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Hepatic arterial and portal venous complications after adult and pediatric living donor liver transplantation, risk factors, management and outcome (A retrospective cohort study)☆

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HIGHLIGHTS

- Preoperative PVT was significant predictor of HA and/or PV complications.
- HA and/or PV complications especially early ones lead to significant poor outcome.
- Proper dealing with the risk factors like pre LT PVT improves outcome.
- The effective management of these complications is mandatory for improving outcome.

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ABSTRACT

Objectives: Hepatic arterial (HA) and portal venous (PV) complications of recipients after living donor liver transplantation(LDLT) result in patient loss. The aim of this study was to analyze these complications.

Methods: We retrospectively analyzed HA and/or PV complications in 213 of 222 recipients underwent LDLT in our centre. The overall male/female and adult/pediatric ratios were 183/30 and 186/27 respectively.

Results: The overall incidence of HA and/or PV complications was 19.7% (n = 42), while adult and pediatric complications were 18.3% (n = 39) and 1.4% (n = 3) respectively. However early (<1month) and late (>1month) complications were 9.4% (n = 20) and 10.3% (n = 22) respectively. Individually HA problems (HA stenosis, HA thrombosis, injury and arterial steal syndrome) 15% (n = 32), PV problems (PV thrombosis and PV stenosis) 2.8% (n = 6) and simultaneous HA and PV problems 1.9% (n = 4). 40/42 of complications were managed by angiography (n = 18), surgery (n = 10) or medically (Anticoagulant and/or thrombolytic) (n = 12) where successful treatment occurred in 18 patients. 13/42 (31%) of patients died as a direct result of these complications. Preoperative PVT was significant predictor of these complications in univariate analysis. The 6-month, 1-, 3-, 5- 7- and 10-year survival rates in patients were 65.3%, 61.5%, 55.9%, 55.4%, 54.5% and 54.5% respectively.

Conclusion: HA and/or PV complications specially early ones lead to significant poor outcome after LDLT, so proper dealing with the risk factors like pre LT PVT (I.e. More intensive anticoagulation therapy) and the effective management of these complications are mandatory for improving outcome.

1. Introduction

Liver transplantation (LT) has become the treatment of choice for pediatric and adult patients with end-stage liver disease (ESLD) [1,2]. However vascular problems such as thrombosis and stenosis of the HA and PV are serious complications after LT and are more frequently seen among recipients of LDLT especially in pediatrics

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List of abbreviations

ABO	Blood group
ALT	Alanine transaminase
ASS	Arterial steel syndrome
AST	Aspartate transaminase
BA	Biliary atresia
BCS	Budd chiari syndrome
BMI	Body Mass Index
CNIs	CalciNeurin Inhibitors
CSA	CycloSporine
CTA	Computed tomography angiography
CUSA	Cavitron ultrasonic surgical aspirator
DM	Diabetes mellitus
ESLD	End stage liver disease
FK or FK-506	Tacrolimus
GDA	Gastroduodenal artery
GRWR	Graft Recipient Weight Ratio
HA	Hepatic artery
HAI	Hepatic artery injury
HAS	Hepatic artery stenosis
HAT	Hepatic artery thrombosis
HBV	Hepatitis B virus
HCC	Hepatocellular carcinoma
HCV	Hepatitis C virus
HPB	Hepatopancreatobiliary
HTK	Hydroxy tryptophan ketoglutarate
HTN	Hypertension
HVT	Hepatic vein thrombosis
IRB	Institutional review board
LDLT	Living donor liver transplantation
LFT	Liver function test
LRDT	Living related donor transplantation
LT	Liver Transplantation
MELD	Model for End stage Liver Disease
MHV	Middle hepatic vein
MMF	Mycophenolate MoFetil
MRA	Magnetic resonance angiography
MRCP	Magnetic resonance cholangio pancreatography
NLI	National Liver Institute
OLT	Orthotopic liver transplantation
PELD	Pediatric end stage liver disease
PBC	Primary biliary cirrhosis
POD	Post operative day
PSC	Primary sclerosing cholangitis
PV	Portal vein
PVS	Portal vein stenosis
PVT	Portal vein thrombosis
SFSS	Small for size syndrome
SRL	SiroLomus
VC	Vascular complications

[3–6]. They can lead to increased morbidity, graft loss, and patient death [2,3,7].

The incidence of vascular complications (VC) reported in the literature varies widely among centers [8]. It is as high as 25%, 16%, and 11% for HAT, PVT, and HAS, respectively with higher pediatric rates [9]. Various factors contributing to development of vascular thrombosis have been proposed: ABO incompatibility [4,10–13], multiple anastomoses [11], prolonged cold ischemic time [14], acute rejection. [4,10–12] and previous vascular thrombosis [11].

Early diagnosis and appropriate management of these complications result in longer survival. Close surveillance of all vascular anastomoses using Duplex ultrasonography facilitates early detection and treatment of these complications before irreversible graft failure. Treatment options usually include surgical revascularization, percutaneous thrombolysis, percutaneous angioplasty, retransplantation, or less commonly, a conservative approach [6].

2. Patients and methods

Two hundred twenty two LDLT operations were done between January 2004 and January 2015 in the department of hepato-pancreato-biliary (HPB) surgery, national liver institute (NLI), university of Menoufiya, Menoufiya, Egypt, our study included 213 patients after exclusion of cases with data loss. After approval of institutional review board (IRB), we did this retrospective cohort study that analyzed the incidence, risk factors, management and outcome of HA and/or PV complications in adults and pediatrics recipients in the period from the end of 2014 to the end of 2015, where patients were observed from POD 1 until the end of July 2015 or until death of patients with mean follow up period of 30.7 ± 31.2 m, range (0–134 m). The data were collected from our records in the LT unit and written informed consents were obtained from both donors and recipients regarding operations and researches. All donors were >19 years old and the donor work-up included liver function tests (LFT), liver biopsy, ultrasound examination, psychological assessment and CT angiography, along with hepatic volumetric study and vascular reconstructions. The following data were studied:

2.1. Preoperative parameters

Donor's age, gender, body mass index (BMI), donor to recipient relation, recipient age, gender, blood group matching, primary disease, Child Pugh and MELD score (<12 years), PELD score(>12 years), co-morbidity (DM, HTN, …), portal hypertension and previous vascular thromboses (HA, PV and HV).

2.2. Intraoperative parameters

Duration of the operation per hours, actual graft weight, actual graft recipient weight ratio (GRWR), number of arterial, portal and

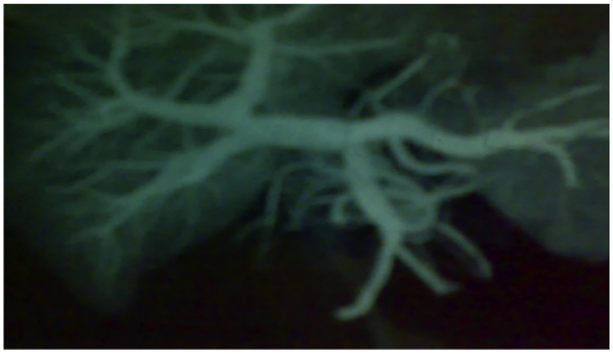

Fig. 1. Trifurcated PV graft where double PV reconstruction with recipient PV was done (complicated by post LT PVT).