



# Use of Peritoneovenous Shunt for the Management of Refractory Ascites

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## ABSTRACT

**Background.** Guidelines for the management of refractory ascites (RA) recommend transjugular intrahepatic portosystemic shunting (TIPS), diuretics, and paracentesis as the main strategies, discouraging use of surgical peritoneovenous shunts (PVSs). However, PVSs, including both Denver (DS) or saphenoperitoneal (SPS) modalities, may still have indications. Herein we report our experience with PVSs in the context of modern surgical and anesthetic management.

**Methods.** In our unit, PVSs are offered to patients with ascites refractory to diuretics in which TIPS are contraindicated. Heart function and spontaneous bacterial peritonitis must be assessed before surgical indication.

**Results.** Seven procedures were performed on 5 patients (6-DS, 1-SPS) in 2013. Their mean age was 61 (range, 54–68) years. In 3 patients, the indication was RA without options for liver transplant; 2 patients were on the waiting list for liver transplantation, which were performed to improve renal function and quality of life (QOL). The median hospital stay was 6.5 (range, 3–12) days. All patients were alive after 12 months. One patient died 2 years after the first DS and another later died due to liver insufficiency with patency of the DS. The ascites was well-controlled in 4 of 5 patients at up to 48 months of follow-up. Decreases in diuretics doses, proper weight maintenance, and a dramatic improvement in QOL (measured by a modified Ascites Symptom Inventory-7 [ASI-7] test) were observed after the procedures.

**Conclusion.** PVSs are useful for the treatment of patients with RA who develop resistance to common therapies, leading to a major improvement in QOL. These surgical procedures should be included in the armamentarium of experienced liver surgeons.

**A**SCITES is the most common complication of cirrhosis. Around 60% of patients with compensated cirrhosis develop ascites within 10 years during the course of their disease [1]. Patients with cirrhosis and ascites are at high risk for other complications of liver disease, such as refractory ascites (RA), spontaneous bacterial peritonitis, hyponatremia, or hepatorenal syndrome (HRS). RA is a serious complication that requires complex strategies to achieve acceptable control [2]. One of the first therapeutic options was reported in 1907 by Wynter [3], who described permanent drainage through the femoral ring with the aim

of draining the abdominal cavity into tissues outside the abdomen. Another classic surgical approach (the ileoentrectomy) was described by Neumann and colleagues [4].

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These methods were effective, but were later abandoned due to several surgical and anesthetic complications.

Surgical refinement in recent years has led to improved outcomes in cirrhotic patients undergoing elective surgery. In this sense, even patients with hepatocellular carcinoma (HCC) and severe cirrhosis have been reported to have excellent survival with few perioperative complications [5]. The use of peritoneovenous shunts (PVS) has been progressively discarded due to perioperative mortality. In fact, the most recent guidelines of the AASLD (2012) describe how “poor long-term patency, excessive complications, and no survival advantage compared to medical therapy in controlled trials have led to the near abandonment of this procedure.” However, nowadays, PVSs should potentially be reconsidered as an alternative therapeutic approach for RA as this approach may increase quality of life (QOL) and decrease hospital admission rate for paracentesis. This technique allows for recirculation of ascitic fluid into the vascular space, but it requires implantation of a foreign body into a central vein using a Denver shunt (DS) or use of the long saphenous vein as a drainage system for the saphenoperitoneous shunt (SPS). The return of ascitic fluid into the circulation is based on the positive pressure gradient between a peritoneal cavity filled with ascites and

central venous pressure [6]. Both of these techniques have generally been abandoned by liver surgeons. We advocate for the reinstatement of these procedures in selected cases. The main aim of this study is to report our preliminary experience with the use of PVS for management of RA.

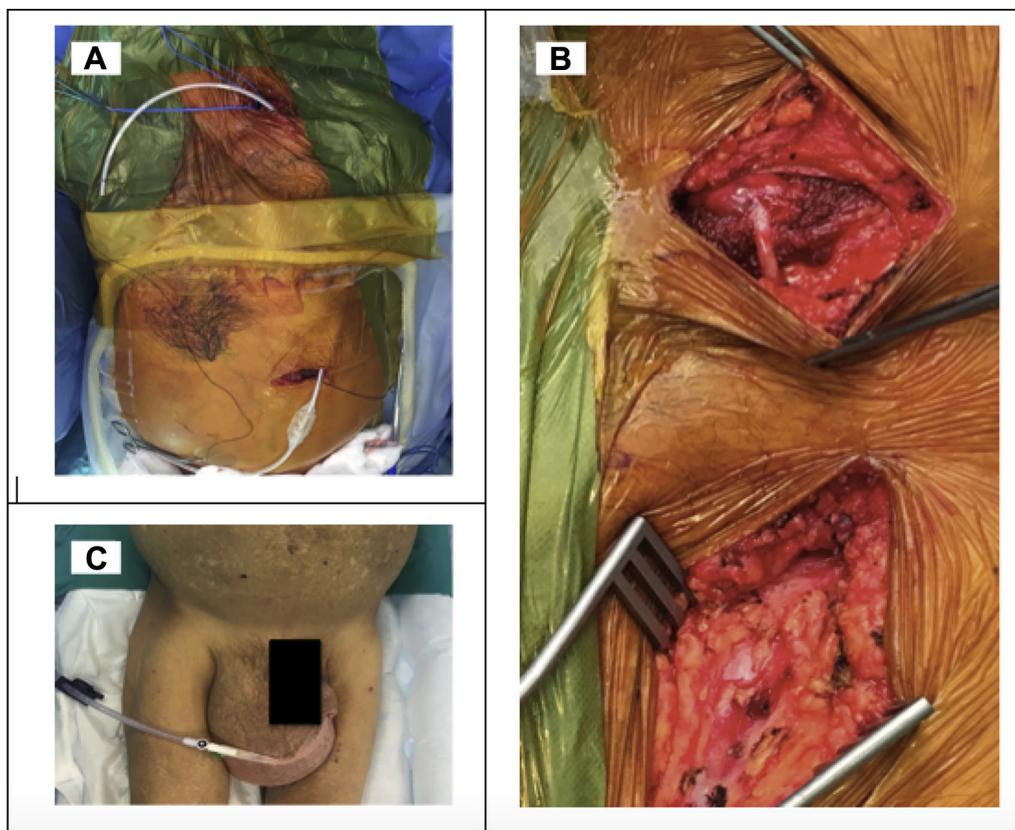
## MATERIALS AND METHODS

### Indications for PVS

At our center, PVSs (DS or SPS) are offered to patients with RA due to chronic liver failure, who have become refractory to diuretics treatment and with contraindications to transjugular intrahepatic portosystemic shunting (TIPS) due to encephalopathy. Patient candidates may or may not be on a transplant waiting list. Renal function, anesthetic risk, and cardiac output are fully screened in all patients. The diagnosis of heart insufficiency is a contraindication for PVS as this procedure may increase cardiac volume by up to 1 L/day. A previous history of spontaneous bacterial peritonitis (SPB) is not an absolute contraindication if the patient has had at least 1 year without recurrence of SPB before the procedure.

### Surgical Technique

All procedures are performed under general anesthesia and with radiologic intraoperative checking. The DS is implanted into the peritoneal cavity through a left mini-subcostal incision. The pump



**Fig 1.** Illustration showing the procedures performed in our center. (A) denver shunt; (B) sapheno-peritoneous shunt; and (C) giant inguinal hernia that was repaired in the same operation.

chamber is usually located subcutaneously over the 11th to 12th rib (Fig 1A). After aspiration of the ascites, a subcutaneous tunnel is performed and inserted into the subclavian vein avoiding kinking of the tube in the neck area. For the SPS, the long saphenous vein is fully exposed and dissected. It is then cut distally, turned upward, and tunneled subcutaneously above the inguinal ligament (not below, as this may cause compression of the shunt). The peritoneum is exposed approximately 7–10 cm in the inguinal region (Fig 1B). An end-to-side anastomosis is performed between the saphenous vein and the peritoneum [7] with 6/0 monofilament polypropylene suture.

#### Follow-up and Outcomes

Evolution during the immediate postoperative stay is screened by daily blood tests and weight measurement. In the case of DS, patients are discharged when adequate working of the device is assessed and full knowledge of pumping strategy is known by the patient and family. All patients are checked in the outpatient clinic every week during the first 2 months to ensure nonrecurrence of ascites. A modified version of the Ascites Symptom Inventory-7 (ASI-7) QOL test is given to patients before and after the operation.

#### RESULTS

From 2013, 7 PVS procedures were performed at our center on 5 patients. Six were DS procedures and 1 was an SPS procedure. The main cause of end-stage liver disease was alcohol abuse. In 2 cases, PVS was indicated to improve renal function and QOL before the liver transplant and in 3 cases to control the RA in patients with no indication for transplantation. The mean age was 61 (range, 54–68) years. In 1 case, surgery was accompanied by inguinal hernia repair due to a giant hernia that led to impaired QOL and the patient's inability to walk (Fig 1C). The median hospital stay was 6.5 (range, 3–12) days. The postoperative course was good in most of the patients. Only 1 patient developed complications: an acute kidney injury that improved after medical treatment. One device obstructed 8 months after placement and contralateral placement of the shunt with concomitant extraction of the previous one being performed. This DS also obstructed. This patient subsequently underwent elective SPS but died due to hepatic decompensation after traumatic paracentesis with hemoperitoneum in the immediate postoperative course. Another patient died due to deterioration of liver function 24 months after the procedure, with a patent unobstructed device. The RA was properly managed in 4 of the 5 patients.

Major improvements in QOL (as measured by the ASI-7 test) were observed after the procedure. Patients reported significant reductions in pressure, bloating, and abdominal pain. In addition, improvements in malleolar edema and dyspnea were observed and patients felt more comfortable with physical activities after the procedure.

#### DISCUSSION

Current guidelines [7] consider intensive diuretics treatment with additional dietary sodium restriction and large-volume

paracentesis as the primary treatment options for patients with refractory ascites. However, the negative impact on systemic hemodynamics and renal function are the main adverse events associated with these strategies. TIPS is a viable treatment option in chronic disease patients, but may be associated with higher rates of hepatic encephalopathy. Both LVP and TIPS may lead to life-threatening complications and are contraindicated for some patients. Despite the fact that current guidelines consider surgical shunts almost outdated, based on our experience, we strongly recommend that these techniques be reconsidered by liver surgeons and offered to patients with risk of encephalopathy, and who need frequent LVP, or for those in whom QOL is seriously impaired.

The PVS approach should be considered as a good alternative for patients with refractory ascites who are not candidates for TIPS (due to encephalopathy) or to LVP due to impaired QOL. Furthermore, PVS avoids repeated paracentesis and hospitalizations, improves QOL, and offers a simple and reproducible surgical technique. The main drawback of the DS is the high rate of obstruction of the device, which may be solved by contralateral replacement or performing an SPS. Early implantation of a PVS should be considered when the ascites condition is resistant to medical therapy. The surgical techniques involved with the SPS and DS require learning curves and precise knowledge of the physiology of the cirrhotic patient. These are not easy-to-treat patients but they may benefit from these techniques and experience a greatly improved QOL. Further randomized trials and pilot studies could lead to worldwide guidelines for these approaches to treatment of RA.

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