

# بسم الله الرحمن الرحيم





# شبكة المعلومات الجامعية

## التوثيق الالكتروني 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





# بعض الوثائق الأصلية تالفة







# بالرسالة صفحات لم ترد بالأصل





Magnetic Resonance Cholangiography  
of Biliary Complications of Liver  
Transplantation

Essay

*Submitted for Partial Fulfillment for the Master  
Degree in Radiodiagnosis*

By

**Hend Yehia Ali Attia**

M.B.B.Ch – Ain Shams University

Supervised By

Prof. Dr. Neviene Mostafa Ibrahim  
*Professor of Radiodiagnosis*  
*Faculty of Medicine - Ain Shams University*

Dr. Gehan Gouda Ali  
*Lecturer of Radiodiagnosis*  
*Faculty of Medicine - Ain Shams University*

Faculty of Medicine  
Ain Shams University  
Department of Radiodiagnosis  
2008



E

قَالُوا سُبْحَانَكَ لَا عِلْمَ لَنَا إِلَّا مَا  
عَلَّمْتَنَا إِنَّكَ أَنْتَ الْعَلِيمُ الْحَكِيمُ

سورة البقرة

صدق الله العظيم  
آية (32)

# Acknowledgement

*Thanks first and last to **GOD**, as we owe him for his great care, support and guidance in every step in our life.*

*I would like to express my sincere gratitude and great appreciation to **Prof. Dr. Neviene Mostafa**, Professor of Radiodiagnosis, Faculty of Medicine, Ain-Shams University, for her support, valuable supervision and for enabling me to fulfill this work. She is not only my professor to whom I am very grateful, but is also a human to whom I wish always the best of every thing.*

*I would like also to thank **Dr. Gehan Gouda**, Lecturer of Radiodiagnosis, Faculty of Medicine, Ain-Shams University, for her help and guidance.*



## List of Contents

Title	Page
· <b>Introduction and Aim of the Work</b> .....	1-3
· <b>Review of Literature:</b>	
○ Anatomical Considerations .....	4
○ MR Cholangiographic Anatomy .....	19
○ Pathology of Biliary Complications .....	40
○ Technique of MR Cholangiography .....	55
○ MR Cholangiographic Findings in Biliary Complications of Liver Transplantation .....	71
· <b>Illustrative Cases</b> .....	95
· <b>Summary and Conclusion</b> .....	100
· <b>References</b> .....	102
· <b>Arabic Summary</b> .....	--

## List of Figures

<b>Fig. No.</b>	<b>Title</b>	<b>Page No.</b>
1-1	Anatomy of the Biliary System	4
1-2	The Gallbladder	5
1-3	The gallbladder relations	6
1-4	Gallbladder variations	8
1-5	The Arterial Supply of the Gallbladder	9
1-6	The Venous Drainage of the Gallbladder	10
1-7	The Biliary Ducts	10
1-8	The Cystic Duct	12
1-9	The common bile duct relations in the free edge of the lesser omentum	12
1-10	A: Anatomy of the major and minor papilla B: sphincter of Oddi	13
1-11	Segmental biliary drainage	14
1-12	Variation in the relationship of bile ducts, and hepatic artery at the porta hepatis	15
1-13	Accessory hepatic ducts	16
1-14	Cystic duct variations	17
2-1	MRCP image shows normal gallbladder	20
2-2	MR cholangiogram shows the gallbladder	21
2-3	Coronal oblique T1-weighted MR cholangiopancreatogram obtained after injection of mangafodipir trisodium, shows the normal anatomy of the biliary tract	22
2-4	MR Cholangiopancreatography; coronal image demonstrates the biliary tract	23
2-5	This MR image is taken from a series of coronal slices in the MRCP exam shows numerous intrahepatic bile ducts	24
2-6	Coronal MR image shows the normal right and left intrahepatic bile ducts	25
2-7	Coronal MRCP image shows the anteriorly located left hepatic duct	25
2-8	Oblique coronal MRCP image show the more posteriorly located right hepatic duct	26
2-9	Coronal oblique MR cholangiopancreatogram demonstrates the normal cystic duct	27
2-10	Axial MR image is taken from a series of images in the MRCP exam. It is a slice taken through the gallbladder demonstrating the neck and beginning of the cystic duct	28

## List of Figures (Cont.)

<b>Fig. No.</b>	<b>Title</b>	<b>Page No.</b>
2-11	MR cholangiogram demonstrates the proximal extrahepatic duct	29
2-12	MR cholangiogram demonstrates the middle and distal thirds of the extrahepatic bile duct	29
2-13	LPO MRCP image show distal common bile duct, ampulla, and most distal pancreatic duct.	30
2-14	Normal MRCP image showing the common bile duct and the pancreatic duct	31
2-15	Diagram shows normal biliary tree	32
2-16	Coronal MR cholangiopancreatogram shows the left hepatic duct (LHD) and RHD forming the common hepatic duct (CHD)	33
2-17	Diagram shows right dorsocaudal branch draining into left hepatic duct	33
2-18	MR cholangiography shows right posterior segmental duct draining aberrantly into left hepatic duct	34
2-19	MR cholangiogram shows lateral (right) emptying of right posterior duct into right anterior duct	35
2-20	Diagram shows trifurcation of biliary duct	35
2-21	Coronal oblique MR cholangiogram shows three ducts joining at hepatic confluence, indicative of ductal trifurcation anomaly	36
2-22	Coronal MR cholangiopancreatography shows cystic duct with low insertion into distal common bile duct (cbd)	37
2-23	Coronal MR cholangiopancreatogram shows a medial and low insertion of the cystic duct	37
2-24	MR cholangiogram shows parallel course of cystic duct and common hepatic duct in woman with cholestasis	38
2-25	Coronal MR cholangiopancreatography shows right accessory biliary duct draining into common hepatic duct	39
3-1	Photograph of gross histologic specimen shows thickening of biliary bifurcation with mural nonanastomotic stenosis.	43
3-2	Photograph of corresponding gross specimen shows necrosis of biliary tree with biloma filled with necrotic debris	44
3-3	Two photographs of microscopic picture of bile duct strictures	45

## List of Figures (Cont.)

<b>Fig. No.</b>	<b>Title</b>	<b>Page No.</b>
3-4	Two photographs of microscopic picture of biliary sludge	50
3-5	Sphincter of Oddi dysfunction	53
4-1	Oblique coronal SSFSE image show normal biliary tree	59
4-2	3-D image of the gallbladder and biliary tree	60
4-3	Torso coil array	62
4-4	MRCP before and after administration of a "negative" oral contrast agent	65
4-5	MR cholangiopancreatography show a normal cystic duct before (and after morphine injection	68
4-6	Mangafodipir-enhanced MR cholangiography shows aberrant biliary anatomy	69
4-7	Normal MRCP performed during secretin stimulation	70
5-1	Coronal MRCP T2-weighted image shows anastomotic stricture	73
5-2	Coronal MR cholangiogram shows high-grade anastomotic stricture	74
5-3A	Anastomotic stricture overestimated at MR cholangiography after orthotopic liver transplantation	75
5-3B	Anastomotic stricture overestimated at MR cholangiography after orthotopic liver transplantation	76
5-4	MR cholangiographic image shows anastomotic stricture after orthotopic liver transplantation	77
5-5	MIP image generated from 3D MRC sequence shows discrepancy between the diameter of common bile ducts of the donor and the host	78
5-6	MR cholangiographic image depicts minimal intrahepatic duct dilatation and a stone immediately proximal to the anastomosis	79
5-7	Maximum intensity projection image from coronal oblique three-dimensional MR cholangiogram reveals a hilar stricture	80
5-8	MIP images from 3D MRC sequence at the confluence of right and left hepatic ducts, oval area of signal void is visible, consistent with the stone	81
5-9	MIP image from 3D MRC shows debris in common bile duct distal to biliary anastomosis, without significant dilatation of proximal bile ducts	83

## List of Figures (Cont.)

<b>Fig. No.</b>	<b>Title</b>	<b>Page No.</b>
5-10	Coronal MRCP T2-weighted images in a liver transplant recipient shows hypointense filling defect consistent with stone immediately above strictured anastomosis site	84
5-11	MR cholangiopancreatography to differentiate stone from pneumobilia	86
5-12	Coronal MIP image from a 3D respiratory-triggered T2-weighted shows a bile leak	87
5-13	Sagittal oblique MR cholangiographic image after orthotopic liver transplantation shows dilatation of the donor bile duct	88
5-14	Coronal oblique two-dimensional MR cholangiogram demonstrates the normal-caliber donor extrahepatic bile duct terminating near a subhepatic fluid collection that obscures the biliary-enteric anastomosis	89
5-15	Axial maximum-intensity-projection image from enhanced MR cholangiogram after orthotopic liver transplantation shows copious contrast material flowing from anastomosis and accumulating over liver surface	91
5-16	Coronal MRCP image shows mucocele of cystic duct remnant after liver transplantation	92
5-17	Coronal MIP image from a 3D respiratory-triggered T2-weighted shows a large, distended, irregularly shaped cystic duct remnant compressing the common bile duct and causing dilatation of the intra- and extrahepatic ducts	93
6-1	Illustrative image of case I	95
6-2	Illustrative image of case II	96
6-3	Illustrative image of case III	97
6-4	Illustrative image of case IV	98
6-5	Illustrative image of case V	99



## ***Dedication***

First of all I would like to dedicate this work to my beloved **Husband** because without his generous help and support, I would have never been able to achieve my success.

And a very special dedication to my dearest and beloved **Parents**.





---

# **Introduction and Aim of the Work**

---