Distal Splenorenal Shunt

Preferred Treatment for Recurrent Variceal Hemorrhage in the Patient With Well-Compensated Cirrhosis

David R. Elwood, MD; James J. Pomposelli, MD, PhD; Elizabeth A. Pomfret, MD, PhD; W. David Lewis, MD; Roger L. Jenkins, MD

Hypothesis: Distal splenorenal shunt (DSRS) is a safe and effective treatment for patients with Child-Pugh class A and B cirrhosis with recurrent variceal hemorrhage after failed transjugular intrahepatic portosystemic shunt.

Design: Retrospective case review.

Setting: Hepatobiliary surgery and liver transplantation department in a tertiary referral medical center.

Patients: Between August 1, 1985, and May 1, 2005, 119 patients with Child-Pugh class A and B cirrhosis underwent DSRS for recurrent variceal hemorrhage. Of these, 17 (14.3%) had thrombosed or failing transjugular intrahepatic portosystemic shunt prior to DSRS.

Intervention: Distal splenorenal shunt for recurrent variceal hemorrhage after failure of conservative management.

Main Outcome Measures: Morbidity, mortality, and subsequent liver transplantation rate.

Results: The overall perioperative morbidity rate was 31.5%. Thirteen patients (11.7%) developed encephalopathy and 6 (5.4%) had recurrent variceal hemorrhage. Other complications included portal vein thrombosis, pancreatitis, pancreatic pseudocyst, pneumonia, and wound infection. The 30-day operative mortality rate was 6.4% (n = 7). The 1-year survival rate was 85.9%. The incidence of DSRS for failed transjugular intrahepatic portosystemic shunt during the first 12 years of the study (1985-1997) was 11.1% (9/81). This proportion increased to 26.7% (8/30) during the second half of the study (1997-2005). During the 20-year period, 15 patients (13.5%) underwent liver transplantation a mean of 5.1 years after DSRS without an increase in morbidity or mortality after transplantation.

Conclusions: Distal splenorenal shunt may be the preferred treatment for recurrent variceal hemorrhage in the patient with well-compensated cirrhosis. In addition, DSRS does not cause increased morbidity or mortality in subsequent liver transplantation.

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tioned TIPS stents can interfere with, or preclude altogether, surgical portosystemic shunting and future liver transplantation.\(^9,10\)

We have reviewed the DSRS experience of a single group of hepatobiliary and liver transplantation surgeons. We compare the results of DSRS in patients with Child-Pugh class A and early class B cirrhosis with published standards with TIPS. Results of patients with failed TIPS subsequently treated with DSRS are discussed.

### METHODS

Between August 1, 1985, and May 1, 2005, 119 patients underwent DSRS by the hepatobiliary and liver transplantation team at the Lahey Clinic Medical Center in Burlington, Mass. Patients were offered the DSRS procedure for recurrent gastric or esophageal variceal bleeding after failing endoscopic management or TIPS. Institutional review board approval was obtained for a retrospective medical record review of this cohort of patients. Medical records were examined for patient demographics, cause of underlying liver disease, documented variceal type, Child-Pugh class, history of TIPS, complications, 30-day mortality, and 1-year survival. Complete medical record data were available for 111 patients. Child-Pugh classification and variceal location were identified for 104 patients. One patient was lost to follow-up within 1 month of surgery. Descriptive analyses of the data were performed using a commercially available statistical package.

### RESULTS

Eighty-one men (68.1%) and 38 women (31.9%) underwent DSRS at a mean age of 50.0 years (range, 20-80 years). In 44 cases (39.6%), cirrhosis and portal hypertension were due to alcohol abuse, and 19 cases (17.1%) were due to chronic hepatitis C infection. All underlying etiologies of portal hypertension in patients undergoing DSRS are listed in Table 1. Seventy-three (65.1%) had Child-Pugh class A disease and 31 (27.8%) had class B disease. Sixty-two patients (55.8%) had esophageal varices, 10 complications (9.6%) had varices isolated to the stomach, and 32 patients (29.8%) had both esophageal and gastric varices.

The overall perioperative morbidity rate was 31.5% (35/111). Most of these complications were minor and easily treated postoperatively. One patient developed recurrent variceal bleeding; 3 patients accumulated significant ascites. Thrombosis of the portal vein, identified by duplex ultrasonography, occurred in 6 patients.

Seven patients (6.4%) died during the perioperative period. Causes of death included acute respiratory distress syndrome and multiorgan system dysfunction (n=2), acute liver decompensation and renal failure (n=1), cardiac dysrhythmia (n=1), myocardial infarction (n=1), coagulopathy with uncontrolled hemorrhage from varices (n=1), and retroperitoneal bleeding (n=1).

The mean follow-up time after surgery was 5.3 years. Thirteen patients (11.7%) developed hepatic encephalopathy, and 6 patients (5.4%) had episodes of recurrent variceal bleeding. The survival rate for all patients followed up for at least 1 year was 85.9% (79/92). Causes of perioperative morbidity and complications occurring more than 30 days after surgery are demonstrated in Table 2.

Seventeen patients (15.3%) underwent DSRS because of failed TIPS. During the first 12 years of the study, 11.1% (9/81) of the patients receiving a DSRS had a prior TIPS procedure. This proportion increased to 26.7% (8/30) during the last 8 years of the study (P = .09). This occurred despite the overall incidence of DSRS diminishing from 6.75 cases per year during the early period to 3.75 cases annually in subsequent years. Stent procedure dates were available only for the last 8 of these 17 patients. The DSRS procedure was performed a mean of 22 months (range, 0-76 months) after TIPS. Three of these patients had undergone TIPS revisions. One TIPS was revised 7 times. In 5 patients, attempts to salvage TIPS stents by percutaneous recannulation were unsuccessful.

During the course of the study, fifteen patients (13.5%) who had received a DSRS underwent liver transplanta-

### Table 1. Underlying Etiologies of Portal Hypertension in 111 Patients with Child-Pugh Class A and Class B Cirrhosis Undergoing Distal Splenorenal Shunt

<table>
<thead>
<tr>
<th>Etiology of Portal Hypertension</th>
<th>No. (%)</th>
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<tbody>
<tr>
<td>Alcohol abuse</td>
<td>44 (39.6)</td>
</tr>
<tr>
<td>Hepatitis C</td>
<td>19 (17.1)</td>
</tr>
<tr>
<td>Cryptogenic hepatitis</td>
<td>17 (15.3)</td>
</tr>
<tr>
<td>Primary sclerosing cholangitis</td>
<td>11 (9.9)</td>
</tr>
<tr>
<td>Primary biliary cirrhosis</td>
<td>7 (6.3)</td>
</tr>
<tr>
<td>Hepatitis B</td>
<td>3 (2.7)</td>
</tr>
<tr>
<td>Portal vein thrombosis</td>
<td>4 (3.6)</td>
</tr>
<tr>
<td>Autoimmune hepatitis</td>
<td>3 (2.7)</td>
</tr>
<tr>
<td>Budd-Chiari disease</td>
<td>1 (0.9)</td>
</tr>
<tr>
<td>Hemochromatosis</td>
<td>1 (0.9)</td>
</tr>
<tr>
<td>Alcoholic liver disease</td>
<td>1 (0.9)</td>
</tr>
</tbody>
</table>

### Table 2. Perioperative Morbidity and Complications Occurring at More Than 30 Days After DSRS Surgery*

<table>
<thead>
<tr>
<th>Type of Complication</th>
<th>No. (%)</th>
</tr>
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<tbody>
<tr>
<td>Perioperative morbidity†</td>
<td></td>
</tr>
<tr>
<td>Portal vein thrombosis</td>
<td>6 (5.4)</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>4 (3.6)</td>
</tr>
<tr>
<td>Ascites</td>
<td>3 (2.7)</td>
</tr>
<tr>
<td>Wound infection</td>
<td>4 (3.6)</td>
</tr>
<tr>
<td>Renal failure</td>
<td>3 (2.7)</td>
</tr>
<tr>
<td>Liver decompensation</td>
<td>3 (2.7)</td>
</tr>
<tr>
<td>Nonfatal arrhythmia</td>
<td>2 (1.8)</td>
</tr>
<tr>
<td>ARDS, MOSF</td>
<td>3 (2.7)</td>
</tr>
<tr>
<td>Pancreatitis</td>
<td>2 (1.8)</td>
</tr>
<tr>
<td>Urinary tract infection</td>
<td>2 (1.8)</td>
</tr>
<tr>
<td>Complications occurring at &gt;30 d after surgery</td>
<td></td>
</tr>
<tr>
<td>Hepatic encephalopathy</td>
<td>13 (11.7)</td>
</tr>
<tr>
<td>Recurrent variceal bleeding</td>
<td>6 (5.4)</td>
</tr>
</tbody>
</table>

Abbreviations: ARDS, acute respiratory distress syndrome; DSRS, distal splenorenal shunt; MOSF, multiple organ system failure.

*Each patient may have more than 1 complication.

†Perioperative morbidity includes 1 case of each of the following: variceal bleeding, retroperitoneal bleeding, pancreatic pseudocyst, ileus, fatal arrhythmia, aspiration, sterile peripancreatic fluid collection, myocardial infarction, and Clostridium difficile colitis.

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tion after a mean interval of 5.1 years. Fourteen of these patients received cadaveric grafts; 1 received a graft from a live adult donor. Perioperative mortality for this group was 0%.

COMMENT

In the short-term management of VH secondary to portal hypertension, there are well-established algorithms to guide treatment. The use of β-blockers, octreotide, and nitrates along with endoscopic intervention with banding or sclerotherapy are typically effective at controlling bleeding. Unless a long-term therapy is pursued, the risk of recurrent bleeding is approximately 30% to 50%, and patients face significant risk of mortality with each episode. Choosing the best long-term management of VH depends on the underlying etiology of the portal hypertension, the degree of liver decompensation, variceal location, and factors specific to the patient. Roughly 20% of acute bleeds, for example, arise from gastric varices that respond poorly to endoscopic measures. For the patients with end-stage cirrhosis, definitive treatment for VH is liver transplantation. In patients with Child-Pugh class A and early class B liver disease, the 2 principal options are DSRS and TIPS.

Each of these shunting procedures has been shown to satisfactorily prevent recurrent VH. The reported incidence of recurrent bleeding is 3.8% to 14% following DSRS and 15% to 30% after TIPS. During the 20-year period covered in this review, 6 (5.4%) of our patients are known to have developed recurrent VH. All of the recurrences occurred outside of the postoperative period.

The DSRS and TIPS interventions are both associated with significant potential for complications. The reported perioperative mortality rates for DSRS are 0% to 14%. In our cohort, the perioperative morbidity and mortality rates were 31.5% and 6.4%, respectively. The complications ranged from pneumonia and cardiac arrhythmias to problems specific to treating patients with liver failure, such as hepatic decompensation, renal failure, and portal vein thrombosis. The early morbidity and mortality rates for all patients undergoing TIPS are 49% and 7% to 45%, respectively. For patients with Child-Pugh class A and B cirrhosis, these rates are somewhat lower (morbidity, 9%-25%; mortality, 20%-26%). The TIPS complications include portal vein thrombosis, hemopteritoneum, hemolytic anemia, biliary-venous fistula, and vegetative shunt infections. Fifteen percent to 30% of patients develop TIPS-related encephalopathy; the reported rate after DSRS is 5% to 19%. A more critical issue when considering the patient with well-compensated cirrhosis is the durability of TIPS. The procedure has a 75% incidence of shunt dysfunction or thrombosis at 6 months to 1 year detectable by duplex ultrasonography. By 2 years, nearly all patients with TIPS have functional stenosis or thrombosis due to pseudo-intimal hyperplasia. To avoid TIPS loss, patients must undergo frequent surveillance with duplex ultrasonography or venography and then face percutaneous dilations or stent redeployments.

When a TIPS ultimately fails or cannot be revised further in a patient with well-compensated liver disease, DSRS has been used as a salvage procedure. In our experience, a total of 15.3% of the patients referred for DSRS had already undergone TIPS or attempted TIPS, and several of these have been revised repeatedly. The percentage of patients who were post-TIPS increased between the former and latter parts of this study, from 11.1% to 26.7% (P = .09). While not statistically significant, we suspect that this trend reflects the increased use of TIPS during the past 10 years and subsequent increase in TIPS-associated complications. It is of little surprise then that DSRS has been shown in cost analysis to be less expensive than TIPS. The DSRS is also better suited for non-compliant patients and for those who have limited access to specialized medical centers capable of dealing with TIPS failures.

Last, the possibility that a patient may be a future candidate for liver transplantation must be considered. Migration or malplacement of TIPS into the suprarehepatic vena cava and right atrium or into the portal vein is reported to occur in up to 8% of patients. The presence of metal wall stents in these locations can make hepatectomy technically treacherous and may disqualify the patient from consideration for transplantation. From a surgical standpoint, DSRS does not compromise future transplantation because it avoids dissection around the porta hepatitis. In our cohort of patients, we are aware of 6 cases of portal vein thrombosis after DSRS. Three of these patients later underwent transplantation despite the portal thrombosis without any technical difficulties. Although these numbers are small, we have already demonstrated that previous DSRS does not negatively impact subsequent transplantation.

The DSRS may be considered first-line therapy for recurrent VH in patients with Child-Pugh class A and early class B cirrhosis who have failed endoscopic sclerotherapy or banding and who are unlikely to undergo transplantation within 5 years. When performed at a center with technical expertise, the short-term rates of rebleeding, encephalopathy, and other complications are acceptable and superior to TIPS. The durability of DSRS makes it a much better option in appropriately selected patients, and it avoids the burden of TIPS surveillance and revision. The DSRS adds little to the difficulty or morbidity of future liver transplantation.

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DISCUSSION

Benedict Cosimi, MD, Boston, Mass: I feel a bit of a déjà vu here. When I was a surgical resident, portosystemic shunting was the only thing available for bleeding varices and that's all we did. It was for these patients that Bob Linton championed the splenorenal shunt, admittedly a proximal rather than distal shunt. Then along came the TIPS procedure and nobody continued to do these portosystemic shunts. I would like to say that many residents now don't even know how to do most of the portosystemic shunts. Now you are advocating that we go back. What has changed? Did TIPS just not prove to be what we thought it was?

Dr Elwood: Thank you for your question. TIPS has not proven to be what we thought it was. The hepatobiliary and liver transplant surgeons, as well as gastroenterologists, who follow patients with cirrhosis over the long-term are growing frustrated with TIPS chronic management for variceal bleeding. These patients are committed to frequent surveillance ultrasounds and often require stent manipulations. It is very disheartening to have patients with early disease come into clinic with encephalopathy post-TIPS that will not resolve until they are transplanted. It is even worse to discover on referral to a transplant center a venous complication, such as the one I showed earlier, that prevents or complicates transplantation. We hope that hepatobiliary surgeons who are experienced with this procedure will start teaching the younger generation so we can go back to using something that is more durable.

Nabil Atweh, MD, Bridgeport, Conn: I wonder if over the 20 years you have noticed any increase in the rate of failures of surgically performing the distal splenorenal shunt. The reason I am saying that is that there has been an increase in the use of sclerosing agents, which seems to spread all the way to underneath the pancreas and cause sclerosing fibrosis to form that makes the procedure more difficult. These are the techniques that the gastroenterologists have used more aggressively recently. Did you notice a drop in the rate of success in achieving a distal splenorenal shunt?

Dr Elwood: At one point while examining our data, I did break down the group’s experience into early and late time periods. The complication and mortality rates were similar, despite the fact that more patients had undergone previous TIPS and other interventions during the latter period.

Dr Atweh: Were there any other procedures performed different than the distal splenorenal shunt for variceal bleeding?

Dr Elwood: I included in this series only the distal splenorenal shunts. Our group does have experience with other surgical shunt options, including portocaval shunts, side-to-side splenorenal shunt, mesocaval shunt, and I mesogonadal shunt.