Management of Arterial Complications after Living Donor Liver Transplantation

Thesis

Submitted for partial fulfillment of M.D. ***Degree of General Surgery***

By

Mohamed Ahmed Fathi El Bahnassy
(M.B.B.Ch - M.S.)
Faculty of Medicine - Ain Shams University

Under Supervision of

Prof. Dr. Khaled Zaky Mansour
Professor of General Surgery
Faculty of Medicine - Ain Shams University

Prof. Dr. Mohamed Mohamed Bahaa El-Din
Professor of General Surgery
Faculty of Medicine - Ain Shams University

Prof. Dr. Ahmed Hussein Abdelhafez
Professor of General Surgery
Faculty of Medicine - Ain Shams University

Dr. Kamal Mamdouh Kamal
Assistant Professor of General Surgery
Faculty of Medicine - Ain Shams University

Faculty of Medicine
Ain Shams University
2019

سورة البقرة الآية: ٣٢

Acknowledgment

First and foremost, I feel always indebted to **ALLAH**, *the Most Kind and Most Merciful.*

I'd like to express my respectful thanks and profound gratitude to **Prof. Dr. Khaled Zaky Mansour**, *Professor of General Surgery Faculty of Medicine - Ain Shams University for his keen guidance, kind supervision, valuable advice and continuous encouragement, which made possible the completion of this work.*

I am also delighted to express my deepest gratitude and thanks to **Prof. Dr. Mohamed Mohamed Bahaa El-Din**, *Professor of General Surgery Faculty of Medicine - Ain Shams University, for his kind care, continuous supervision, valuable instructions, constant help and great assistance throughout this work.*

I am deeply thankful to **Prof. Dr. Ahmed Hussein Abdelhafez**, *Professor of General Surgery Faculty of Medicine - Ain Shams University, for her great help, active participation and guidance.*

I wish to introduce my deep respect and thanks to **Dr. Kamal Mamdouh Kamal**, *Assistant Professor of General Surgery Faculty of Medicine - Ain Shams University, for her kindness, supervision and cooperation in this work.*

Mohamed Ahmed Fathi El Bahnassy

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List of Abbreviations

Abb.	Full term
ASCOT	Ain Shams center for organ transplantation
CA	Celiac axis
CHA	Common hepatic artery
CNIs	Calcineurin inhibitors
CsA	Cyclosporine
CT	Computed tomography
CTA	Computerized tomography angiography
DDLT	deceased donor liver transplantation
GDA	Gastroduodenal artery
GRWR	Graft recipient weight ratio
HA	Hepatic artery
HABR	HA buffer response
HAP	Hepatic artery pseudoaneurysm
HAR	Hepatic artery rupture
HAT	Hepatic artery thrombosis
HTK	Hydroxy tryptophan ketoglutarate
HV	Hepatic vein
LDLT	Living donor liver transplantation
LFT	Liver function tests
LGA	Left gastric artery
LHA	Left hepatic artery
LHD	Left hepatic duct
LPV	Left portal vein
MMF	Mycophenolate mofetil
MRA	Magnetic resonance angiography
OLT	Orthotopic liver transplantation
PHA	Proper hepatic artery
PHP	Portal hyperperfusion

List of Abbreviations Cont...

Abb.	Full term
PNCR	Pancreas
PV	Portal vein
RHA	Right hepatic artery
RHA	Right hepatic artery
RI	Resistive \ indices
SASS	Splenic artery steal syndrome
SAT	Systolic ascending time
SMA	Superior mesenteric artery
SPA	Splenic artery
SRL	Sirolimus

INTRODUCTION

Liver transplantation is perceived as the only curative treatment for patients with end-stage liver disease. Approximately 20-25% of patients with liver failure die while waiting for a liver transplant, and another 20-30% of patients with hepatocellular carcinoma drop off the waiting list because of tumor progression ***(Guba et al., 2010).***

Living donor liver transplantation (LDLT) has emerged as the alternative life-saving treatment to deceased donor liver transplantation (DDLT). Over the past 2 decades, the number of LDLTs has steadily increased in many transplant centers, especially in Asia ***(Lee et al., 2009).***

Living donor liver transplantation has the following advantages over DDLT: a shorter wait time, a shorter cold ischemic time, and a better organization of the surgery time. However, donor risks are inevitable and are an undeniable problem that troubles transplant surgeons. Moreover, LDLT has a smaller biliary and vascular caliber and an additional transection step, which may potentially increase the surgical risk and the incidence of postoperative complications. Previous investigations have suggested that patients undergoing LDLT may have a higher incidence of biliary and vascular complications and a lower long-term survival rate than patients undergoing DDLT ***(Freise et al., 2008).***

As surgical techniques and postoperative managements continue to advance, the outcomes of LDLT have continued to improve. Patients considering LDLT should know whether the risk, severity of complications and long-term survival ***(Eguchi et al., 2008).***

Many complications have been reported in the recipient such as biliary complications, vascular complications, intra-abdominal bleeding, intra-abdominal abscesses, ileus, bowel obstruction, pulmonary complications, deep venous thrombosis, wound dehiscence, incisional hernia, infections (bacterial, viral and fungal), ascitis, acute or chronic rejection, recurrence of previous infection with HBV, HCV OR malignancy as HCC ***(Olthoff et al., 2009).***

Vascular complications are common cause of morbidity of liver transplantation, especially hepatic artery problems. It was reported that the hepatic artery complication rate to be approximately 5%-16% ***(Khalaf, 2010).***

Living donor liver transplantation patients may suffer from a higher incidence of arterial complications due to the smaller vessel diameter, the insufficient length for reconstruction and the greater risk of a twist of the vascular pedicle. These complications include mainly hepatic artery thrombosis and hepatic artery stenosis ***(Khalaf, 2010).***

Doppler ultrasonography has high sensitivity for the diagnosis of hepatic artery thrombosis by performing serial examinations at frequent intervals during the first 1 to 2 weeks post-transplant. Hepatic artery thrombosis can be detected before it becomes clinically obvious ***(Steinbrück et al., 2011).***

Early diagnosis permits immediate thrombectomy and revascularization before the patient deteriorates. If there is suspicion for hepatic artery thrombosis, one can choose to delineate the anatomy with angiography or proceed urgent re-exploration. Angiography offers non-operative method to diagnose and potentially treat with balloon angioplasty ***(Steinbrück et al., 2011).***

Postoperatively, the patient is closely watched with frequent Doppler. Systemic heparinization is used according to coagulation parameters ***(Steinbrück et al., 2011).***

If there is a delay in the diagnosis, or if ultrasound is questionable, selective arteriography may be employed to diagnose the site of thrombosis and to begin therapeutic thrombolysis. Decisions on retransplantation are made based on the clinical condition, patency of the vessels, and appearance of late complications as biliary stricture ***(Steinbrück et al., 2011).***

Late hepatic artery thrombosis (HAT) is a rare complication after liver transplantation conventionally

described as occurring more than 30 days after surgery ***(Gunsar et al., 2003)***.

Late hepatic artery thrombosisis often asymptomatic because of the development of a rich collateral network. Attempts at operative revision should not be undertaken, as a large majority survives with normal allograft function, and any operative procedure carries the risk of destroying the graft-sustaining collaterals. Significant late allograft dysfunction needs careful monitoring for septic complications, biloma and cholangitis. Attempts at graft salvage in this population are universally unsuccessful ***(Henrik et al., 2009).***

Hepatic artery stenosis, although usually asymptomatic, will eventually progress to hepatic artery thrombosis. Frequently, patients develop biliary strictures and bile leaks. Hepatic artery stenosis may be detected on surveillance Doppler. Dampened waveforms with decreased resistive \ indices (RI) and slow peak velocities suggest hepatic artery stenosis. Stenosis should be suspected when the RI is <0.5 or the systolic ascending time (SAT) is >10 msec. The diagnosis should be confirmed by angiography. If diagnosed in the immediate postoperative period, planned exploration and revision of the arterial anastomosis should be undertaken. Although conventional treatment is either surgical repair or a re-transplant, percutaneous transluminal angioplasty (PTA) or stent placement is becoming predominant ***(Polak et al., 2009).***

Aim of the Work

This retrospective study aims to assess the different modalities of management and outcome of arterial complications and to analyze the risk factors of such complications after living donor liver transplantaion.

Chapter 1

ANATOMY OF THE LIVER

Segmental Anatomy of the Liver:

The segmental anatomy is based on the internal vascular Skeleton of the liver and not on the external attachment of the lobar landmarks. The classification of ***Couinaud (1994)***, which is based principally on the position of the major hepatic vascular structures defines eight hepatic segments. The liver is divided primarily into two main parts which include the left and right lobes. The left liver lobe is supplied by the left branch of the portal vein and the left hepatic artery and the right liver lobe is supplied by the right branch of the portal vein and the right hepatic artery. In addition to these two lobes of the liver, there is a separate small caudate lobe (segment I) that has its own blood supply (Fig. 1) ***(Parulekar and Bree, 2004).***