Hepatobiliary & Pancreatic Diseases International 18 (2019) 488–490

Contents lists available at ScienceDirect

Hepatobiliary & Pancreatic Diseases International

journal homepage: www.elsevier.com/locate/hbpd

Viewpoint

Surgical portosystemic shunts to facilitate major intrabdominal surgery

Michail Pizanias*, Elissaios Kontis, Evangelos Prassas, Parthi Srinivasan, Andreas Prachalias

Department of Liver Transplantation, Hepatobiliary Pancreatic Surgery, King's Healthcare Partners, King's College Hospital NHS FT, Institute of Liver Studies, Denmark Hill, London SE5 9RS, UK

The effective management of patients with chronic liver disease (CLD) and portal hypertension (PHT) has significantly prolonged their survival. Hence, there is an emerging number of patients who will require major elective intrabdominal surgery for reasons unrelated to their CLD (e.g., colorectal cancer). This group of patients represent high-risk surgical procedure due to their CLD, namely liver decompensation. To this end, alleviation of PHT is the most effective option of decreasing the risk of liver-related morbidity, either with surgical portosystemic shunts (SPS) or transjugular intrahepatic portosystemic shunt (TIPS). We present the short-term outcomes of a case series of 7 consecutive patients with established CLD and PHT, who underwent a concomitant SPS to facilitate major intraabdominal surgery. The short-term outcomes of SPS are presented and the current indications are reviewed.

Between October 2013 and July 2018, we retrospectively identified seven patients who underwent an SPS for elective major intrabdominal surgery and their characteristics are summarized in Table 1. The study was approved as an institutional audit (No. LIV01122018). Primary gastrointestinal malignancy and surgery with curative intent was the indication for surgery, and all patients had evidence of PHT on preoperative cross-sectional imaging as reviewed by an expert liver radiologist. The preoperative work-up included oncological staging, assessment of severity of liver disease (Child-Pugh/MELD scoring), cardiopulmonary exercise tests and estimation of the degree of PHT (ascites, oesophageal varies, splenomegaly, etc.). After a multidisciplinary team discussion the decision of a concomitant SPS at the time of resection was made based upon the need of long-term patency and need for immediate decompression of the portal circulation. The contraindications to SPS were the same as for TIPS, e.g., anatomical contraindications, previous episodes of hepatic encephalopathy, and cardiac dysfunction. Finally, patients with bilirubin >50 μmol/L, INR >1.7, ascites or encephalopathy were not considered for SPS.

Surgical exposure was achieved by a transverse upper abdominal or reverse "L" incision (which could be later extended to a lower midline to facilitate the colorectal resection). Retrograde cholecystectomy was performed, and the hepatoduodenal ligament was skeletonised. Meticulous dissection of the retro-portal lymph nodes was carried out to expose the portal vein and common bile duct. In case of aberrant anatomy of the right hepatic artery (i.e., replaced or accessory right hepatic artery originating from the superior mesenteric artery), careful dissection was carried out to allow for medial retraction of the right hepatic artery with the common bile duct. The correct geometrical opposition of the portal vein and inferior vena cava (IVC) is crucial for the technical success of the shunt (Fig. 1(A) and (B)). Care should be taken so that the axis of the portocaval shunt is parallel to that of the portal trunk. Hence an oblique incision should be made on the IVC. In order to achieve the above orientation, a partial caudate lobectomy or transection of the caudate process might be required to expose sufficient length of the IVC, which along with sufficient mobility of the portal vein assure a tension free portocaval anastomosis. Similar principles apply for H-shunts. The portocaval shunt was carried in a standard fashion with partially occluding vascular clamps and 6–0 running prolene suture. It is critical the diameter of the anastomosis not to exceed 1 cm in diameter to minimize the risk of postoperative hepatic encephalopathy. An intraoperative Doppler ultrasound should be carried out at the completion of the portocaval anastomosis to exclude retrograde flow in the portal vein. In the case of retrograde portal flow, the diameter of the shunt was tailored down to achieve antegrade portal flow. In most of the patients in our study, we performed a side-to-side portocaval shunt, as this is the preferred technique for non-selective shunt due to technical feasibility, decreased operative time and a shorter graft (H-type shunt) if any (side-to-side). Exception to the above were patients undergoing right hemicolectomy and a patient undergoing a high anterior resection, where a mesocaval SPS was preferred to avoid additional dissection at the porta hepatis.

For H-type shunts or mesocaval shunts, we opted for a cadaveric vein of compatible blood group instead of a synthetic graft. The portal vein pressure was measured before and after the construction of the SPS with the use of a 25-G needle (attached to a water pressure gauge with saline) in the main portal vein trunk just proximal to the bifurcation of the main portal vein (Fig. 1(C)). At the same time, the central venous pressure was also measured through a transducer attached to a central vein catheter, as an approximation of the hepatic vein pressure. We aimed to achieve an end gradient of portal vein to pressure to central vein pressure of 10–12 mmHg. Following successful completion, the oncological resection was carried out.

* Corresponding author.
E-mail address: m.pizanias@nhs.net (M. Pizanias).

https://doi.org/10.1016/j.hbpd.2019.05.009

Table 1
Characteristics of all patients who underwent an SPS for elective major intrabdominal surgery.

Characteristics	Patient A	Patient B	Patient C	Patient D	Patient E	Patient F	Patient G
Operation	Right extended hemicolectomy	Left hemicolectomy	Anterior resection	High anterior resection	Anterior resection	High anterior resection	Whipple's
Etiology of liver disease	Hepatitis B	ALD	ALD	NASH	ALD	ALD	ALD
Pre-SPS portal pressure (mmHg)	20	18	22	23	16	21	21
Post-SPS portal pressure (mmHg)	11	6	14	7	8	16	12
Central venous pressure (mmHg)	2	1	1	2	1	3	2
Type of shunt	Mesocaval	Side-to-side portocaval	Side-to-side portocaval	Mesocaval	Side-to-side portocaval	Side-to-side portocaval	Side-to-side portocaval
MELD	7	16	13	7	6	12	10
Child-Pugh score	6 (A)	8 (B)	7 (B)	5 (A)	6 (A)	8 (B)	8 (B)
Postoperative encephalopathy	No	No	Grade I	No	No	Grade I	No
Postoperative ascites	No	No	No	No	No	Yes	No
Clavien–Dindo classification	Nil	I (wound infection)	IVa (type I respiratory failure)	Nil	I (ileus)	I (wound infection)	IVa (multiorgan failure-gastrojejunostomy leak)
SPS patency (follow-up in mon)	Yes (3)	Yes (35)	Yes (27)	Yes (5)	Yes (16)	Yes (16)	Yes (7)
Hospital stay (d)	14	15	65	9	14	20	9 and 38

ALD: alcoholic liver disease; NASH: nonalcoholic steatohepatitis; SPS: surgical portosystemic shunts.

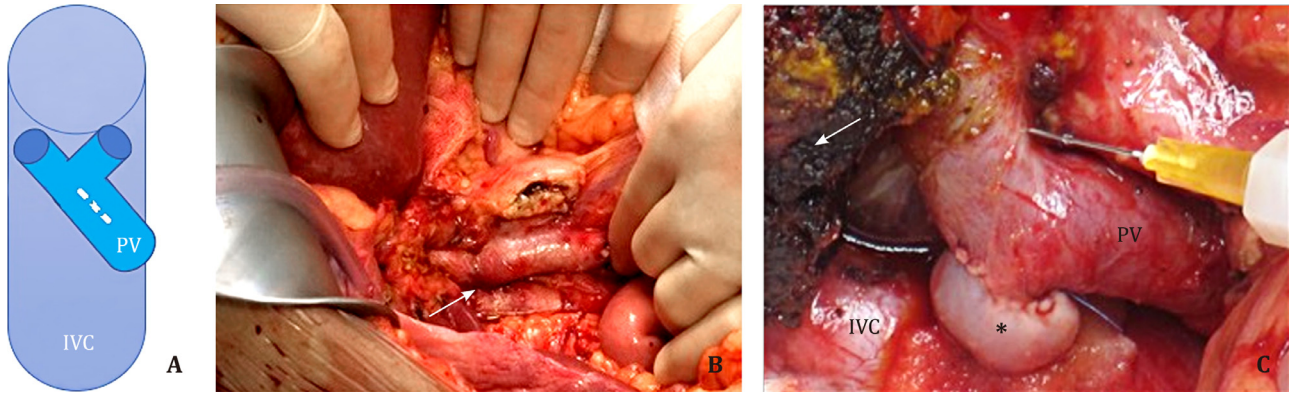

Fig. 1. Composite image depicting the geometrical orientation of a surgical portosystemic shunt. (**A**) Graph depiction of the necessary opposition of the portal vein (PV) and inferior vena cava (IVC). The dashed line marks the axis of the portocaval anastomosis and it is parallel to the axis of the PV. (**B**) Intraoperative photograph showing a lateral view of the portocaval shunt (white arrow). (**C**) Intraoperative image of the portal measurement distally to an H-type shunt. The measurement point should always be located distally to the shunt in order for the measurement to actually represent the portal flow directed to the liver. *: Cadaveric graft to form an H-type shunt; white arrow: transection surface of the caudate process.

None of the patients experienced 90-day mortality. The median hospital stay was 15 days (range 9–65). SPS achieved an average decrease in portal vein pressure of 40.6% (median 9 mmHg, range 5–16). Albeit, two patients did develop grade I encephalopathy and were treated conservatively. Patency of the shunt was confirmed in all patient's postoperatively with computed tomographies. One patient who had anterior resection developed acute respiratory failure due to hospital-acquired pneumonia and required a prolonged stay in the intensive care unit. The patient who underwent Whipple's procedure was discharged on the 9th postoperative day but was readmitted with peritonitis and acute renal failure secondary to a gastrojejunostomy leak. A laparotomy and primary repair were done (five days after previous discharge), and then the patient required long-term dialysis before renal function was fully recovered. At the time of this report, all the patients with colorectal cancer were free of recurrence. The patient with pancreatic adenocarcinoma did not receive adjuvant chemotherapy and developed metastatic disease (liver and lung metastases) four months later. In all patients, the SPS remained patent throughout follow-up (Table 1).

Our study have shown that SPS can be performed safely among highly selected patients with established PHT who necessitate major elective surgery for intrabdominal malignancies. In the era of TIPS, the indications of SPS are seldom to patients who are contraindicated to undergo TIPS. Those include absolute contraindications: heart failure, severe tricuspid regurgitation, mean pulmonary pressure greater than 45 mmHg, multiple hepatic cysts, uncontrolled systemic infection or sepsis, unrelieved biliary obstruction, encephalopathy and relative contraindications: hepatoma, obstruction of all hepatic veins, portal vein thrombosis, severe coagulopathy, thrombocytopenia and moderate pulmonary hypertension. The main reason TIPS has supplanted SPS is the equivalent results with decreased morbidity as well as not disturbing the portal vein anatomy among transplant candidates. However, SPS is still superior to endovascular therapy (i.e., TIPS) in terms of immediate decrease of the portal pressure and sustained long-term patency, as well as decreased direct and indirect costs [1]. In almost half of the patients undergoing TIPS, the shunt will lose patency within one year [2]. Furthermore, morbidity in terms of recurrent variceal bleeding, shunt stenosis and hepatic

encephalopathy is significantly higher among patients with TIPS in comparison to those with an SPS [3]. In this cohort of patients, i.e. patients with established CLD and PHT with intrabdominal malignancy, the goal is to achieve an immediate decrease of the portal pressure and achieve a durable long-term alleviation of the PHT, as these patients will not represent liver transplant candidates for any less than 5 years with the caveat that they remain disease free. In this aspect, SPS is advantageous to TIPS as it achieved a more than 40% immediate decrease of the portal pressure gradient and none of the patients lost patency of the SPS during follow-up. Furthermore, the simultaneous performance of an SPS avoids a dual process and eliminates the procedural risks of a TIPS which could then affect the oncological procedure.

However, as all cirrhotic patients, those undergoing SPS remain high-risk surgical procedure for both liver-related (i.e., encephalopathy, shunt thrombosis, etc.) and non-liver-related morbidity (i.e., bleeding, surgical site infections, etc.). Intraoperative bleeding, coagulopathy, new onset ascites are among the major challenges cirrhotic patients faced with when undergoing surgery and the mortality rates have been described as high as 10%–57% [4]. That is evident as two out of seven patients developed liver-related morbidity (grade I encephalopathy) and also class IVa Clavien–Dindo complication. Despite the above, all but one patient managed to continue their oncological treatment with adjuvant chemotherapy.

A rigorous patient's assessment is necessary prior to consideration of an SPS. One should not overlook that liver cirrhosis is life threatening disease itself and the MELD score is a useful method of quantification of the risk of mortality for consultation of the patient. In the publication by Wiesner et al. [5], the 3-month mortality geometrically increases as MELD score increases; thus while a MELD score of less than 19 is associated with 6% risk of 3-month follow-up mortality, a MELD score in the range of 20–29 is associated with a 3-month mortality of almost 20%, while a MELD score of 30–39 is associated with more than 50% 3-month mortality. In our study none of the patients had a MELD score more than 16 and we consider a MELD score of 19 and more as a contraindication for surgery.

The current study is limited given its small number of patients. However, considering within context, the number of patients who suffer with CLD and PHT with a relatively preserved MELD score (<19) and who in need of major intrabdominal surgery with curative intent, is extremely limited. Despite this limitation, the present case series advocates that complex oncological procedures can be undertaken with acceptable morbidity and mortality rates among highly selected patients with PHT who would otherwise be denied a potentially curative resection. Judicious selection of these patients should always be undertaken as they represent high-risk patients prone to complications. These procedures should only be performed in transplant and hepatopancreaticobiliary centres where expertise is readily available for their perioperative management.

In conclusion, highly selected patients with CLD and associated PHT with a relatively preserved MELD score (<19), could undergo a simultaneous SPS to facilitate major intrabdominal surgery with favorable outcomes. However, this cohort of patients remain at high-risk for both liver-related and non-liver-related morbidity and mortality and such endeavors should only be undertaken in liver transplant and hepatopancreaticobiliary centres, where the necessary expertise for their postoperative management is readily available.

Contributors

PA proposed the study. PM collected and analyzed the data. PM and KE performed the research and wrote the first draft. PE, SP and PA contributed to the design and interpretation of the study. All authors contributed to further drafts. PA is the guarantor.

Funding

None.

Ethical approval

The study was approved as institutional audit by King's College Hospital's Liver Clinical Audit and Improvement Programme (No. LIV01122018).

Competing interest

No benefits in any form have been received or will be received from a commercial party related directly or indirectly to the subject of this article.

References

[1] Pierce DS, Sperry J, Nirula R. Cost-effective analysis of transjugular intrahepatic portosystemic shunt versus surgical portacaval shunt for variceal bleeding in early cirrhosis. Am Surg 2011;77:169–173.
[2] Fanelli F. The evolution of transjugular intrahepatic portosystemic shunt: tips. ISRN Hepatol 2014;2014:762096.
[3] Huang L, Yu QS, Zhang Q, Liu JD, Wang Z. Transjugular intrahepatic portosystemic shunt versus surgical shunting in the management of portal hypertension. Chin Med J (Engl) 2015;128:826–834.
[4] Gil A, Martínez-Regueira F, Hernández-Lizoain JL, Pardo F, Olea JM, Bastarrika G, et al. The role of transjugular intrahepatic portosystemic shunt prior to abdominal tumoral surgery in cirrhotic patients with portal hypertension. Eur J Surg Oncol 2004;30:46–52.
[5] Wiesner R, Edwards E, Freeman R, Harper A, Kim R, Kamath P, et al. Model for end-stage liver disease (MELD) and allocation of donor livers. Gastroenterology 2003;124:91–96.

Received 30 December 2018
Accepted 20 May 2019
Available online 23 May 2019