



شبكة المعلومات الجامعية
التوثيق الإلكتروني والميكرو فيلم

بسم الله الرحمن الرحيم



HANAA ALY



شبكة المعلومات الجامعية
التوثيق الإلكتروني والميكروفيلم



شبكة المعلومات الجامعية التوثيق الإلكتروني والميكروفيلم



HANAA ALY



شبكة المعلومات الجامعية
التوثيق الإلكتروني والميكروفيلم

جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأقراص المدمجة قد أعدت دون أية تغيرات



يجب أن

تحفظ هذه الأقراص المدمجة بعيدا عن الغبار



HANAA ALY

**Arterial complications in living donor liver
transplantation: Right or left hepatic artery
reconstruction, does it differ?
A retrospective study**

A Thesis

Submitted for partial fulfillment of Master degree
in General Surgery

By

Mohamed Osama Marei Ismaeil

M.B.B.Ch, Misr University for Science and Technology, 2015

Under Supervision of

Prof. Dr. Mohamed Fathy Abdel Ghaffar

Professor of Hepatobiliary Surgery
Faculty of Medicine, Ain Shams University

Prof. Dr. Youssef Farouk Youssef

Professor of Hepatobiliary Surgery
Theodor Bilharz Research Institute

Prof. Dr. Kamal Mamdouh Kamal

Assistant professor of Hepatobiliary Surgery
Faculty of Medicine, Ain Shams University

Dr. Remon Mamdouh Mahfouz Ghobrial

Lecturer of Hepatobiliary Surgery
Faculty of Medicine – Ain Shams University

Faculty of Medicine
Ain Shams University

2021

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

قالوا

سبحانك لا علم لنا
إلا ما علمتنا إنك أنت
العليم العظيم

صدق الله العظيم

سورة البقرة الآية: ٣٢



Acknowledgments

*First and foremost, I feel always indebted to **Allah**, the **Most Beneficent** and **Merciful**, who gave me the strength to accomplish this work,*

*My deepest gratitude to my supervisor, **Prof. Dr. Mohamed Fathy Abdel Ghaffar**, Professor of Hepatobiliary Surgery, Faculty of Medicine, Ain Shams University, for his valuable guidance and expert supervision, in addition to his great deal of support and encouragement. I really have the honor to complete this work under his supervision.*

*My appreciation and gratitude to **Prof. Dr. Youssef Farouk Youssef** and **Prof. Dr. Mohamed Abbass** Professors of Hepatobiliary Surgery, Theodor Bilharz Research Institute, for their great support and valuable reviews and recommendations.*

*I would like to express my great and deep appreciation and thanks to **Assist. Prof. Dr. Kamal Mamdouh Kamal**, Assistant Professor of Hepatobiliary Surgery, Faculty of Medicine, Ain Shams University, for his meticulous supervision, and his patience in reviewing and correcting this work, I greatly appreciate his efforts.*

*I can't forget to thank **Dr. Remon Mamdouh Mahfouz Ghobrial**, Lecturer of Hepatobiliary Surgery, Faculty of Medicine, Ain Shams University for his encouragement and cooperation.*

*Special thanks to my **Parents and wife** and all members of my **Family** for their continuous encouragement, enduring me and pushing me forward in every step of my life.*

List of Contents

<i>Subject</i>	<i>Page No.</i>
List of Abbreviations	i
List of Tables	iii
List of Figures	v
Introduction	1
Aim of the Work	4
Review of Literature	
Surgical Anatomy of the Liver	5
Liver Transplantation	12
Indications for Liver Transplantation	18
Surgical Technique of Living Donor Liver Transplantation	22
Liver Transplantation Complications	50
Patients and Methods	68
Results.....	74
Discussion	91
Conclusion	105
Recommendations.....	106
Summary	107
References.....	110
Arabic Summary.....	—

List of Abbreviations

Abbr.	Full-term
ASCOT	: Ain shams center for organ transplantation
BC	: Biliary Complications
CAC	: Caval anastomosis complications
CHA	: Common hepatic artery
CHD	: Common hepatic duct
CLD	: Chronic liver disease
DDLT	: Deceased donor liver transplantation
HA	: Hepatic artery
HAC	: Hepatic arterial complications
HAR	: Hepatic artery reconstruction
HARI	: Hepatic artery resistive index
HAS	: Hepatic artery stenosis
HAT	: Hepatic artery thrombosis
HCC	: Hepatocellular carcinoma
HV	: Hepatic vein
IC	: Ischemic cholangiopathy
IVC	: Inferior vena cava
LDLT	: Living donor liver transplantation
LHA	: Left hepatic artery
LL-LDLT	: Living donor liver transplantation using the left lobe
LPV	: Left portal vein
LT	: Liver transplantation

MELD	: Model of end stage liver disease
MHA	: Middle hepatic artery
MHV	: Middle hepatic vein
NHBD	: Non-heart beating donor
NLI	: National Liver institute
OLT	: Orthotopic liver Transplantation
PHA	: Proper hepatic artery
PV	: Portal vein
PVT	: Portal vein thrombosis
RHA	: Right Hepatic artery
RHA	: Right hepatic artery
RHV	: Right hepatic vein
RI	: Resistive index
RL-LDLT	: Living donor liver transplantation using the right lobe
SD	: Standard deviation
SMA	: Superior mesenteric artery
SPSS	: Statistical package for social science
TACE	: Trans- arterial chemo embolization

List of Tables

Table No.	Title	Page No.
Table (1):	Types of liver transplantation	15
Table (2):	Indications for liver transplantation	20
Table (3):	Vascular complications following orthotopic liver transplantation	60
Table (4):	CHILD score	70
Table (5):	Distribution of study population according to their years of data collection.	74
Table (6):	Distribution of study population according to their demographic data regarding sex and age	75
Table (7):	Distribution of study population according to the recipient's inflow artery	76
Table (8):	Distribution of study population according to the occurrence of hepatic artery thrombosis and stenosis	77
Table (9):	Distribution of arterial complications in the group 2 into either HAT and HAS.	78
Table (10):	Intervention done for cases in the group 2	79
Table (11):	Distribution of arterial complications according to the intervention done:.....	80
Table (12):	Comparison between Group 1 and Group 2 according to their years of data collection.....	81

Table (13): Demographic features of the two studied groups.	82
Table (14): Comparison between the two studied groups according to the recipient's inflow artery used.....	83
Table (15): Complications in the two studied groups.....	84
Table (16): Percentage of hepatic arterial complications classified according to year of operations in group 2 subgroups	85
Table (17): Mean values of laboratory investigations measured at pre and post operation in group 2 Subgroups	86
Table (18): Risk factors for arterial complications in group 2 subgroups.....	87
Table (19): Comparison between Group 2 Subgroups according to the intervention performed	88
Table (20): Comparison between Group 2 A (Right hepatic artery as an inflow artery) and Group 2 B (left hepatic artery as an inflow artery) according to their HAT, early, late and HAS	89

List of Figures

Figure No.	Title	Page No.
Figure (1):	An overview of the venous portal system – draining into the hepatic portal vein.	5
Figure (2):	Diagram to show the intrahepatic distribution of the hepatic artery.....	6
Figure (3):	Close anatomical relation of LPV.	7
Figure (4):	Hepatic arteries.	8
Figure (5):	Variations of hepatic artery.	10
Figure (6):	Division of celiac trunk	11
Figure (7):	Indications for liver transplantation in Egypt.....	21
Figure (8):	Hepatic CT angiography showing the standard anatomy & example of variants.....	25
Figure (9):	Dissection of the parenchyma and graft retrieval.....	28
Figure (10):	The line of transection (at the same site of encircling by a right-angled forcep) of the right hepatic duct at the time of liver transection.	29
Figure (11):	The four major prerequisites for technically successful LDLT	30
Figure (12):	To alleviate anastomotic stenosis of V5 and V8, widening of the caudal slit-incision of orifices is made at back table.....	32

Figure (13): Placement of a composite vessel patch offsets stenosis-inducing tissue reaction of PTFE grafts and avoids tearing thin-walled V5/V8 during suture.	33
Figure (14): Small caudal incision (thick black arrow) is made at V5/V8 to widen orifices	33
Figure (15): Intraoperative images of HA reconstruction	38
Figure (16): The conventional twisting technique.....	41
Figure (17): Placing two stitches to the middle of the posterior wall (6 o'clock position) and middle of the anterior wall (12 o'clock position) in the modified technique.....	41
Figure (18): The artery is twisted 90_ to the right side.....	42
Figure (19): The artery is twisted 90_ to the left side instead of 180_ rotation once to place the back wall stitches.....	42
Figure (20): The reconstruction of the hepatic artery was performed before the liver graft was transplanted.	43
Figure (21): Back-table technique of unification arterioplasty to form a common orifice	45
Figure (22): Representation of an accessory right hepatic artery from the superior mesenteric artery, and a reconstruction using a superior mesenteric artery Carrel-patch with the splenic artery.....	49
Figure (23): CT angiography for HAS	56

Figure (24): Pie chart distribution of arterial complications in liver transplantation according to their demographic data regarding sex and age.	75
Figure (25): Pie chart distribution of arterial complications in liver transplantation according to their inflow artery.	76
Figure (26): Pie chart Distribution of study population according to the occurrence of hepatic artery thrombosis and stenosis.....	77
Figure (27): Bar chart distribution of arterial complications in the Group 2 according to their HAT.....	78
Figure (28): Bar chart distribution of arterial complications in liver transplantation according to their intervention.....	79
Figure (29): Bar chart showing gender distribution among the two studied groups	82
Figure (30): Bar chart showing the comparison between the two studied groups according to the recipient's inflow artery used.....	83
Figure (31): Bar chart showing Complications in the two studied groups.....	84
Figure (32): Bar chart between Group 2 Subgroups according to their HAT, early, late and HAS.	90

Introduction

Liver transplantation (LT) has emerged as an established and well-accepted therapeutic option for patients with acute and chronic liver failure and hepatocellular carcinoma (*Graziadei et al., 2016*).

The shortage of organ donors has become a major global problem. Therefore, living donor liver transplantation (LDLT) has become a standard therapy. However, large number of risks associated with LDLT compared with deceased donor liver transplantation (DDLT), especially concerning arterial and biliary complications. LDLT is technically difficult due to the small and short bile duct, short hepatic artery, severe intimal damage, and limited usable vessel graft (*Miyagi et al., 2018*).

Any strategy to reduce technical complications and prevent graft loss and the need for retransplantation would be crucial to improving management of chronic end-stage liver disease (*Reigada et al., 2017*).

Hepatic artery thrombosis (HAT) is the most severe vascular complication with an incidence ranging from 2 to 9% in adults. Its occurrence after LT increases postoperative morbidity and contributes to subsequent primary graft dysfunction, ischemic biliary complications and long-term graft loss (*Herrero et al., 2017*).