonography [13,14]. Helton et al conducted a prospective, randomized trial on 40 patients with Child–Pugh class A or B and variceal bleeding; 20 patients underwent DSRS and 20 underwent TIPSS. The patients who underwent TIPSS demonstrated a higher mortality rate, more rebleeding episodes, and required more rehospitalization than those treated with DSRS. In order to avoid TIPSS loss, patients must undergo frequent surveillance by duplex ultrasonography or venography and face the risk of percutaneous dilatation or rest-enting [15]. DSRS has been shown to be more cost-effective than TIPSS for treating severely compensated cirrhotic patients with variceal rebleeding [16]. DSRS is also better suited for treating noncompliant patients and for those with limited access to specialized medical centers capable of dealing with TIPSS failures [17]. There are fewer specialized endoscopists in eastern Taiwan than western Taiwan, and most patients are typically a long distance from the nearest the tertiary medical center. Hence, surgical selective portosystemic shunts are the preferred treatment for treating rebleeding GV in patients with severely compensated liver function in eastern Taiwan.

The maintenance of portal circulation by splenopancreatic disconnection plays a role in the development of encephalopathy. A study by Spina et al found no cases of chronic encephalopathy in patients who underwent splenopancreatic disconnection [18].

There also are several advantages to DSRS over other selective and nonselective shunts for controlling variceal rebleeding. Selective decompression of the gastroesophageal varices by splenic circulation maintains portal flow into the liver and the delivery of the hepatotrophic factors that preserve hepatic function and volume [19,20]. In our series, no patient developed encephalopathy or deteriorated liver function during hospitalization or the follow-up period. The transient change in liver function is based on the Child–Turcotte–Pugh classification, but the most severely affected parameter in three patients was the serum albumin level, which might have contributed to the development of postoperative systemic inflammatory response syndrome. Moreover, DSRS makes it possible to avoid dissection and mobilization of the hepatoduodenal ligament, which significantly complicates liver transplantation [21]. Two patients in this series have been on the waiting list for liver transplantation for more than 4 years. According to the allocation principle and organ shortages in Taiwan, the waiting time might be more than 5 years for patients with well-compensated liver cirrhosis who present with complications.

5. Conclusions

Because of the current geographic and medical considerations in eastern Taiwan, DSRS may be considered the first-line therapy for treating rebleeding GV in patients with Child–Turcotte–Pugh class A and early class B cirrhosis who have failed to improve following endoscopic treatment and are unlikely to receive liver transplantation within 5 years. The durability of DSRS makes it a much better option for some patients and also avoids the disadvantages of TIPSS.

Table 2
Perioperative results.

Operation Type		
DSRS	5	
DSRS + SPD	7	
OP Time (minute)	280	(220-360)
Blood Loss (ml)	267	(50-1100)
Warm ischemic time of left kidney (minute)	24	(17-37)
Length of Hospital Stay (Day)	10.1	(7-17)
Encephalopathy	0	
Early Rebleeding	0	
Complications	0	
Mortality	0	

DSRS: distal splenorenal shunt; SPD: splenopancreatic disconnection.

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