

# Surgical Technique Used for Portal Vein Thrombosis when Thrombectomy is not Possible during Liver Transplantation

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## Abstract

Portal vein thrombosis (PVT) was for a long time considered a barrier to liver transplantation. The aim of this study is to demonstrate the surgical technical options for portal vein reconstruction during liver transplantation in patients with PVT in which thrombectomy was not possible. Between September 1991 and March 2009, 420 liver transplanted patients were retrospectively analyzed, identifying 29 cases with PVT (6.9%). Preoperative diagnosis, preoperative risk factors, surgical technique options to treat various forms (grades) of PVT, postoperative recurrence and actuarial survival rates were studied. In three cases of PVT grade II and in one case PVT grade III the thrombectomy was insufficient, requiring some surgical technique options (13.79%). In two cases placement of iliac vein graft was performed, in one an anastomosis of the portal vein with collateral splenorenal vein and in the other with left gastric varicose. The actuarial survival rate for patients without PVT and patients with PVT and effective thrombectomy was 73.8% while those with PVT who needed some type of surgical option was 75%. Our results suggest that actuarial survival rates were similar among patients with PVT or PVT with effective thrombectomy when compared with PVT that required some surgical options.

**Keywords:** Liver Transplantation, Portal Vein Thrombosis, Surgical Technique

## 1. Introduction

Portal vein thrombosis (PVT) is an entity that occurs in the general population at around 1% and may be caused by a variety of conditions including cirrhosis, cancer, myeloproliferative diseases, inflammation, and abdominal infection, among others [1,2]. Considering cirrhotic patients with worsening liver function (expressed by Child-Pugh score) it may occur in up to 26% [3] of the patients and when concomitant to the hepatocellular carcinoma it can reach 44% [2]. In patients who are being prepared for liver transplantation it might affect between 5 and 15% [4-12]. When we find PVT during a surgery in its various grades, often due to low sensitivity of tests performed preoperatively, the surgeon is faced with a condition in which various surgical strategies may need to be used: throm-

bectomy, use of graft (autologous or heterologous), anastomosis with collateral vessels to bypass some obstruction or maybe a cavoportal hemitransposition will enable a successful orthotopic liver transplantation (OLT) [8, 12-20]. Therefore, the aim of this study is to retrospectively review our experience of performing OLT in order to demonstrate the surgical technical options for vein portal reconstruction in patients with PVT when thrombectomy is not possible, as well as to compare actuarial survival among patients without PVT, those with successful thrombectomy or patients with PVT who needed some type of surgical options for portal vein reconstruction.

## 2. Methods

This is a retrospective observational study of 420 pa-

tients undergoing OLT from cadaveric donor, from September 1991 to April 2010. The majority (70%) of the cases were submitted to piggyback technique [13]. We identified intraoperative PVT in 29 patients (6.9%) and classified its different grades, with analysis carried out through a review of medical records, the etiology of hepatic cirrhosis, the degree of liver function (Child-Pugh classification and MELD), the accuracy of ultrasonography performed for preoperative diagnosis of PVT, the surgical technical options used in reconstruction of portal vein, time of surgery, the quantity of red cell units used during the surgery, the postoperative recurrence of PVT and the actuarial survival rate among patients with or without thrombosis.

We opted to use PVT classification suggested by Yerdel, *et al.* [5], which can be classified as grade (G) - I when the obstruction of the portal vein thrombus is in 50% of its lumen, in G-II when the obstruction is greater than 50% and may result in complete occlusion, in G-III when the complete obstruction of the portal vein thrombus extends to the proximal part of the superior mesenteric vein (SMV), and G-IV when the portal vein thrombus affects all the parts of the proximal and distal SMV. When the patients did not require the construction of “shunts” was called group A and when required was called B.

### 3. Results

There were 29 cases of PVT diagnosis in the intraoperative period of which 22 were male and 7 female with mean age of 48 years (18 to 63 years). The most common etiology was hepatitis C virus. There were 25 (89%) cases of PVT grade I, three (7%) cases of PVT grade II and one (4%) case of PVT in grade III and no cases of PVT grade IV. Of these, 25 cases were PVT G-I and II in which thrombectomy was performed successfully was called group A. The another 4 cases (11%), 3 cases PVT GII with insufficient thrombectomy and one case of PVT G III was called B.

The three types of “shunts” were:

1) SMV recipient with iliac donor vein and portal donor vein were used in two cases of PVT with G-II failure of thrombectomy;

2) in another case [PVT G-II] anastomosis was carried out on the dilated left gastric vein with portal donor vein;

3) and in the last case, PVT G-III, end-to-end anastomosis was used between the splenorenal varices with portal donor vein.

All these patients used 75 mg dipiridamole twice per day after the second postoperative day or when the platelet count was greater than 50,000/mm<sup>3</sup> for up to 3 months.

Both groups A and B were similar for liver function at the time of transplantation surgery, surgical time and the need of red blood cells units used during the surgery.

A Doppler ultrasound of the abdomen which was performed preoperatively (day of admission to the OLT) showed accuracy in the cases of PVT GI and GII in which thrombectomy was successfully performed in 40% (8/20), for cases PVT GII in the thrombectomy was insufficient in 66.7% (2/3) and in the case of PVT GIII was none. In 5 cases with PVT GI and GII in which thrombectomy was performed successfully the records were not found.

In follow-up of patients who had a diagnosis of PVT during the surgery, we observed in 2 cases (6.9%) new PVT [rethrombosis] after primary OLT. Of these patients, one died due to sepsis in the postoperative period.

The actuarial survival rate using the Kaplan-Meier method, for patients without PVT -group A- (PVT with G I and G II with effective thrombectomy) was 73.8% and for group B (with PVT and ineffective thrombectomy G II and G III, in other words, the group that needed some type of anastomosis) was 75% (1/4) as can see in **Table 1**.

### 4. Discussion

We found that the incidence of PVT in patients submitted to OLT is consistent with the literature review as well as the incidence of posttransplantation rethrombosis, which in more studies ranged from 4.3 to 11.3% [3,5, 6,8,14]. It is observed that there is a high mortality rate in patients who developed rethrombosis despite its low incidence [5].

Several factors have been associated with PVT occurrence: male sex, high Child-Pugh score (>9), presence of neoplasia, autoimmune hepatitis and cryptogenic cirrhosis, as already described in current literature [12,15-17].

In our series 13.69% (4/29) of patients with PVT diagnosed during surgery required shunt technical options

**Table 1. Characteristics of patients with thrombectomy (group A) and the group that need some type of anastomosis (group B).**

Variables	Groups	
	A	B
CTP	9.44 ± 1.66	9.75 ± 1.89
MELD	19.04 ± 5.5	17.25 ± 2.466
RBC (units)	5.2 ± 5.6	3.0 ± 1.91
Survival (1th year)	73.8%	75.0%
Donor age (years)	39.9 ± 12.3	38.9 ± 13.3

CTP = Child-Turcotte-Pugh classification in points; RBC = red blood cells.

due to thrombectomy failure.

As is known, there is a tendency to try the thrombectomy procedure first before using the venous anastomosis technique option that could be performed for different degrees of PVT. Apparently, the first option is thrombectomy when related to PVT GI and GII; in PVT GIII the use of grafts (interposition with iliac vein graft) could be needed and in GIV an anastomosis to the splanchnic tributaries may be needed or even a cavoportal hemitransposition. This was proposed firstly by Tzakis *et al.* [4,7-9]. It is valid to emphasize that in our study the 3 cases of PVT GII, 10.34% (3/29) and another PVT GIII required some kind of “shunt” anastomosis. Therefore, we can see that it is difficult to standardize a technical option. It is recommended that surgeons who choose to act in this area of liver transplantation know all the technical options available to choose the best procedure in every case. Despite our small sample, only 4 cases of PVT required an option to “shunt”. It can be seen that the option of the use of autologous grafting of iliac vein was safe and feasible, and there was no negative impact on patient survival [11].

Usually the ultrasound was performed in the pre-operative transplantation time. It was shown with low accuracy to detect PVT [14,15]. Classic studies such as Yerdel *et al.* [5] have demonstrated a great sensitivity to the method as the most advanced degree of PVT, reaching values of 100% in cases of PVT GIII and GIV. In this study we could not verify similar results in our sample. Perhaps the justification for medical ultrasound has not identified the case for PVT GIII, despite the absence of portal flow, which is due to the presence of large ascitis, a great collateral circulation or the presence of intestinal gases observed in those patients.

The four patients with PVT that required some kind of “shunt” had good liver function after the transplantation procedure and no statistically significant difference in the time of surgery or blood requirement units during the surgery were observed. This was described by Tao *et al.* [6], although other studies have demonstrated the longest operative time or the greater necessity for red blood cell transfusion in such cases [3,10,14,18-20].

The actuarial survival rate for the patients submitted to a venous shunt was 75%. There was no statistical difference between patients without PVT or those with PVT GI and GII with successful thrombectomy or patients PVT GII and GIII who required some type of “shunt”, as already observed in other studies [6,10,18-20].

In conclusion, we confirm that the surgical technical options with or without the use of grafts are feasible and portal venous reconstruction in patients with and without PVT grade I, II and III showed similar survival rates despite shunt requirements during the surgery.

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