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## **Pancreaticoduodenectomy in a patient with severe portal hypertension: the role of preoperative TIPS**

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Abbreviations list

Pancreaticoduodenectomy (PD)

Transjugular Intrahepatic Portosystemic Shunt (TIPS)

Chronic Liver Disease (CLD)

Hepatic Venous Pressure Gradient (HVPG)

Authors declare no conflict of interest.

Dear Editor,

The complication rate of patients undergoing Pancreaticoduodenectomy (PD) can rise up to 50% in large series.[1, 2] Despite prehabilitation and the use mitigation strategies, postoperative pancreatic fistula is the most common complication[3, 4]; however, postoperative hemorrhage, biliary fistula, wound infection, and pulmonary complications can also be encountered. Additionally, mortality rate can be variable depending on center volume, surgeon experience and technical complexity. [5]

Chronic enolic liver disease is the most common cause of portal hypertension in the Western world. [6] The diagnosis can be obtained by measuring the difference between the wedge hepatic venous pressure and free hepatic venous pressure: portal hypertension is defined as an increase above 5 mmHg in the portal gradient and it is considered clinically significant when it exceeds 10 mmHg. The clinical relevance of this condition is related to its complications, including the development of collateral circulation leading to gastroesophageal varices, ascites, and hepatic encephalopathy, among others. [7]

Although cirrhosis is not an absolute contraindication to PD, the morbidity and mortality rate can be very high, and therefore surgery is recommended only in Child A patients with no portal hypertension.[8] The management of portal hypertension in a clinically resectable patient with tumors requiring PD continues to be a challenge and currently no standardized management exists for these patients.[9]

The aim of this study is to present the case of a patient with portal hypertension and resectable ampullary cancer managed with TIPS as a preoperative bridge to surgery, and review the existing literature on this topic.

## Case report

A 67 year-old male patient with ampullary carcinoma was referred to our Hospital. He had been previously treated in another center by endoscopic ampullectomy for an in-situ ampullary carcinoma and during the follow-up, a local recurrence with a biopsy-proven invasive carcinoma not amenable of endoscopic resection was demonstrated. The patient had also been followed up for alcohol-induced Child B liver cirrhosis, with a MELD score of 12. Previously, he also received endoscopic treatment for variceal bleeding in several occasions. A fibroscan revealed a cirrhotic liver (METAVIR score F4, 33.6kPa). The hepatic venous portal gradient (HVPG) was calculated, confirming the presence of severe portal hypertension (21.5 mmHg).

Following discussion in a multidisciplinary meeting, and after discussing with the patient any treatment options, a TIPS was placed leading to a significant decrease of portal vein gradient (12 mmHg). The patient was then offered the option of surgical resection.

An open PD was performed. Surgical resection was uneventful (Figure 1) The patient developed hepatic encephalopathy on postoperative day 3, which was treated with medical management. He was eventually discharged on postoperative day 8. The final histopathological examination revealed a stage III tumor (3.2cm tumor, intermediate grade, intestinal type, 4 out of 23 lymph nodes with metastasis, negative margins). Subsequently, he was not considered a candidate for adjuvant chemotherapy due to his comorbidities. Currently, at one year follow-up, there are no signs of recurrence and his liver disease remains stable.

## Discussion

The presence of underlying chronic liver disease (CLD) in a patient with periampullary cancer represents an increased risk of complications and mortality for the patient and a challenge for the surgeon. [1, 2]

The risk of decompensation of liver disease following major surgery is very high and previous publications suggested that Child A patients only should be considered for surgery in absence of portal hypertension. Also, the risk of intraoperative bleeding due to large varices and collateral high-pressure circulation makes the surgery a potential life-threatening event.[9] In a series of 140 patients with cirrhosis and portal hypertension undergoing elective extrahepatic surgery,

portal hypertension venous group (HVPG) values  $>16$  were found to be a risk factor associated with increased mortality, and in the subgroup with HVPG  $\geq 20$  mmHg, elevated mortality rates (44%) were observed. [10]

In a literature review of neoadjuvant TIPS in non-hepatic surgery, some authors found that postoperative complications in patients treated with TIPS included: ascites in 12.5%, bleeding in 6.3%, encephalopathy in 12.5%, infection in 12.5%, intestinal leakage in 7.8%, ileus in 9.4%, and other complications in 23.4%. They also considered neoadjuvant TIPS as a feasible option with limited risks, aiming to achieve planned surgery in the majority of cases with acceptable short and long-term outcomes.[11] However, only few patients undergoing pancreatic surgery were included in this study. In fact, the resection of the falciform ligament and umbilical vein, pancreaticoduodenal veins, and the tributaries of the right gastroepiploic vein can dramatically increase portal hypertension during the resection and impair portal hypertension (Figure 2). This also implies an increased risk of intraoperative bleeding associated with the resection and the release of vascular structures from the tumor, as well as an increased risk of postoperative decompensation of ascites, right-sided cardiac overload, hepatic encephalopathy, and variceal bleeding.

Selection of the patients who are candidates to such an aggressive strategy is very important; our patient is still disease-free at 12 months but unfortunately preoperative staging underestimated the results of final pathology. We believe only patients with very early stage disease should be considered and possibly pancreatic ductal adenocarcinoma should be an exclusion criteria given the limited benefit of the resection and the obvious limitations to receive (neo)adjuvant treatments. [12]

There are very few cases describing the management of portal hypertension in patients undergoing Whipple's procedure. This is because portal hypertension is usually seen as a relative contraindication for surgery. [11]

All studies in which neoadjuvant TIPS was performed in patients undergoing PD with portal hypertension are shown in Table 1. Only three cases were described: one patient had no postoperative complications, [13] and the remaining 2 patients experienced severe postoperative complications.[14, 15] There is a further study not included in this table which

includes patients undergoing upper gastrointestinal and pancreatic surgery, where 12 TIPS procedures were performed; however, there is no description of the surgical procedures on the pancreas. [16]

In conclusion, neoadjuvant TIPS can play an important role as a bridge treatment to pancreaticoduodenectomy in selected cases with localized disease and severe portal hypertension.

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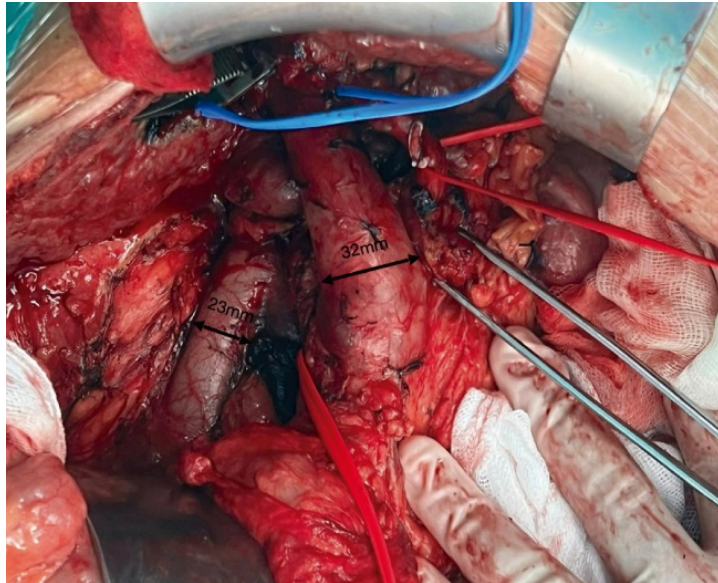


Figure 1. Intraoperative view of the hepatoportal junction. From right to left, proper hepatic artery (red loop), portal vein (blue loop, 32 mm), common bile duct (clamp), inferior vena cava (23 mm). Superior mesenteric artery is also encircled with a red loop behind the portal vein. Due to portal hypertension, a significant dilation of the splenic-porto-mesenteric axis can be noted.