Sudan University of Science and Technology

College of Graduate Studies

Evaluation of Obstructive Jaundice Using Magnetic Resonance

تقييم اليرقان الانسدادي باستخدام الرنين المغنطيسي

A thesis For Submitted Fulfillment of Requirements of M.Sc degree in Diagnostic Radiology

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Dedication

To my family

To my Friends

To my colleagues

Acknowledgement

I would like to express my deepest gratitude to my supervisor Dr. Asma Ibrahim Ahmed Alamin for giving opportunity to carry out my work for trusting me with assignment of this very interesting subject as well as for their ongoing interest ,guidance and support throughout my project's application .

I would like to thank the participant in my survey, who have willingly shared their precious time during the process .I also cannot express enough gratitude to my family and friends me who believed in me and encourage me throughout my whole time of study .

Last but not least my truthful thanks go out to Dr. Ahmed Abu konna for his support and interest during the length of my research .

Abstract

Obstructive jaundice is one of the most frequent and grave form of hepatobiliary disease.It can pose It problems in diagnosis and management,particularlyIntrahepaticCholestasis.

To evaluate the diagnostic accuracy of Magnetic Resonance Cholangiopancreatography(MRCP) in studying the cause of obstructive jaundice, cholestasis diagnosing and differentiating benign from malignant lesions and to compare it with USG findingsalong with histopathological and surgical correlation.

This is a prospective study conducted at Ribat university hospital over a period starting from April 2015 to April 2016. 80 patients who were referred from department of surgery and medicine with strong clinical suspicion of biliary obstruction and altered LFT were enrolled in the study. Initial Ultrasonography (USG) evaluation was followed by MRCP, Histopathological diagnosis, surgical findings (as applicable) were considered as reference.

On ultrasound 49/80 patients were diagnosed with the actual cause of obstructive jaundice. On the other hand 57/80 patients were diagnosed with actual cause of obstructive jaundice by MRCP.Majority of cases of biliary obstruction were due to Choledocholithiasis (31%) followed by strictures(12%), then cholangiocarcinoma (18%) then GB mass (6%),then choledochal cyst (3%), and pancreatic pathology (6%)

Ultrasound is a good screening method but is less accurate for diagnosing the distal CBD obstruction .MRCP on the other hand has high sensitivity for diagnosing the cause and extend of

biliary obstruction and hence should be the modality of choice for all the patient presenting with obstructive jaundice .

ملخص الأطروحة

الانسداد اليرقاني الصفراوي هي واحدة من نماذج الامراض الأكثر شيوعا وخطورة . ويمكن أن تثير مشاكل في التشخيص والعلاج، وخاصة الركود الصفراوي داخل الكبد .

هــدفــت وهــــذه الــدراســـــــــة لتقييم اليـــــرقـــــان الإنســـــــــــــدادي باستحدام تقنية الرنيـــــــــن المغناطيســـــــي

و لتقييم التشخيص بالرنين المغناطيسي في دراسة سبب اليرقان الانسدادي وركــود الصــفراوي والحميـدة مـن الاورام او الخبيـث ومقارنتهـا مـع نتـائج الموجات الصوتيةوربطها مع مع نتائج معمل الانسجة والجراحة.

هذه الدراسةعملية أجريت في مستشفى الرباط الجامعي خلال الفترة من أبريـل 2015 إلـى أبريـل 2016.علـي 80 مريضـا الـذين تـم تحـويلهم مـن قسـم الجراحـة والطـب البـاطني باتهـام الشـك السـريري القـوي مـن انسـداد القنـوات الصفراوية وخلل في وظائف الكبد ضمنت في الدراسة . وعقب التصـويرالاولـي بالموجــات فــوق الصـــوتية (USG) تــم عمــل(MRCP) تصـــوير بـــالرنين المغنطيســي للقنــوات المراريــة لكــل المرضــي للتشــخيص ،ولـربط ذلـك بالنتــائج الجراحية (حسب مقتضى الحال) كانت تعتبر كمرجع.

عـن طريـق الموجـات فـوق الصـوتية تـم تشـخيص 80/49 المرضـى الـذين يعـانون مـن السـبب الحقيقـي لليرقـان الانسـدادي. مـن ناحيـة أخـرى تـم تشـخيص 80/57 المرضى مع السبب الحقيقي لليرقان الانسدادي عن طريق ال MRCP .معظم حالات انسداد القنوات الصفراوية من تكون الحصـاوي (31٪)تقريبـا ، يليه ضيق

القنوات (12٪)، ثم سرطان الأوعية الصفراوية (18٪) ثم اورام كيس المرارة (6٪)، ثم تكيس قناة الصفراء (3٪)، وأمراض البنكرياس (6٪).

وخلصت الدراسة الي ان الموجات الصوتية طريقة ممتازة لاجراء مسح لحالات الانسداد اليرقاني لكنه اقل دقة لتوضيح مستوي انسداد القناة الصفراوية المشتركة خاصة الجزء القريب أمبولة فاتر.في حين نجد ان ال (MRCP) ذات حساسية عالية في توضيح سبب الانسداد وامتداده مستواه لذلك يعد افضل تصوير طبي للمرضي الذين يعانون من انسداد يرقاني

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Abbreviation

MRCP	Magnetic Resonance Cholangiopancreatography.
ERCP	Endoscopic Retrograde Cholangiopancreatography.
PTC	Percutanious Transhepatic Cholangiography.
CBD	Common Bile Duct.
U/S	Ultrasound.
CT	Computerized Tomography.
MR	Magnetic Resonance.
MIP	Maximum intensity Projection.
HASTE	Half Acquisition Single Shot .
3D FSE	Three Dimensional Fast Spin Echo.
MHz	Mega Hertz.
T2	Weighted image .Image that demonstrates the differences in the T2 times of the tissues.
FOV	Field Of View.
FSE	Fast Spin Echo.
SSFP	Steady State Free Precession.
NEX	No of Excitation.
MPR	Multiplaner Reconstruction.
TSE	Turbo spin echo.

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CHAPTER ONE

Chapter One

1-1 Introduction:

MRCP is Magnetic Resonance Cholangiopancreatogrphy a rapidly expanding imaging modality. Its versatility and safety have made it an increasingly popular diagnostic unit tool. Although the physical principles are complex, a detailed knowledge is not required to interpret the images.

On 3 July 1977 the first MRI scan was performed on a human subject taking approximately 5 hours to obtain just one image .thirty years prior to this the principle was used for measuring flow in the fuel pipes of satellite rockotes. Now almost all countries have MRI scanner that produces a whole series of images in just a few minutes. In Sudan there are number machines, the recent one in Ribat University teaching hospital (Siemens 1.5 T).

An MRI Scanner is not require ionizing radiation but utilizes an extremely powerful magnet (.e.g. 0.5, 1.0, 1, 5, 3.0 T).

Obstruction to biliary tract at any part is a common disorder it may be sudden or insides it cause status and rise tract which predispose infection stone formation or obstructive juice.

Whatever the cause of obstruction it invariably leads to gall bladder impairment. Which initially is entirely reversibly if the obstruction element is removed.

So early diagnoses and management is preventive of long standing obstruction as well as prevention of dissemination of malignancy.

The most causes of obstruction to the biliary tract are stones, tumors, and strictures. Obstruction could be internal due to stones or masses or narrowing (tubal ligation) or extra ductual hepatic or extrahepatic compressive masses, hepatic secondary or lymph nodes pancreatitis.

There many investigation tools used for the management of obstructive jaundice and MRCP has a good role.

1-2 The Problem Of The Study:

In spite of the various imaging modalities applied to evaluate obstruction jaundice U/S appeared to be the first choice for the physician to evaluate such problem. However MRCP an u/s are known to be operator dependant modality and the technical obstacles encounter performing scans to visualize the whole hepatobiliary system encourage the application of a new advanced technique using magnetic resonance. Magnetic Resonance cholangiopancreatogrphy (MRCP).

1-3 The importance of the study:

To facilitate for a physician a direct evaluation and diagnostic tools in reaching a quick and final diagnosis for obstructive jaundice causes.

1-4 Significant Of The Study

the researcher assumes that MRCP would present superior and significant evaluation of obstructive jaundice causes in addition to other modalities.

1-4 Objectives:

- To define different MRCP features of obstructive jaundice.
- To establish the incidence of due different causative pathology.
- To define all radiological investigations and feature of obstructive jaundice.
- To correlate the MRCP feature obtained with other radiological investigations.
- To compare this study with pervious done elsewhere.

1-5 Over view of the study:

This study consist of five chapter:

- Chapter One introduction.
- Chapter two Literature review and previous studies.
- Chapter three materials and method.
- Chapter four results.
- Chapter five discussion, conclusion and recommendations.

CHAPTER TWO

Chapter two

Literature review and previous studies:

2.1 Anatomy of the Biliary Tract:

The right hepatic duct is formed by the intrahepatic union of the dorsocaudal and ventrocranial branches draining the two sectors of the right liver (segments V-VIII); the ventrocranial duct is in direct line with the right hepatic duct and crosses in front of the dorsocaudal branch as this arches downwards before reaching the confluence of the two ducts. The left hepatic duct, which is formed by n1edial and lateral branches draining (segments II-IV), is longer than the right hepatic duct. It follows a partial extra hepatic course (of variable length depending on the width of the quadrate lobe) and, therefore, dilates readily in the presence of distal obstructive disease. The extra hepatic portion of the left duct and its segment III branch can be accessed surgically at the hilum by following the insertion of the round ligament (ligament teres) in the depths of the recesses of Rex. This 'round ligament' approach is an effective method of bilio-enteric bypass for inoperable cholangiocarcinoma of the extra hepatic ducts.

The union of the right and left hepatic ducts is usually extra hepatic (90%within 1.0 cm of liver parenchyma), high up in the porta hepatis. The resulting common hepatic duct receives the cystic duct lower down, whereupon it becomes the common bile duct. It is customary, however, in surgical anatomy to use the term common bile duct' or simply 'bile duct' for the entire extra hepatic conduit as it obviates difficulties in nomenclature, especially when there is low insertion of the cystic duct. The junction of the right and left hepatic ducts is also referred to as the hilar bifurcation. Together with the hepatic artery to its left and the portal vein behind, the common bile duct is surrounded by fibrous- tissue known as the glissonian sheath. At the hilum this is thickened and forms a condensation that is often referred to as the hilar plate. If the liver is incised interiorly and posteriorly (between the hilum and the caudate lobe) to the hilar plate, finger dissection enables the mobilization of the main divisions of the hepatic duct, hepatic artery and portal vein and this manoeuvre allows inferior displacement and thus access in case of high bile duct strictures. It is also used for segmental resection of the liver.

2.1.1 Ductal anomalies:

The intrahepatic arrangement outlined above applies in 750/0 of cases. The different arrangement is encountered in the remainder when either the right dorsocaudal or ventro-cranial ducts join the left hepatic duct, or the common hepatic duct forms a trifurcation. The majority (75-80%) of intrahepatic calculi are located in the left hepatic duct and right-sided calculi, which are far less common, are usually found in the ventrocrainial branch of the right hepatic duct.

Important extra hepatic anomalies sometimes referred to as 'aberrant ducts' are encountered in 15-190/0 of patients. In fact, these 'anomalous / aberrant ducts' represent an extra hepatic confluence of a segmental duct and in the vast majority (95%) affect the right system, when the aberrant duct joins the right hepatic duct (extra hepatic ally), or common hepatic duct or cystic duct and very rarely, the gallbladder.

2.1.2 Gall bladder and cystic duct:

The gall bladder is a pear-shaped sac- about 10 cm in length. And is situated on the inferior surface of segment V of the right lobe of liver. It is covered with a layer of peritoneun1 that contains many small veins that require coagulation during cholecystectomy. It is customarily divided into the fundus, the body and the neck which leads to the cystic duct. Not infrequently, the neck has an abnormal sacculation, which is referred to as Hartman's pouch. This may become adherent to the surrounding structure of the porta hepatis, particularly the common bile duct, seriously obscuring anatomical relationships during dissection of this region.

The cystic duct runs a variable course from the neck of the gall bladder to join the common hepatic duct. Its mucosa is arranged in a spiral fold or valve (valve of Heister) which often causes difficulties. In annulations during operative transcystic cholangiography. Although most anatomical textbooks indicate that the cystic duct joins the bile duct along its right margin, several large series of surgical dissections and analyses of operative cholangiograms demonstrate clearly that this arrangement is rare. Much more commonly, the cystic duct enters the bile duct either posteriorly or interiorly. It may also pursue a spiral or a parallel course with the bile duct, with the two structures being enclosed in a common fibrous sheath that tends to obscure the exact location of the entry of the cystic duct into the bile duct. The spiral cystic duct runs down and behind the common hepatic duct to enter on its medial aspect. The parallel cystic duct runs parallel to the bile duct for a variable distance before entering it. This is the rarest arrangement and is encountered in 5-7(% of patients. Rarely, the cystic duct joins the right hepatic duct and very infrequently the left "duct. (Ref No1)

Biliary system

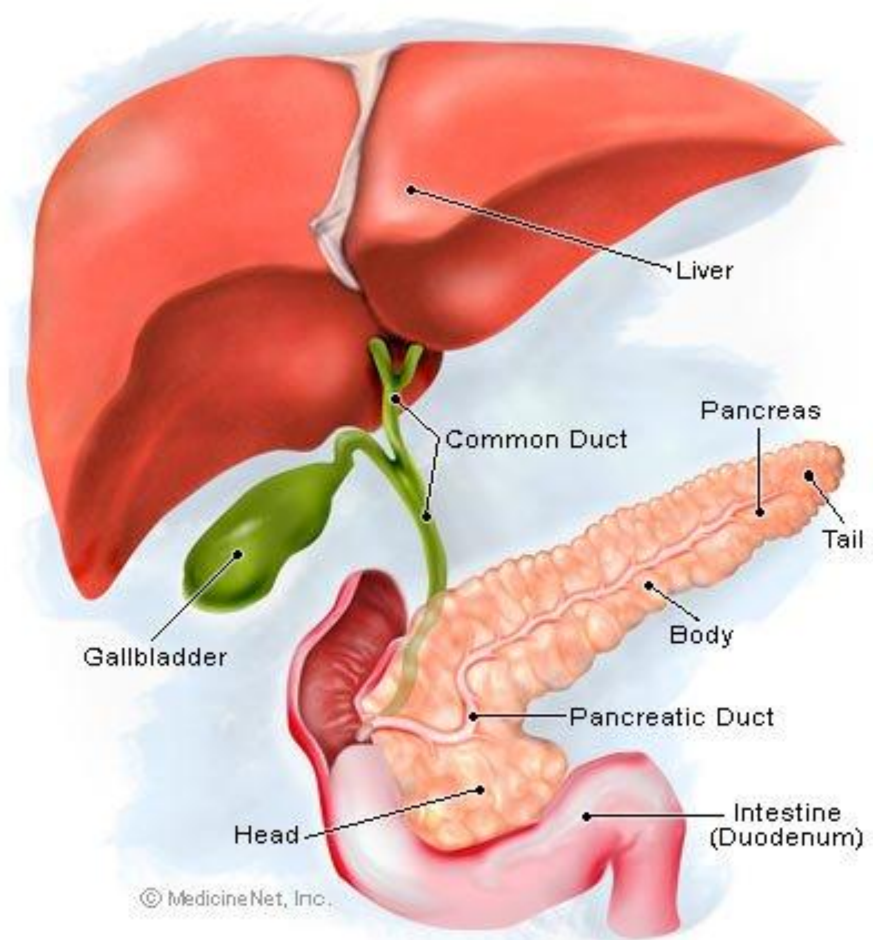


Fig (2 – 1)anatomy biliary system

2.1.3 Anomalies of the gallbladder

The most common anomaly of the gall bladder encountered during surgery is the Phrygian cap where the fundus is constricted and turned back on itself. The fully intrahepatic gallbladder is rare. The so-called floating gall bladder, which has a complete serosal covering and a dorsal mesentery, is relatively uncommon, as is malposition of the gall bladder and double gall bladder. (Ref No 1)

The floating gallbladder predisposes to torsion, which simulates acute cholecystitis. An elongated sausage-shaped gall bladder frequently accompanies congenital cystic disease of the bile ducts. Agenesis (congenital absence) of the gall bladder is very rare and the condition can be confirmed at laparotomy. (Ref No1)

In a patient who has not undergone previous biliary tract surgery. Another rare anomaly is the trabeculated gall bladder, but this usually causes symptoms similar to chronic cholecystitis and is associated with abnormal gall bladder emptying. (Ref No1)

A left-sided gall bladder is an integral component of situs in versus. In the absence of this condition, malposition is generally regarded as a very rare anomaly. Thus a collective review of the Western literature yielded only 24 cases of left-sided gall bladder. (Ref No1)

Two types of gall bladder malposition have been described as medio position of the gall bladder and sinistroposition (transposition). In medioposition, the gallbladder is displaced medially to lie on the under surface of the quadrate lobe (segment Ill) to the left of the round ligament Despite the left-sided location of the gallbladder, the Biliary pain experienced by these patients is always on the right side. The pre-operative diagnosis of this anomaly is made rarely despite routine preoperative external ultrasonography and selective recourse to endoscopic retrograde cholangio-pancreatography (ERCP). In sinistroposition, the cystic artery always crosses in front of the common bile duct from right to left. The cystic duct may open on the left or right side of the common hepatic duct. The anomaly does not preclude safe laparoscopic cholecystectomy but modifications of the port sites and the use of the falciform on the left facilitate the procedure in these case. (Ref No3)

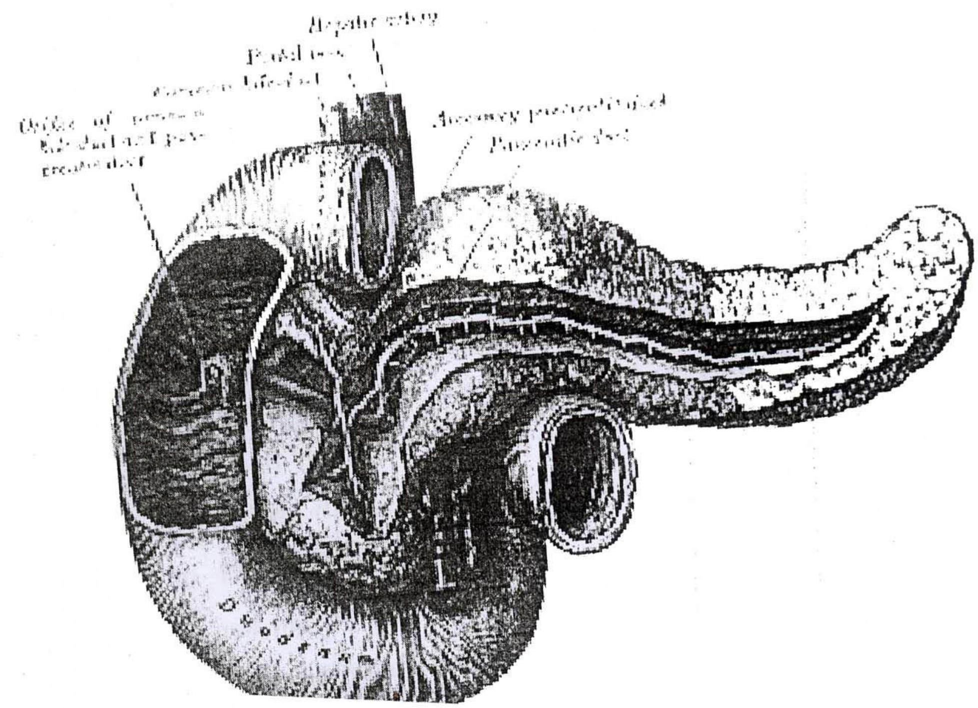
The arterial supply of the gall bladder is by means of the cystic artery, which usually arises from the right hepatic artery. The cystic artery is end-artery and its occlusion is followed by gangrene of the gallbladder. There are several congenital anomalies of the arterial supply of the gallbladder, cystic artery, which usually arises from the right hepatic artery. The cystic artery is end-artery and its occlusion is followed by gangrene the gallbladder. There are several congenital anomalies of the arterial supply of the gallbladder, the most important of which a short cystic artery. All these arterial anomalies are however important and must be recognized during cholecystectomy before ligature of the 'cystic artery', careful display and verification of the anatomy is the single most important factor in the prevention of arterial bleeding and iatrogenic injuries during cholecystectomy and biliary tract surgery. (Ref No3)

2.1.4 Common bile duct:

The bile duct (choledochus) is formed by the union of the right and left hepatic ducts each draining the respective hemi-liver. It is joined at a variable distance along its course by the cystic duct. In strict anatomical terms, the segmel1t between the hilar bifurcation and the cystic duct is referred to as the common hepatic duct and the junction. From the surgical standpoint, however, it is best to consider it as one structure, which is divisible into the supraduodenal, retro duodenal, intrapancreatic and intradoudenal segment. It serves as a conduit of bile from the liver and gallbladder to the duodenal papilla, and in the adult measures 11-12 cm In length with an average diameter of 7 mm, range 4-10 ml. The supradoudenal segment is important surgically because it is the area that is 1110St commonly explored. It lies in the free edge of the hepatoduodenal ligament of the right of the hepatic artery and anterolateral to the portal vein. The retrodoudenal segment curves to the right away from the portal vein behind the first part of the duodenum before entering the head of the pancreas. However, in 20% of patients the duct has a partial or complete extra pancreatic course.

The trans duodenal segment (also known as the infundibulum) which transverse obliquely the duodenal wall and usually joins the pancreatic duct, opens into the duodenal lumen at the suml11it of the major duodenal papilla, the lower end of the common bile duct, therefore, deviates to the right before entering the lumen of the duodenum almost at right angles. This is an important practical consideration since forcible probing through this area may perforate the bile duct and result in a haematoma, post-operative pancreatitis, choledochodoudenal fistula or stricture of the lower end of the bile duct. (Ref No7)

The main pancreatic duct (Wirsung) joins the poster medial wall of the transdoudenal segment of the bile duct to form a common channel in 900/0 of cases. A localized dilatation of the common channel to form an ampulla of water is uncommon (1020%) and in 10% of patients the two ducts open separately into the duodenum. The ventral segment includes the lower 2.5-3.0 cm of the common bile duct, the distal part of the pancreatic duct, the ampulla or common bile channel and the major duodenal papilla. These structure are surrounded by a condensation of circular and longenitudinal smooth muscle fibers often referred to as the sphincter of Oddi, although it was Boyden who described the detailed anatomy of the various components of this sphincteric complex. (Ref No 7)



(Fig.2.2) Diagram illustrating the *bile pancreatic ducts* and the sphincter of Oddi

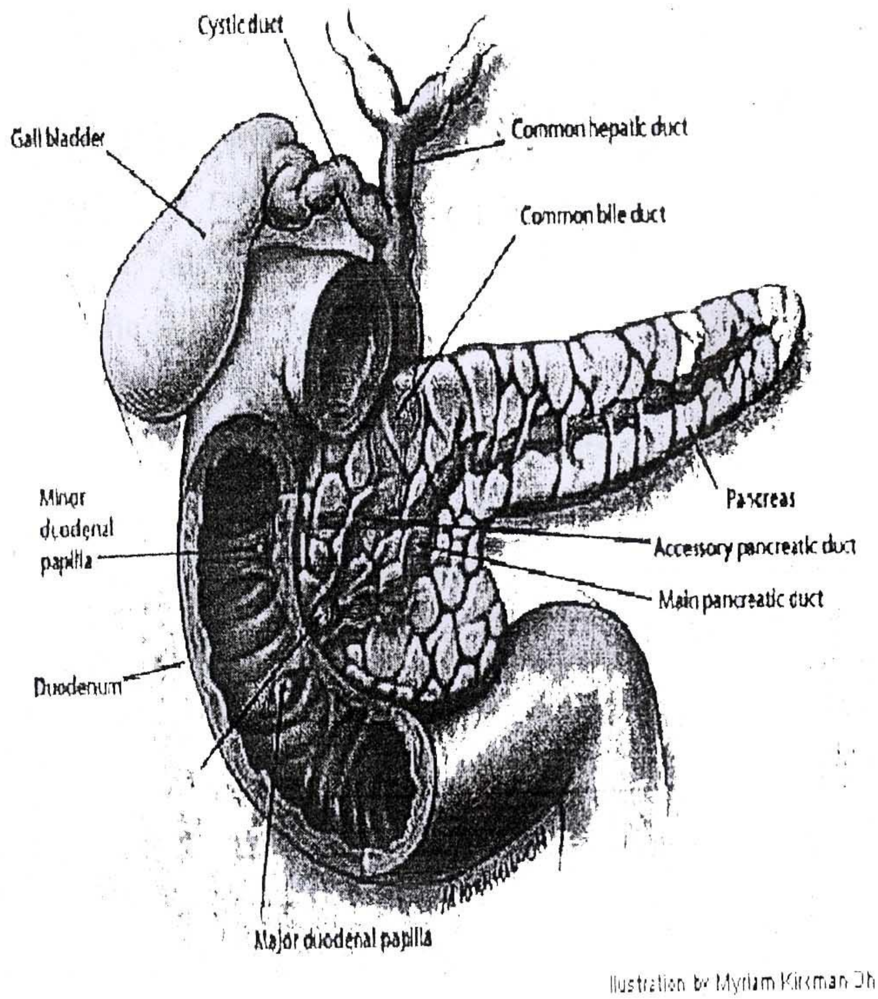
Fig (2 – 2)

The inferior sphincter is the strongest component and is also known as the papillary muscular ball. It surrounds the terminations of the bile and pancreatic ducts and the common channel the middle sphincter is the longest and the thinnest of the con1ponents and surround the transdoudenal and a variable portion of the transpancreatic segment of the bile duct and the duct of Wirsung. The superior sphincters consist of localized thickenings of the middle sphincters around the bile and pancreatic ducts at the proximal end of the sphincter complex.

An important variation of the anatomy of the Ventral segment is the condition known as pancreas division, which result fron1 failure of fusion of the ventral and dorsal pancreas during embryological development.

The rest of the common bile duct contains few muscle fibers. Its epithelial lining rests on a loose stroma containing elastic fibers, which disappear with age or disease. Thus" stone impaction, prolonged distension or cholangitis may lead to rigidity of the common bile duct and it occurs at its point of entrance into the duodenal wall and this area is often indicated by a notch on the cholangiogram. The diameter of the Trans duodenal papilla varies from 0.5 to 1.5 mn1. The commonest site for calculus arrest or impaction is just proximal to the transduodenal segment. The major duodenal papilla is situated on the postromedial aspect of the second part of the duodenum about 7.0-10.0 from the pylorus. Its appearance may vary from the usual well-defined papilla with varying degrees of projection to a flattened depression between the mucosal folds. Irrespective of its exact configuration, the major duodenal papilla frequently has a dorsal mucosal fold. The papilla is more easily located by ERCP than by direct inspection during surgical intervention. The minor (accessory) papilla is more proximally situated and assumes clinical importance only in patients with pancreas division.

The activity of the choledochal sphincteric complex is independent of the duodenal musculature but n1ay be influenced by it. Tints, the effect of certain drugs on the choledochal sphincter differs from their action on the duodenal wall, and duodenal. Muscular peristaltic activity has no significant effect on the common bile duct pressure. The choledochal sphincter is an active structure and measures up to 2.5 cm in length. It consists of well-developed longitudinal and circular smooth muscle. Contraction of the longitudinal muscle tends to open the duct lumen, whereas the circular muscle has the opposite effect. These contracted (systolic) and relaxed (diastolic) states of the choledochal sphincter lead to quite distinct appearance of the lower end of the common bile duct at cholangiography. During contraction, contrast often forms a meniscus with the concavity facing downwards sin1ulating a stone (the pseudo calculus phenomenon).



(Fig. 2.3) **Diagram illustrating the biliary and pancreatic road map.**

Fig (2 – 3)

2.1.5 Hepatobiliary Physiology:

The liver is the largest and most metabolically active organ in the body, and in ancient times it is functionally interposed between the gut, from which it receives macronutrients and micronutrients, and the other organs to which it supplies energy source in exchange for metabolites that are either incorporated into complex molecules or degraded. ( )

Toxic endogenous and exogenous substances (xenobiotics) are detoxified and excreted into the bile or blood stream for disposal through the kidneys. In addition, the liver responsible for the synthesis of specific proteins, e.g. albumin, clotting factors, immunoglobulin and lipoproteins, and plays a crucial role un bilirubin metabolism. ( )

2.2 Pathology:

2.2.1 The Causes of Surgical Jaundice:

Ductal calculi, Gall bladder stones, Pancreatic and Biliary malignancy Non-malignant strictures, external compression of bile duct by lymph nodes and tumor masses and parasitic infestations of the biliary tract. ( )

2.3.1.1 Gall stones and ductal calculi:

Gall stones are very common world-wide. The prevalence in the western hemisphere is high with female preponderance. (2:1) the 5 Ps (female, forty, fertile, fat and flatulent). The currently accepted classification recognizes three main types of gall stones:

2.3.1.1.1 Cholesterol stones: essentially metabolic stones that form in the gallbladder and are preceded by biliary sludge.

2.3.1.1.2 Black pigment stones:

2.3.1.1.3 form in the gall bladder and are more common in far eastern countries. Can be associated with hemolytic states. Consist of bilirubin polymers with varying amounts of cholesterol (3-25%) in the matrix of orgal11c material. Associated with infection in less than 20%. (2) (3) Brown pigment stones form in the bile ducts (primary ductal stones) and are associated with obstructive lesions, infections and infestations of the biliary tract. Bacteria are present in the crevices and pits of the amorphous soft stones that consist of calcium bilirunate and palmitate. ( )

2.3.1.2 Spectrum of symptomatic gall stone disease:

The symtomatology and pathologic and pathogenic potential of gallstones vary widely. Most surveys on necropsy findings have shown that silent (symptom less) gallstones heavily outnumber the symptomatic ones. When symptomatic, gallstones can cause:

- Chronic symptoms due to stones associated with chronic cholecystitis: jaundice is rare.
- Acute biliary colic/acute obstructive cholecystitis: jaundice occurs in 20-40%.
- Jaundice due to large bile duct obstruction.
- Cholangitis and septicemia: jaundice in 100%.
- Acute gallstones-associated pancreatitis: conjugated hyper-bilirubinaemia in 500/0.
- Biliary fistulous disease.

- Gallstones ileus.
- Carcinoma of the gallbladder (strong association).

2.3. 1.3 Ductal calculi:

The pathologic potential of ductal calculi consists of the triad: jaundice, cholangitis and acute gallstone-associated pancreatitis. Ductal calculi can result from migration of gallstones through a patent cystic duct. These are referred to as secondary ductal calculi (cholesterol or black pigment), as distinct from primary ductal stones, which arise de novo.

Within the bile ducts are brown pigment stones. These are associated with biliary tract colonization by glucuronidase-secreting bacteria, e.g. Escherichia coli, usually in the presence of sub clinical obstruction at the distal end of the common bile duct. Calculi may also form around foreign bodies within the lumen of the common bile duct. These become encrusted with calcium bilirunate. A common example of this nowadays is caused by the internalization of titanium metal clips used to secure the medial end of the cystic duct stump during laparoscopic cholecystectomy (LC). The exact pathology for this eventuality is not known but pressure necrosis by the clip that included the adjacent wall of the Common bile duct is thought to be involved. The patients present several months after an uneventful surgery with jaundice and/or cholangitis. ( )

Several other clinical terms are used in relation to ductal calculi: unsuspected, missed or retained, and recurrent. Unsuspected stones are those discovered accidentally during cholecystectomy for symptomatic Gallstone disease when routine intraoperative cholangiography (lOC) is performed.

The stones are usually small and floating, and the common bile duct is of normal caliber. The liver function tests are normal, although some patients may have an elevation of the alkaline phosphates that is either missed or attributed to other cause. The estimated incidence of unsuspected stones is 5-10% of patients undergoing cholecystectomy. ( )

The terms missed and retained are synonymous and indicate that the intervention (surgical or endoscopic) failed to achieve complete ductal clearance. By custom, ductal calculi that present or are diagnosed within 2 years of the intervention are designated as missed or retained. Most are, in fact, detected much earlier. The insertion of T - tube or cystic duct drainage cannulae after surgical ductal clearance (open or laparoscopic) permits the performance of a postoperative tube choledochogram as a check for complete ductal clearance. ( )

Recurrent ductal stones present at least 2 years after the first intervention. These tend to be primary ductal stone (brown pigment) and are almost always associated with significant dilatation of the Common bile duct, indicating a fibrotic or dysfunctional terminal segment of the conlnl0n bile duct. There is a mistaken belief that endoscopic sphincterotomy IS sufficient to overcome this obstruction. This is not the case as the Vaterian segment (containing the entire choledoctal sphincter complex) cannot be completely divided by an endoscopic sphincterotomy (essentially a papillotmy), however generous. If fit, these patients are best managed by ductal clearance and an internal surgical drainage procedure, most commonly a choledochoduodenostomy, which can be open or laparoscopic.

2.3.1.4 Pancreatic and biliary malignancy:

The clinical picture of both pancreatic and biliary cancer is dominated by jaundice (large bile duct obstruction) and itching. In pancreatic ductal Aden carcinoma weight loss is also an important clinical feature, as is recent onset of diabetes.

2.3.1.5 Pancreatic cancer

It IS important to distinguish between pancreatic Aden carcinoma (head, body, tail) and periampullary tumours because of their vastly different prognosis. Food contaminated with aflatoxins produced by the fungus Aspergillus flavus has been incriminated in SO111e cases. There is also a high incidence of the disease in patients with certain fmnilial/congenital disorders such as antitrypsin deficiency and tyrosinaen1ia. The fibrolmnellar variant of the disease is encountered predO1ninantly in young patients without cirrhosis and carries a good prognosis after complete resection. ( )

The symptoms include pain in the right hypochondrium, hepatic enlargelnent and ascites. The tumour gives rise to systemic manifestations. These include polycythaetnia, carcinoid syndrome, hypoglycaemia and hypocalcaemia. Raised Q-fetoprotien is present in 60-700/0 of cases. (Ref No1)

2.3.1.6 Peiampullary cariamoma:

These include cancers of the ampulla of vater, distal common bile duct and peri- Vaterian duedcnum. By far the most common Presentation IS painless progressive jaundice and itching. Presentation is with hyperamylasamia, pancreatitis or grey stools (gastrointestinal blood loss). ( )

2.3.1.7 Carcinoll1a of the gallbladder:

This is the most common malignancy of the biliary tract and accounts for 3-4% of all gastrointestinal malignancies. It is. a disease of old age and carries a uniformly poor prognosis. Gallstones are present in 75-90% of cases. The clinical presentation is with jaundice and /01' accrue cholecystitis.

2.3.1.8 Cholangiocarcinomas:

These tumours of the biliary tract, all of which present with jaundice, usually occur in the elderly but some occurs as early as the fifth decade. They are classified by the anatomical site of origin:

- Intrahepatic: From minor hepatic ducts. Often multicentric and usually classified with primary liver tumours.
- Proximal: From right and left hepatic ducts, hilaI' confluence and proximal common hepatic ducts.
- A/it/die: From the distal common hepatic ducts, cystic duct and its confluence with common bile duct.
- Distal: Include with periampullary tumours.

Most of these tumours are of the cirrhosis variety and some can be very a cellular, such that histological confirmation may be difficult. Radio logically; they give rise to a 'stricture' with proximal dilatation.

2.3.2.1.9 Benign bile duct strictures:

Most benign bile duct strictures are the result of iatrogenic injury during cholecystectomy. The constriction and compression of the intrapancreatic segment of the comn10n bile duct by the pseudotumour of chronic pancreatitis can result in jaundice that complicates the course of this disease in some patients.

2.3.1.10 Malignant jaundice:

This tern1 is used to jaundice due to malignant large bile duct obstruction, e.g. biliary and pancreatic cancer, or jaundice occurring in association with hepatic malignancy, which can be primary (hepatocellular carcinoma) or secondary from a primary in another site. The presence of jaundice in association with liver tumours indicates extensive involvement of the liver parenchyma:, with the patient being incurable and unlikely to benefit from any form of treatment. Undoubtedly, surgical treatment and chemotherapy are contraindicated malignancy in jaundiced patients who harbor hepatic.

2.3.1.11 Imaging of biliary system:

2.3.1.11.1 Plain abdominal radiography:

The plain abdominal film is rarely used in the diagnosis of gall stones in the elective situation as only 10% of gall stones are radio-opaque. However, a plain film of the abdomen can provide useful diagnostic information in the acute situation. It may demonstrate gas in the biliary tract in patients with bilio–enteric fistulas. The stones itself is rarely visualized in the film. Also plain film can provide valuable diagnostic information of emphysematous cholecystitis. Finally calcification within the gall bladder wall which is established risk factor for carcinoma of the gall bladder, is best detected by a plain abdominal a film.

2.3.1.11.2 Oral cholecystography:

Now superseded by ultrasound as the primary investigation for suspected cholelithiasis, oral choleccystography still has a limited role in anatomic and functional assessment of the gall bladder.

The contrast media in common use are sodium ipodate (Biloptin) and calcium ipodate (Sollubiloptin). The are tri-iodinated benzene ring compounds whose concentration in the gall bladder is dependent upon ingestion and adequate absorption in the gut ,take up in the liver, excretion in the bile, entrohepatic recirculation and a patent cystic duct. Any factor influencing this pathway will result in failure of opacification and a non-functioning gallbladder.

Therefore non-biliary causes of failure of opacification which need to be considered are:

- Failure of transfer e.g. non-compliant patient esophageal achalasia, pyloric stenosis.
- Failure of absorption ,e.g. diarrhea ,small bowel by pass or resection.
- Parenchymal liver disease in particular intra or extra hepatic cholestasis.
- Biliary enteric fistulae of surgical anastomosis.
- Acute pancreatitis .

Optimum technique includes a preliminary plain radiograph, followed by coned (low kv) films either screened or with standardized prone oblique, supine oblique and a horizontal-ray projection at an interval of 12-15 hours following ingestion of 3g of contrast media. Anomalies of gall bladder position should be excluded with an abdominal radiograph if these standardized coned views fail to visualize the gallbladder. Ingestion of contrast can also be confirmed with radiopaque medium demonstrated within bowel. The diagnostic accuracy of oral cholecystogrphy in demonstrating gallbladder is85%-95%. (Ref No2)

2.3.1.11.3 Intravenous cholangiography:

Endoscopic retrograde cholangiography has virtually replaced intravenous cholangiography in the assessment of extra hepatic biliary tree, although it enjoyed a brief resurgence in some surgical circles with the advent of laparoscopic cholecystectomy and the inherent limitation for operative cholangiography.

The contrast media in use are I polyamide (Biligram) and iotroximate (billiscopan). the differ from the oral compounds in that they are highly soluble, become rapidly bound to albumin and do not undergo significant entra hepatic circulation. It is relatively poor resolution compared with ERCP, technical limitations in up to 40%of studies, and hypersensitivity reactions with mortality quoted at up to1in 5000, are further factors which limit the acceptability of intravenous cholangiography.

2.3.1.11.4 Percutaneous cholangiography (PTC):

Direct puncture of the intrahepticducts using a fine gauge chiba needle allows demonstration of biliary tree with relative safety .Expert operators can pacify the duct system in over 98%of cases in both adults and children. Technical success is reduced with undilated duct system and in less experienced hands there are specific indications; To define the cause and level of obstruction in patients with dilated bile ducts on ultrasound in the presence of jaundice. In patients with clinical and biochemical indications of obstruction but undilated ducts on ultrasound. (Ref No9)

Although in the majority of cases endoscopic cholangiography fulfills this role. If there has previous surgery with disconnection of the bile ducts with drainage through a roux loop. Access to the bile ducts can only be by Tran hepatic route. For example, in children who develop cholestasis following construction of a hepaticojejunostomy for a choledochal cyst or orthopic segmental liver graft, percutaneous cholangiography is used to;

- Evaluate the biliary anastomosis and roux loop drainage.
- In defining biliary - enteric or biliary-coetaneous fistulas.
- In definition the level of bile leak.
- To map the biliary tree as a preliminary to establishing external or internal biliary drainage with sent placement.

2.3.1.11.5 ndoscopic retrograde cholangiopancreatography (ERCP):

ERCP and PTC should not be seen as competitors but as allies in evaluation of the biliary tract. Advantages of ERCP are that both the biliary and pancreatic ducts studied, and it allows direct inspection and biopsy of the papilla and duodenum and therapeutic procedures of sphinctertomy and stone extraction. As with PTC a diagnostic procedure can become a therapeutic one with sent placement and relief of jaundice. In patient with obliterative cholangiopathies, such as sclerosing cholangitis or with biliary hypoplasia, opacification on the biliary tree may be technically easier by a retrograde approach. Conversely if there has been previous sugary with a hepaticojejunostomy or if there is duodenal obstruction from a pancreatic carcinoma, then there is no access for an endoscopic examination. This illustrates the importance of a biliary team radiologist, endoscopist and hepaobiliary surgeon matching the needs of the patient to local expertise and availability.

This technique carries a low morbidity(less than 3%) and mortality (2%).Pancreatitis and duodenal perforation or bleeding following sphicnterotomy for impacted ductal stones are significant contributors to theses figures.

2.3.1.11.6 Operative cholangiography:

Specific indication for operative cholangiography prior to further surgery are well define. Of these the most common is determining the need for exploration of the common bile duct at the time of cholecystectomy .10%of patients presenting with gallstones necessitating cholecystectomy will have common duct stones; it is estimated that worldwide about 15000 patient per year will present with stones following cholecystectomy, a significant proportion of these stones having been missed at the time of the original surgery. This second group of patients can be treated endoscopically operative cholangiograbhy with demonstration of stones, together with clinical criteria of clolangitis with duct dilatation, pancreatitis or palpable stones at surgery, are the indications for exploration of the bile duct with a high positive predictive value.

Other indications for cholangiography at the time of surgery include demonstration of anomalous duct anatomy ,and defining developmental disorders of the billiary hypoplasia and bilairy atresia prior to surgical drainage if the preoperative investigations are equivocal.

Post operative cholangiography through a t-tube is indicated to ensure that all stones have been removed following exploration of the bile duct. Further indications are evaluation of the anastomosis and intrahepatic biliary tree of a liver transplants. Although T-tubes may not be routinely used ,a specific operative indication is when there is disparity in caliber between the donor and recipient bile duct.

2.3.1.11.7 Endoscpic ultrasound:

This now an established technique for investigation of biliary disorders. It has a developing role in the investigation bile duct tumors at the ampulla or liver helium to determine operability Experienced operators can also survey the common duct for bile duct stones before or after cholecystectomy and evaluate choledouchal varices or other sub mucosal pathology invisible to conventional endoscopy and radiology. (Ref No8)

2. .3.1.11.8 Computed tomography:

The sensitivity of computed tomography in differentiating hepatocellular from obstructive jaundice and in determining the level and cause of obstruction parallel that of ultrasound. The density of gallstones is an indicator of their constituent matrix. For instance pure cholesterol stones have density approximating to that of fat. This finding coupled with absence of calcification, definees those patient who may benefit from dissolution therapy. However, ultrasound has the advantage in cost, availability and the lack of ionizing radiation.

. 2.4.1 Ultrasound:

Ultrasound is the technique which answers of clinical questions posed in patients with suspected biliary tract pathology specially, in the investigations of jaundiced patient, differentiation of a hepatocelluar (medical) from an obstructive surgical cause lies at the fulcrum of diagnostic algorithm. Failure to recognize dilated ducts of biliary obstruction or parenchymal tumor infiltration will direct the patient along a potentially fruitless diagnostic path. Equally ultrasound is often the only investigation necessary in confirming calculus disease. Its sensitivity in detection of such pathologies means that careful correlation between the clinical presentation and ultrasound findings has to be made to ensure that unnecessary treatment is not carried out particularly cholesystectomy in patient with gallstones as an incidental fining.

2.4.2 The normal gall bladder:

Fasting for a minimum of six hours should ensure distension of gall bladder for visualization of the lumen. Scanning in tow positions supine and the left lateral position ensures optimal visualization with a 3.5 or 5 MHz probe. The normal gall bladder contains anechoic bile and has a mural thickness of 3mm or less High frequency scanning is able to define the three layers of the mucosa, muscular is and serosa. Concentration is demonstrable following a fatty meal but this feature rarely aids in diagnosis The spiral valves of heisted appear echogenic with acoustic shadowing and have to be differentiated from calculi.

2.4.3 Gallstones:

The accuracy of ultrasound in detection of gallstones is over 98%; false negative are usually due to observer error or technical limitation such patient obesity. Gall stones are characteristically echogenic, with posterior acoustic shadowing consequent to their crystalline matrix and often lie within the portion of the gallbladder. They may be freely mobile as the patients position change but is an inconsistent feature.

2.4.4 Cholecystitis:

In acute cholecystitis, recognized feature is circumferential halo of low echogenicity with mural thickening of greater than 3mm in the fasting state. Calculi may be present but a calculus cholecystitis is recognized although an uncommon entity. Local tenderness on scanning is a key feature as there are conditions which result mural thickening, in absence of active biliary disease:

These are portal hypertension with or without cirrhosis, acute hepatitis, ascites of any cause, and chronic renal failure. Echogenic bile which occurs as a result of stasis and hyper concentration of bile, may be present, but obstruction and not inflammation is etiologic factor Hence its occurrence in computed tomography is reserved for those patient where is doubt as to the cause of obstruction an in staging of biliary tumors particularly cholangiocarinoma, lobar atrophy, vascular encasement, or occlusion, and presence of lymphadenopathy.

2.4.5 Normal bile ducts;

Extra hepatic ducts: It may be difficult to see the extra hepatic bile ducts. Particularly with a linear transducer. Use a curvilinear or sector transducer if available. Move the patient into different positions, varying the scanning techniques as much as possible wherever the extra hepatic ducts need to be demonstrated.

Intra hepatic ducts: Intra hepatic ducts are best seen on the left side of the liver in deep inspiration .It is not easy to see the normal intra hepatic ducts on ultrasound because they are often very small and thin walled. However, when the ducts are often too small and thin-walled. However, when the ducts are dilated, they are easily seen and shown as numerous, branching irregular structures throughout the liver substance (the "branching tree" effect) near the portal veins.

2.4.6 Gallbladder in jaundice:

If the gallbladder is distended, the obstruction usually affects the common bile duct (e.g. calculus, ascaris, acute pancreatitis or carcinoma). The hepatic ducts will also be distended.

If the gallbladder is not distended or is very small, obstruction is unlikely or the obstruction is above the level of the cystic duct (e.g. enlarged lymph nodes or tumour near the porta hepatic).

2.4.7. Biliary tract in jaundice:

- Maximum diameter of normal common hepatic duct: less than 5 mm.
- Maximum diameter of normal common bile duct: less than 9 mm.
- Maximum diameter of common bile duct post-cholecystectomy: 10-12 mm.

Sometimes following surgery, and in patients over 70 years of age, the common bile duct may be a few millimeters wider (i.g 12-14 mm). Add 1 mm to all of the measurements above for each decade over 70 years of age:

1. If the intrahepatic ducts are mildly dilated, suspect biliary obstruction which can be recognized on ultrasound before there is clinical jaundice the bile ducts are not dilated, rescan after 24 hours.
2. If the extrahepatic ducts are dilated, but not the intrahepatic ducts, scan the liver parenchyma. If jaundice is persistent, the cause may be cirrhosis. But also exclude obstruction of the lower common bile duct.

Dilated intrahepatic ducts are best seen by scanning the sub-xiphoid region to show the left lobe of the liver. They will appear as tubular structure parallel to the portal vein, both centrally and extending into the periphery of the liver. If it seems that there are two vessels running parallel, one is most likely a dilated bile duct, which will also be seen extending elsewhere in the liver, probably about the same size as the portal vein.

2.5 Magnetic Resonance imag Patient Preparation and MRCP

2.5.1Procedure:

No patient preparation is required for MRCP but fasting 2-4 hours prior to the examination can be beneficial because it reduces the fluid in the gastric antrum and the duodenum, which may overlie the ducts. The MRCP examination takes 30-40 minutes. If a complete MRI of the liver and pancreas is necessary, the entire procedure takes about one hour and may include the administration of a contrast agent.

When patients have suspected biliary or pancreatic disease, ultrasound imaging is the traditional screening technique. However, ultrasound is limited in its ability to image abnormalities in the biliary and pancreatic ductal systems and further evaluation may be necessary with either endoscopic retrograde cholangiopancreatography (ERCP) or MRCP.

ERCP is a minimally invasive procedure that combines endoscopy with the injection of iodinated contrast agent into the biliary and pancreatic ducts. ERCP has the advantage of combining diagnosis with intervention. In addition, manometry can be performed and the ampulla can be directly visualized. However, ERCP carries a small but significant risk of complications, including pancreatitis, hemorrhage, and perforation. At MGH, the complication rate is 1-2%, significantly lower than the national average. In addition, ERCP may be difficult in patients with post-surgical anastomotic complications.

MRCP is a less costly, non-invasive, and sensitive technique for evaluating the biliary and pancreatic ductal systems. In MRCP, multiplanar images are obtained parallel to the orientation of the biliary tree, using an MR sequence that is sensitive to static fluid without the need for exogenous contrast agents. Fluid in the ducts appears bright against the darker tissue. Image post-processing (maximal intensity projection) is used to make multi-dimensional images of the entire biliary tree and the pancreatic ducts. Although MRCP images have somewhat lower resolution than ERCP, MRCP shows the ducts in their natural, non-distended state and can easily be combined with MRI of the surrounding viscera.In this study initial ultrasonography evaluation was followed by MRCP,Transabdominal ultrasonography was done with convex 1 to 5MHZ probe using seimens sonoline G60. The patients were then referred to the radiology Department and after giving inform consent ,the paient underwent MRCP on 1.5 tesla MAGNTOM AVANTO machine.The position of the patient was kept supine and 8 channel upper body array coil was used .FOV 34 cm ,frequency 256 MHZ phase 128,NEX2,bandwidth and auto frequency of water were used . FRFSE-XL pulse sequence was used and image were obtained in 3D mode.MRCP images were evaluated on viewing console by senior consultant radiologist blined to the finding USG. Histopathological diagnosis ,surgical findings(as applicable) were considered as reference.

General Guidelines for the Selection of MRCP or ERCP

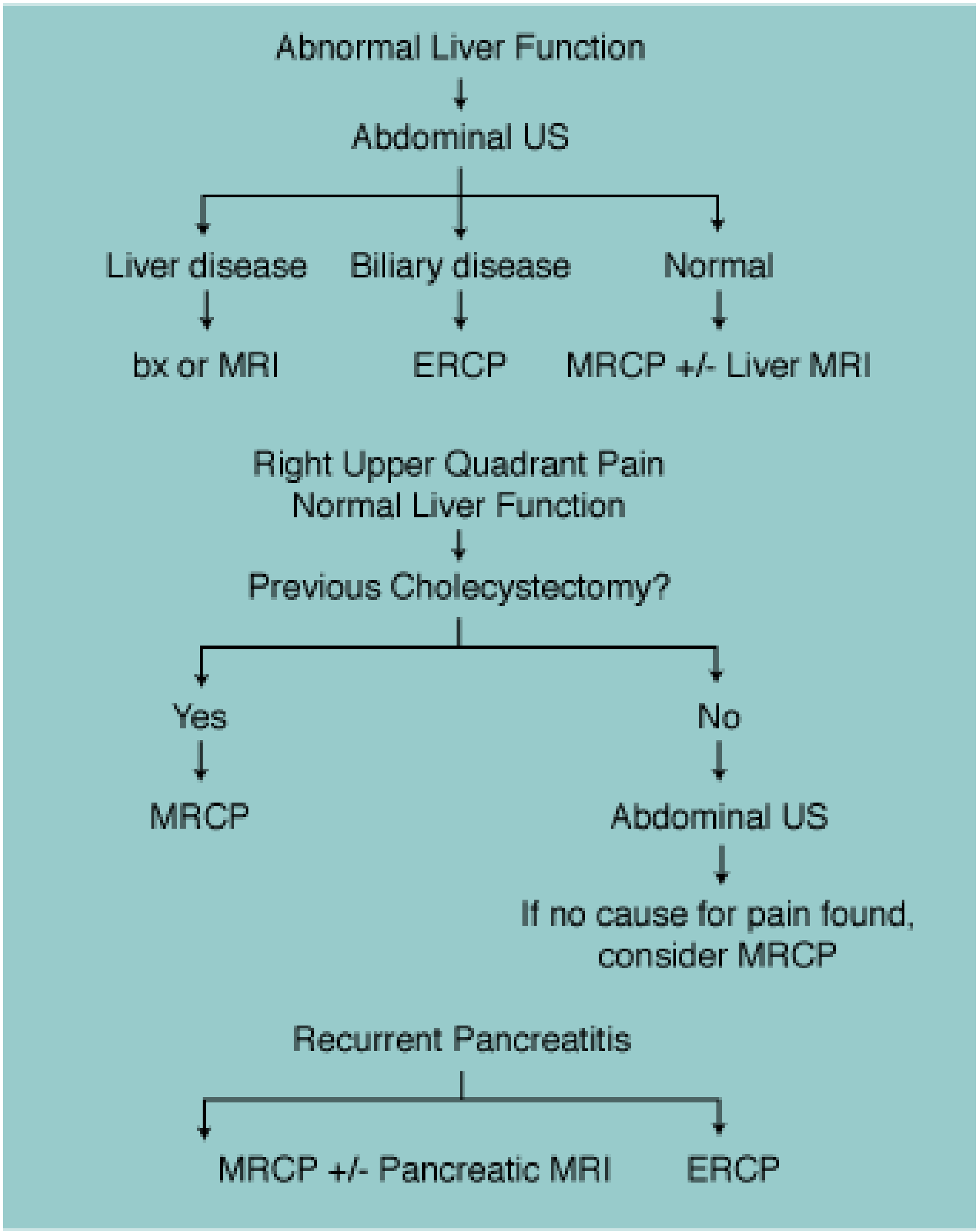


Fig no 2- 4

Introduction:

Magnetic resonance cholangiopancreatography (MRCP) is a medical imaging technique, which uses magnetic resonance to visualize the biliary tree and pancreatic ducts in a non-invasive way. Though several variations of this technique have been developed in the recent years, they all share the use of a heavily T2W pulse sequence, which selectively displays static or slow-moving fluid-filled structures as high intensity areas. The recent development of many three dimensional (3D) sequences has substantially enhanced the quality of the MRCP images. Likewise, the introduction of hepatobiliary contrast media and secretin, has enabled functional assessment of biliary excretion and the exocrine pancreas, respectively.

In this article, we present new MRCP techniques using 3D acquisition and the role of functional MRCP. In addition, we discuss commonly imaged biliary and pancreatic duct pathologies, including congenital anomalies, obstruction, trauma and tumors.

When patients have suspected biliary or pancreatic disease, ultrasound imaging is the traditional screening technique. However, ultrasound is limited in its ability to image abnormalities in the biliary and pancreatic ductal systems and further evaluation may be necessary with either endoscopic retrograde cholangiopancreatography (ERCP) or MRCP.

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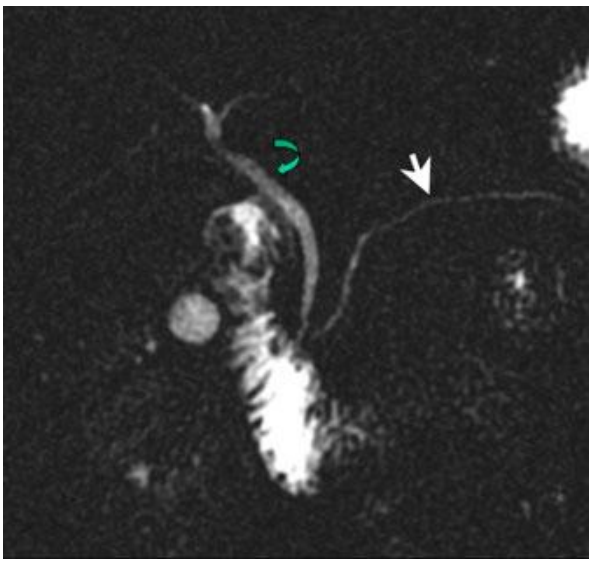
Genthe Selection oeral Guidelines for f MRCP or ERCP



Normal MRCP image showing the common bile duct (curved arrow) and the pancreatic duct (arrow). Note the fluid filled duodenum.fig No 2-5

Diseases Diagnosed by MRCP:

MRCP can diagnose the presence of bile duct obstruction and the level of obstruction in most cases. Biliary calculi smaller than 6 mm can be missed although 2 mm calculi can be seen in some cases. Primary sclerosing cholangitis can be diagnosed from the multiple irregular strictures seen in the biliary ducts. Benign and malignant causes of biliary dilatation can be differentiated and, as MRCP can be coupled with imaging of the adjacent viscera, malignant neoplasms and metastases can be detected and evaluated.

MRCP has an advantage over ERCP for the detection of cholangiocarcinoma, since there is a risk sepsis following ERCP. Post-operative bile-duct injuries and anastomotic leaks can be readily detected with MRCP and it is suitable for assessment of the biliary tree after orthotopic liver transplantation.

In patients with recurrent pancreatitis, MRCP can be performed to look for stones, divisum, or strictures. MRCP in conjunction with MRI can be used to evaluate parenchymal changes due to pancreatitis or to detect pancreatic cancer.

Biliary Disease:

- Cystic disease of bile duct (choledochal cyst, choledochocele, Caroli's disease).
- Congenital variants (low or medial duct insertion, aberrant right hepatic duct).
- Choledocholilithiasis.
- Primary sclerosing cholangitis.
- Post-surgical biliary complications.
- Cholangiocarcinoma.

Pancreatic Disease:

- Pancreas divisum.
- Chronic pancreatitis.

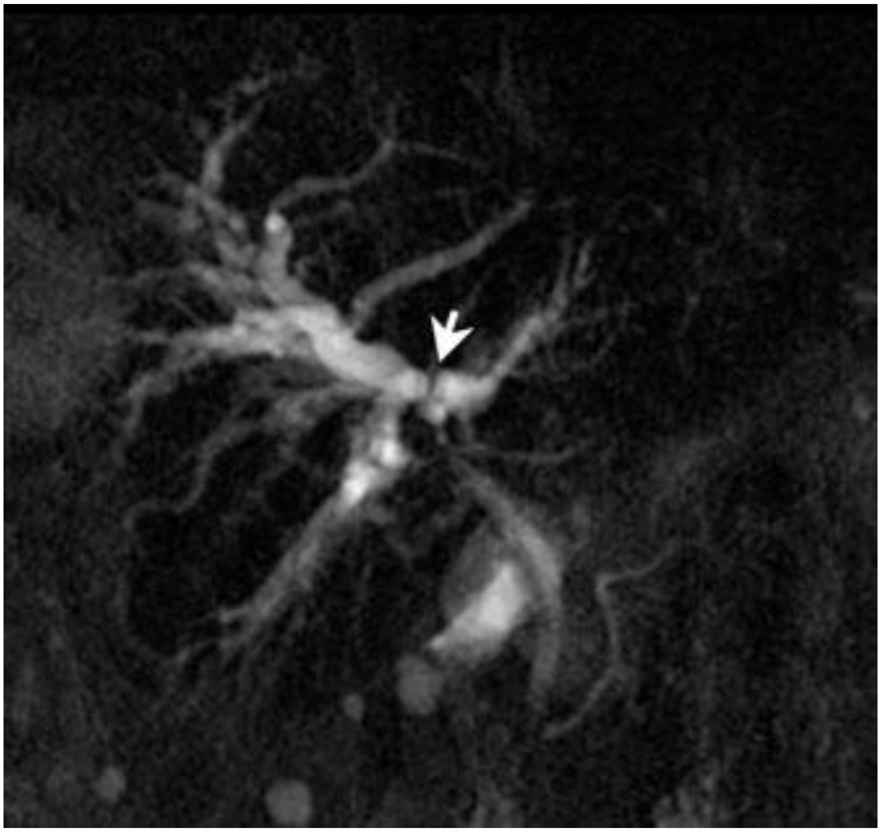
Limitations:

MRCP should be considered as alternative to ERCP or prior to ERCP for:

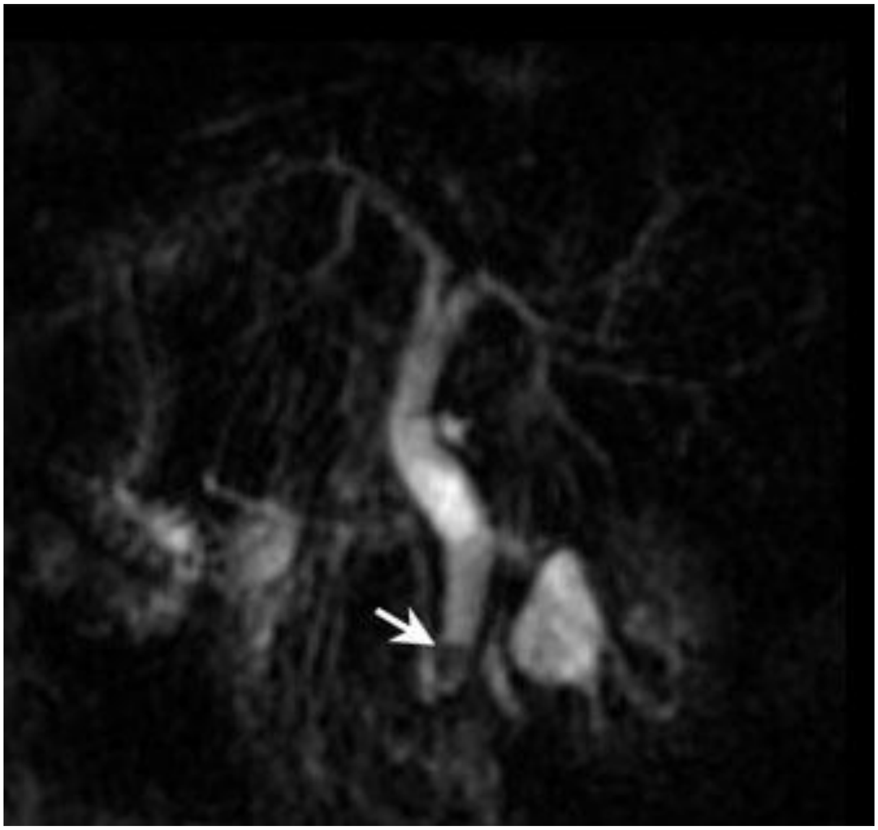
1. Pediatric patients, elderly patients, and those with many comorbidities.
2. Acute pancreatitis.
3. Cholangitis.

Patient Preparation and MRCP Procedure:

No patient preparation is required for MRCP but fasting 2-4 hours prior to the examination can be beneficial because it reduces the fluid in the gastric antrum and the duodenum, which may overlie the ducts. The MRCP examination takes 30-40 minutes. If a complete MRI of the liver and pancreas is necessary, the entire procedure takes about one hour and may include the administration of a contrast agent.



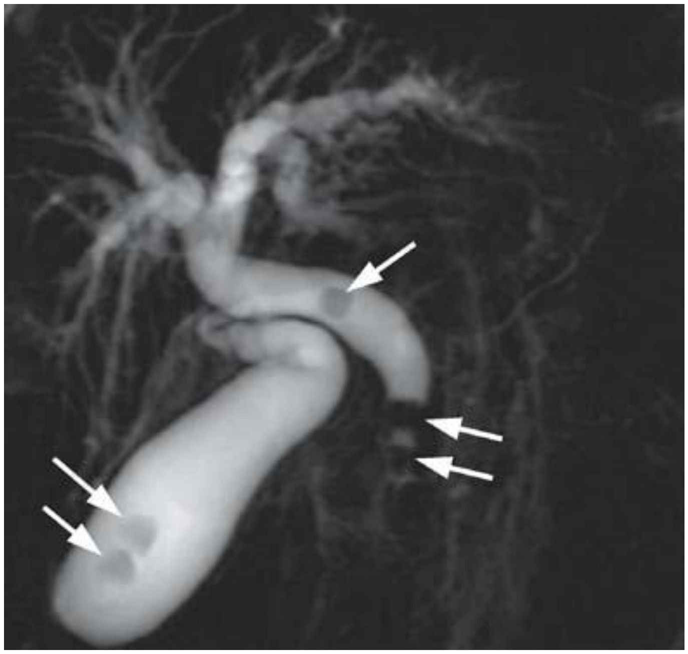
Klatskin Tumor of the Bile Duct. MRCP image shows dilatation of intrahepatic ducts along with stricture from the tumor seen at the confluence of right and left intrahepatic ducts (arrow). Note the normal caliber of distal common bile duct and pancreatic duct. Fig No 2-6



Common Bile Duct Stone. MRCP image shows a dilated bile duct with a dark stone (arrow) in its distal end. Fig No 2-6

Magnetic resonance cholangiopancreagraphy (MRCP) is becoming established as a non-invasive alternative to evaluate the biliary tree. This technique uses either a body coil or multi-coil in magnets of greater than 0.5 Tesla field strength. The high signal ('bright bile') techniques are commonly preferred and can be performed using either Contrast-Enhanced fourier

acquired Steady-State (CE-FAST) or fast Spin-Echo (FSE) pulse sequence in the coronal plane without intravenous constrast media. The former is a fig No 2-8



variant of gradient-echo imaging and utilizes a heavily T2-weighted breath hold sequence. This sequence is extremely motion sensitive and to date the published series have been limited to using a body coil only, resulting in reduced resolution. The fast Spin-Echo method is a variant of spin-echo imaging with long echo and repletion times. Although repeated acquisitions are required, the use of multi coil or flexible surface coils allows higher signal to noise ratio and smaller field of view resulting in improved resolution. Fat suppression further enhances image quality. Both techniques require image processing with a Maximum Intensity Projection (MIP) algorithm, allowing rotation of the summed image and display of the cholangiogram to best advantage.

2.6 Radionuclide imaging:

I-$_{131}$ rose Bengal has now been superseded by derivates of 99 m Tic-labeled N-substituted iminodiacetic acid, e.g. 99 Tc-HIDA, as the agents to study the action of the biliary tree.

Technique between 2 and 10 MCI of TC-HIDA is administered intravenously after 2-hours fast. Images are acquired over the next hour an 1-minute intervals over 24 hours to evaluate excretion. The normal 99 m TC HIDA scan provides functional and morphological information about the heatic parenchyma in the first 10 minutes, the extrahepatic biliary tree by 20 minutes and excretion into the bowel by one hour. Falsely abnormal results may occur in normal subject following an adequate period of starvation. Physiologic gallbladder contraction may occur up to 6 hours after enteric stimulation and biliary scintigraphy should not be carried out during this period. Conversely, prolonged starvation may be equally misleading as the tracer may not enter an abnormally distended gallbladder. These patients should be pretreated with cholecystokinin analogues prior to the study. ( )

2.4 Previous Studies:

2.4.1 Ultrasonography:

Common bile duct (CB D) is considered dilated if its diameter is greater than 6 n1m (exceptions include patients after cholecystectomy and some older patients). The localization of the level of the obstruction is possible in 90% and the evaluation of its character in 70% of cases.

The sensitivity of this the technique in diagnosing choledocholithiasis reaches 55-80%(4). The most serious problems are caused by stones located in distal, intrahepatic part of the common bile duct (the most frequent location) and deposits in non dilated bi le ducts. ( )

Ultrasonography is an efficient method in the diagnosis of cholangiocarcinoma that might develop at each level leading to the dilatation of proximal bile ducts. Hiliar cholangiocarcinomas (called Klatskin's tumors) are not always well depicted by U/s examination; the diagnosis is based on indirect symptoms (intrahepatic bile duct are dilated and separated in the hilus, extra hepatic bile ducts are normal). Ampullary tumors cause the most serious problems, the tUl11or is suspected when dilated common bile duct and dilated pancreatic duct are present. It must be differentiated with inflammatory changes in papilla or in head of pancreas by endoscopic examination. Pancreatic head tumors belong to the most frequent malignant causes of mechanical jaundice. In U/s the following changes are depicted: hypo echoic lesion in the head of pancreas that might be accompanied by the dilatation of pancreatic duct and occasionally, by the atrophy of pancreatic body or tail.

Ultrasound examination has various advantages its availability, low cost and noninvasive nature. It is used to monitor the course of a disease as well as to assist an invasive examination such as percutaneuos cholangiography and biopsy. The main disadvantages of UlS are its dependence on the operator's experience and patient’s conditions (constitution, cooperation during the examination). The problems occur in the case of obesity, intestinal loops expanded with gas, pnemnobile. The paralysis of right diaphragmatic leaf, recent wounds and drains. Most of the changes diagnosed with U/S require further diagnostic work-up in order to estimate their extent and character.

Ultrasound and CT are most frequently used in the initial evaluation of the biliary tract. Ultrasound is the first study in the radiological workup of patients with jaundice and suspected biliary diseases and enables a number of useful decisions to be made. For example, the cause of jaundice can be categorized as hepatic or biliary. T f dilatation of the intra-and extra hepatic biliary tree is seen, the cause of jaundice is obstructive with a 97% accuracy rate. If there is no biliary dilatation, jaundice is most likely to be hepatocellular.

Ultrasound detennines the degree of biliary obstruction, the number and location of biliary stones, the size and extent of cancer of the bile duct, and metastasis of the liver and lymph nodes. Ultrasound plays a pivotal role for further evaluation with other diagnostic tests and for the selection of management methods. It is quick, not invasive, inexpensive, and convenient for both patients and doctors. It plays a valuable role in the screening or patients with suspected biliary tract diseases, including diseases of the gall bladder.

The first studies on magnetic resonance cholangiopancreatography (MRCP) were published at the beginning of 1990s. In order to visualize bile ducts, the technique called magnetic resonance hydrography is applied. It is possible to obtain images similar to those of endoscopic cholangiography without the administration of contrast medium. When examination parameters are selected adequately, static fluid located not only in bile ducts but also in intestinal loops, cysts, in necrotic foci inside tumors and in peritoneal cavity (large ascites may significantly hinder the interpretation can be visualized). Apart from MR cholarigiography, It is possible to perform MR urography, MR myelography, MR labirynthography, MR sialography and MR hysterosalpingography. Rapidly flowing fluids (blood in vessels) are not visualized in the examination. Diagnostic efficacy of MRCP is higher while preformed together with conventional MR examination of the epigastrium. One of the advantages of this method is the visualization of bile ducts in any plane. It is possible, thanks to computer techniques of image reconstruction (maximum intensity projection).

In MRCP, fast spin-echo sequences (HASTE, 3D FSE) are applied with long effective echo time (TE eff) not shorter than 240 msec. The image obtained are C highly T2-weighted, where stationary fluid has very high signal intensity, while the signal from other tissues is minitnal. Additional reduction of background signal is, possible, thanks to the technique of selective suppression of fat.

In order to reduce motion artifacts that worsen the quality of the examination, respiratory gating or breath-holding is used. The shortest sequences last about 10 seconds and the whole examination is performed during single breath-hold. The disadvantages of 20 FSE technique is slightly worse spatial resolution. In slim people, it is indicated to apply surface coils which increase signal to noise ratio (SN ratio) and spatial resolution. In order to improve the visualization of perimpullary region some authors recommend oral administration of 200-400 ml of water before the examination. The administration of antiperistalic drugs (Buscopan, Glucagon) decreases motion artifacts resulting from bowel movement. Some authors recon1tnend intravenous administration of secretion for better visualization of distal segments of bile and pancreatic ducts. It causes Oddi's sphincter contraction and better filling of the ducts (7), In study carried out by latnes Brice the following, result are registered:

For detennining the presence of duct obstruction:

MRCP: sensitivity 98%, ERCP: sensitivity 87% " For differentiating between normal and abnormal conditions: MRCP: sensitivity 98%.

ERCP: sensitivity 87% For determining the presence of bile duct stones: MRCP: sensitivity 86(% ERCP: sensitivity 850/0).

Common bile duct stones: The sensitivity of MRCP in the diagnosis of CBDS has been reported to be 90% to 100%. MRCP can depict stones at a minimum size of 2 mm in diameter. Pitfalls in the diagnosis of CBDS include pneumobilia, hel11obilia, protein plugs, polypoid tumors, surgical clips, and signal voids frOl11 adjacent vessels.

Intrahepatic gallstones: In Japan, the incidence of intrahepatic gallstones is about 2% among patients with cholelithiasis. Intrahepatic cholangiocarcinomas are associated with intrahepatic gallstones in 20/0 to 5% of patients. On MRCP, intrahepatic gallstones appear as intraductal foci of Iow signal intensity. MRCP may fail to demonstrate stones in the peripheral bile ducts or liver parenchyma when stones are not surrounded by hyper intense bile. MRCP provides detailed information on stenosis and dilatation of the intrahepatic bile ducts, which is valuable for planning treatment either by peroercutaneous Trans hepatic cholangioscopy or surgery. ( )

Malignant obstruction: MRCP can diagnose the presence and level of malignant bile duct obstruction with an accuracy of 98%. Compared with direct cholangiography, MRCP has the advantage of depicting the site of obstruction in the both the proximal and distal bile ducts. M RCP also depicts the pancreatic duct and is useful to identify hi le duct stenosis secondary to pancreatic diseases.

Gallbladder imaging: MRCP provides information on acute cholecystitis, including gallbladder distention, edema of the gallbladder wall, stones in the gallbladder neck and cystic duct, and pericholecystic fluid collection and abscesses. These findings are readily delnonstrated by ultrasound and CT. However, MRCP may be a valuable alternative in the diagnosis of acute cholecystitis when obstructing CBDS can be detected with same imaging examination.

Normal pancreatic duct system: MRCP using single-shot FSE allows routine visualization of the normal pancreatic duct system. In our study of 30 normal subjects confined by ERCP, MRCP depicted the normal main pancreatic duct in 100%, Santorini's duct in 93%, and the uncinate process branch in 83%. MRCP correctly determined the level biliary ductal obstruction in 96% of patients diagnosed with ERCP or PTC. It identified eight of nine cases of common bile duct stenosis, 31 of 32 hepatic confluence stenoses, and all six intrahepatic stenoses seen with the other techniques.

The sensitivity value for MRCP for common bile duct stenosis were 88%. The values for biliary confluence stenosis were 96%. The study was published in the May/June issue of the Journal of Computer Assisted Tomography. Although MRCP's image resolution is not as good as that of x-ray, it completely visualizes all intrahepatic bile ducts, which may not always be possible with direct, cholangiography, said coauthor Dr. Pierre-Jean Valette, chief of gastrointestinal radiology at Hospital Edouard Herriot.

Sensitivity in diagnosing choledocholithiasis remian Iow, ranging from 20% to 80% for ultrasound, and 23% to 85% for Ct. In one study, MRCP diagnosed the presence of choledocholithiasis with a sensitivity of 97<%. Calculi generally appears as hypointense filling defects within the duct, but it is impossible to conlment on their composition on MRCP. An obstructing calculus may appear as an abrupt cutoff (that is, there is a complete lack of bile signal at the level of obstruction) from the duct with a "meniscus" sign.

Projection techniques could lead to a false-negative diagnosis because the calculi may be masked by the high signal intensity bile. We therefore strongly advocate the additional use of multislice techniques, such as HASTE, in different planes to confirm or exclude the presence of calculi. ( )

In case of malignant obstruction, the excellent spatial resolution of ERCP usually permits a detailed analysis of the morphology of bile or pancreatic-duct stricture, (such as the length, asymmetry, and distension of the ducts, and tapering ends). Earlier studies reported poor result with MRCP because the ducts were shown to be cut off at the blockage site and the stricture itself could not be assessed. A combination of routine spin-echo sequences and free breath-hold MRCP has improved accuracy: 95% sensitivity, 980/0, and characterization of the type of obstructing euplastic in 640/0 of cases, when there is an occlusion or high-grade obstruction, MRCP depicts the intrahepatic bile ducts more reliably than ERCP. MRCP can provide a complete Inap of the biliary tree. An axial projection i_ideal for showing the intrahepatic strictures.

Asymptomatic patients (those without significant jaundice, itching, etc.) with unrespectable tumors and Inutile intrahepatic strictures can be spared a biliary drainage that may be of doubtful benefit. Correlation of dilated ducts on -MRCP with images of surrounding hepatic parenchyma provides a Ineans of planning optional non surgical drainage in patients with complex hailer stricture. This avoids drainage of atrophic segments that also contain dilated ducts.

A complete tumor staging process that can demonstrate involvement of the liver, portal nodes, and vein can often be obtained fron1 the axial MRCP and fron1 additional conventional '1'1 weighted parenchymal images. The following studies were done to determine the sensitivity of MRCP in detecting biliary obstruction:

- Tayles et al 2002 (98%).
- Laokpessi et al 2001 (93%).
- Sotiris et al 200 (87%

CHAPTER THREE

Chapter three

3.1 Material and method:

This is prospective study which is done to evaluate the role of Magnetic Resonance cholangiopancreatogrphy (MRCP) in the evaluation of obstructive jaundice.

3.1.1 Study duration:

The study is conducted between april 2015 and april 2016.

In Ribat university hospital.

3.1.1Sampling and simple size:

Eighty patients who were suspected with obstructed jaundice included in this study.

3.1.3 Included criteria:

All patient who were suspected with obstructed jaundice.

3.1.4 Excluded criteria:

Patient who already diagnosed as obstructed jaundice and treated are excluded.

3.1.5 Data collection:

The data was collected by data sheet ,which include all variables such as patient age, gender duration of symptoms in addition to other complains to satisfy the study.

3.1.6 Machine:

– Machine Siemens 1.5 tesla superconductive type

3.2 Methods

3.2.1 Ivestigation protocols

Magnetic resonance cholangiopancreatography (MRCP) is a special type of magnetic resonance imaging (MRI) exam that produces detailed images of the hepatobiliary and pancreatic systems, including the liver, gallbladder, bile ducts, pancreasand pancreatic duct.

Magnetic resonance imaging (MRI) is a noninvasive medical test that physicians use to diagnose and treat medical conditions.

MRI uses a powerful magnetic field, radio frequency pulses and a computer to produce detailed pictures of organs, soft tissues, bone and virtually all other internal body structures. MRI does not use ionizing radiation (x-rays).

Detailed MR images allow physicians to evaluate various parts of the body and determine the presence of certain diseases. The images can then be examined on a computer monitor, transmitted electronically, printed or copied to a CD.

*What are some common uses of the procedure?

*Physicians use MRCP to:

- Examine diseases of the liver, gallbladder, bile ducts, pancreas and pancreatic duct. These may include tumors, stones, inflammation or infection.
- Evaluate patients with pancreatitis to detect the underlying cause. In patients with pancreatitis, an MRCP may be performed using a

medication called Secretin to assess for long term scarring and to determine the amount of healthy pancreatic function and secretions.

- Help to diagnose unexplained abdominal pain.
- Provide a less invasive alternative to endoscopic retrograde cholangiopancreatography (ERCP). ERCP is a diagnostic procedure that combines endoscopy, which uses an illuminated optical instrument to examine inside the body, with iodinated contrast injection and x-ray images.

*patient preparation

You may be asked to wear a gown during the exam or you may be allowed to wear your own clothing if it is loose-fitting and has no metal fasteners.

Guidelines about eating and drinking before an MRI exam vary at different facilities. Usually, you will be instructed not to eat or drink anything for several hours before your procedure. Because your procedure may require use of contrast material that is swallowed or injected into your bloodstream, theradiologist or technologist may ask if you have allergies of any kind, including allergies to food or drugs, hay fever, hives or allergic asthma. However, the contrast material used for an MRI exam is based on gadolinium and does not contain iodine. A gadolinium contrast agent is less likely to cause an allergic reaction compared to the iodinated contrast agents used in CT scanning.

The radiologist should also know if you have any serious health problems and what surgeries you have undergone. Some conditions, such as kidney disease, may prevent you from having an MRI with contrast material.

Women should always inform their physician or technologist if there is any possibility that they are pregnant. MRI has been used for scanning patients since the 1980s with no reports of any ill effects on pregnant women or their unborn babies. However, because the unborn baby will be in a strong magnetic field, pregnant women should not have this exam in the first trimester of pregnancy unless the potential benefit from the MRI exam is assumed to outweigh the potential risks. Pregnant women should not receive injections of gadolinium contrast material except when absolutely necessary for medical treatment.

If you have claustrophobia (fear of enclosed spaces) or anxiety, you may want to ask your physician for a prescription for a mild sedative prior to your scheduled examination. Jewelry and other accessories should be left at home if possible, or removed prior to the MRI scan. Because they can interfere with the magnetic field of the MRI unit, metal and electronic items are not allowed in the exam room. These items include:

- Jewelry, watches, credit cards and hearing aids, all of which can be damaged.
- Pins, hairpins, metal zippers and similar metallic items, which can Distort MRI images.
- Removable dental work.
- Pens, pocket knives and eyeglasses.
- Body piercings.

In most cases, an MRI exam is safe for patients with metal implants, except for a few types. People with the following implants cannot be scanned and should not enter the MRI scanning area:

- Cochlear (ear) implant.
- Some types of clips used for brain aneurysms.
- Some types of metal coils placed within blood vessels.
- Nearly all cardiac defibrillators and pacemakers.

You should tell the technologist if you have medical or electronic devices in your body. These objects may interfere with the exam or potentially pose a risk, depending on their nature and the strength of the MRI magnet. Many implanted devices will have a pamphlet explaining the MRI risks for that particular device. If you have the pamphlet, it is useful to bring that to the attention of the technologist or scheduler before the exam. Some implanted devices require a short period of time after placement (usually six weeks) before being safe for MRI examinations. Examples include but are not limited to:

- artificial heart valves
- implanted drug infusion ports
- artificial limbs or metallic joint prostheses
- implanted nerve stimulators
- metal pins, screws, plates, stents or surgical staples

In general, metal objects used in orthopedic surgery pose no risk during MRI. However, a recently placed artificial joint may require the use of another imaging procedure. If there is any question of their presence, an x-ray may be taken to detect and identify any metal objects.

Patients who might have metal objects in certain parts of their bodies may also require an x-ray prior to an MRI. You should notify the technologist or radiologist of any shrapnel, bullets, or other pieces of metal which may be present in your body due to prior accidents. Foreign bodies near and especially lodged in the eyes are particularly important. Dyes used in tattoos may contain iron and could heat up during MRI, but this is rarely a problem. Tooth fillings and braces usually are not affected by the magnetic field, but they may distort images of the facial area or brain, so the radiologist should be aware of them.

Your child may need to be sedated in order to hold still adequately during the procedure. If this is the case, you will be given instructions for your child about not eating or drinking several hours prior to sedation and the examination. For the safety of your child during the sedation, it is important that you fully understand and follow any instructions that have been given. After the procedure there will be a recovery period from the sedation. Your child will be discharged when the nurses and physicians believe he/she is sufficiently awake to be safely sent home.

*What does the equipment look like?

The traditional MRI unit is a large cylinder-shaped tube surrounded by a circular magnet. You will lie on a moveable examination table that slides into the center of the magnet.

Some MRI units, called short-bore systems, are designed so that the magnet does not completely surround you. Some newer MRI machines have a larger diameter bore which can be more comfortable for larger size patients or patients with claustrophobia. Other MRI machines are open on the sides (open MRI). Open units are especially helpful for examining larger patients or those with claustrophobia. Newer open MRI units provide very high quality images for many types of exams; however, older open MRI units may not provide this same image quality. Certain types of exams cannot be performed using open MRI. For more information, consult your radiologist.

The computer workstation that processes the imaging information is located in a separate room from the scanner.

*How does the procedure work?

Unlike conventional x-ray examinations and computed tomography (CT) scans, MRI does not utilize on ionizing radiation. Instead, radio waves redirect alignment of hydrogen atoms that naturally exist within the body while you are in the scanner without causing any chemical changes in the tissues. As the hydrogen atoms return to their usual alignment, they emit energy that varies according to the type of body tissue from which they come. The MR scanner captures this energy and creates a picture of the tissues scanned based on this information.

The magnetic field is produced by passing an electric current through wire coils in most MRI units. Other coils, located in the machine and in some cases, placed around the part of the body being imaged, send and receive radio waves, producing signals that are detected by the coils.

A computer then processes the signals and generates a series of images, each of which shows a thin slice of the body. The images can then be studied from different angles by the interpreting radiologist.

Frequently, the differentiation of abnormal (diseased) tissue from normal tissues is better with MRI than with other imaging modalities such as x-ray, CT and ultrasound.

*How is the procedure performed?

MRI examinations may be performed on out patients or inpatients. You will be positioned on the moveable examination table. Straps and bolsters may be used to help you stay still and maintain the correct position during imaging.

Devices that contain coils capable of sending and receiving radio waves may be placed around or adjacent to the area of the body being studied.

If a contrast material will be used in the MRI exam, a physician, nurse or technologist will insert an intravenous (IV) catheter, also known as an IV line, into a vein in your hand or arm. A saline solution may be used to inject the contrast material. The solution will drip through the IV to prevent blockage of the IV catheter until the contrast material is injected.

You will be placed into the magnet of the MRI unit and the radiologist and technologist will perform the examination while working at a computer outside of the room.

If a contrast material is used during the examination, it will be injected into the intravenous line (IV) after an initial series of scans. Additional series of images will be taken during or following the injection.

The actual MRCP exam takes about 10 minutes, but it is often performed with a standard MRI of the abdomen, which may last approximately 30 minutes and involves the use of contrast material. In this case, the entire examination is usually completed within 45 minutes.

*What will I experience during and after the procedure?

Most MRI exams are painless. However, some patients find it uncomfortable to remain still during MR imaging. Others experience a sense of being closed-in (claustrophobia). Therefore, sedation can be arranged for those patients who anticipate anxiety, but fewer than one in 20 require medication.

If contrast material is used, there may be brief discomfort during initial placement of the intravenous catheter line. The oral contrast used at some institutions may have an unpleasant taste and cause temporary fullness, but most patients usually tolerate it well.

It is normal for the area of your body being imaged to feel slightly warm, but if it bothers you, notify the radiologist or technologist. It is important that you remain perfectly still while the images are being obtained, which is typically only a few seconds to a few minutes at a time. You will know when images are being recorded because you will hear and feel loud tapping or thumping sounds when the coils that generate the radiofrequency pulses are activated. Some centers provide earplugs, while others use headphones to reduce the intensity of the sounds made by the MRI machine. You will be able to relax between imaging sequences, but will be asked to maintain your position without movement as much as possible.

You will usually be alone in the exam room during the MRI procedure. However, the technologist will be able to see, hear and speak with you at all times using a two-way intercom. Many MRI centers allow a friend or parent to stay in the room as long as they are also screened for safety in the magnetic environment.

Children will be given appropriately sized earplugs or headphones during the exam. MRI scanners are air-conditioned and well-lit. Music may be played through the headphones to help you pass the time.

In some cases, intravenous injection of contrast material may be performed. The intravenous needle may cause you some discomfort when it is inserted and you may experience some bruising. There is also a very small chance of irritation of your skin at the site of the IV tube insertion. Some patients may sense a temporary metallic taste in their mouth after the contrast injection.

If you have not been sedated, no recovery period is necessary. You may resume your usual activities and normal diet immediately after the exam. On very rare occasions, a few patients experience side effects from the contrast material, including nausea and local pain. Similarly, patients are very rarely allergic to the contrast material and experience hives, itchy eyes or other reactions. If you experience allergic symptoms, notify the technologist. A radiologist or other physician will be available for immediate assistance

What are the benefits vs. risks?

Benefits

- MRI is a noninvasive imaging technique that does not involve exposure to ionizing radiation.
- MR images of the soft-tissue structures of the body—such as the heart, liver, pancreas and many other organs—are clearer and more detailed than with other imaging methods. This detail makes MRI an invaluable tool in early diagnosis and evaluation of cancer.

- MRI has proven valuable in diagnosing a broad range of conditions, including heart and vascular disease, stroke, and joint and musculoskeletal disorders.
- MRI can help physicians evaluate both the structure of an organ and how it is working.
- MRI enables the discovery of abnormalities that might be obscured by bone with other imaging methods.
- The contrast material used in MRI exams is less likely to produce an allergic reaction than the iodine-based contrast materials used for conventional x-rays and CT scanning.
- MRCP can produce images comparable to those obtained by a more invasive exam called endoscopic retrograde cholangiopancreatography (ERCP) without its associated risks including pancreatitis, or inflammation of the pancreas, perforation of pancreatic and bile ducts and bowel, and the risks for intravenous sedation required for ERCP.

*Risks:

- The MRI examination poses almost no risk to the average patient when appropriate safety guidelines are followed.
- If sedation is used, there are risks of excessive sedation. However, the technologist or nurse monitors your vital signs to minimize this risk.
- Although the strong magnetic field is not harmful in itself, implanted medical devices that contain metal may malfunction or cause problems during an MRI exam.
- Nephrogenic systemic fibrosis is currently a recognized, but rare, complication of MRI believed to be caused by the injection of high

doses of gadolinium-based contrast material in patients with very poor kidney function. Careful assessment of kidney function before considering a contrast injection minimizes the risk of this very rare complication.

- There is a very slight risk of an allergic reaction if contrast material is injected. Such reactions usually are mild and easily controlled by medication. If you experience allergic symptoms, a radiologist or other physician will be available for immediate assistance.
- Reaction to the oral contrast given at some institutions for MRCP is very rare. Also, the oral contrast used at some institutions may have an unpleasant taste and cause temporary fullness, but most patients usually tolerate it well.
- Manufacturers of intravenous contrast indicate mothers should not breastfeed their babies for 24-48 hours after contrast medium is given. However, both the American College of Radiology (ACR) and the European Society of Urogenital Radiology note that the available data suggest that it is safe to continue breastfeeding after receiving intravenous contrast. For further information please consult the ACR Manual on Contrast Media and its references.

*What are the limitations of MRCP?

High-quality images are assured only if you are able to remain perfectly still and follow breath-holding instructions while the images are being recorded. If you are anxious, confused or in severe pain, you may find it difficult to lie still during imaging.

A person who is very large may not fit into the opening of certain types of MRI machines.

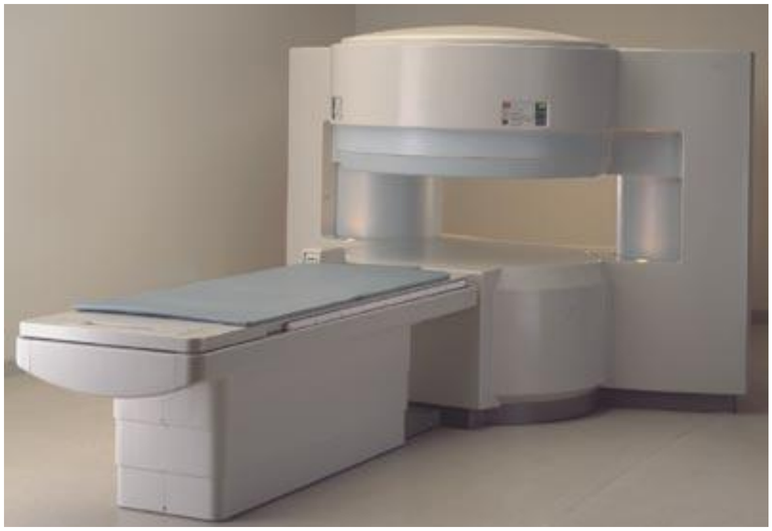
The presence of an implant or other metallic object sometimes makes it difficult to obtain clear images. Patient movement can have the same effect.

A very irregular heartbeat may affect the quality of images obtained using techniques that time the imaging based on the electrical activity of the heart, such as electrocardiography (EKG).

MRI generally is not recommended for patients who have been acutely injured; however, this decision is based on clinical judgment. This is because traction devices and many types of life support equipment must be kept away from the area to be imaged. Furthermore, the examination takes longer than other imaging modalities (typically x-ray and CT) and the results may not be immediately available, as is often necessary in trauma situations.

Although there is no reason to believe that magnetic resonance imaging harms the fetus, pregnant women usually are advised not to have an MRI exam during the first trimester unless medically necessary.

MRI may not always distinguish whether edema fluid is caused by infection, inflammation or cancer. It generally cannot detect calcium present in soft tissues such as tumor fig 3-9



Open MRI UNIT

3.3 data analysis

the data will be analyzed by using Statistical Packaged for Social Studies (SPSS) using excel analysis and statistical correlation between variables.

CHAPTER FOUR

CHAPTER FOUR

RESULT

Table(4- 1)MRCP findings of under study cases:

Case No & Sex & Age	U/S finding	MRCP finding
1 (F)30	Ca head of pancreas	Obstructed CBD
2 (F)27	Ca head of pancreas	Normal ampulla Normal pancreatic duct Normal biliary tree
3 (F)45	Ca-head of pancreas	Stricture of pancreatic duct with dilation CBD
4 (M)43	CA head of pancreas	Obstructed biliary tree
5 (M)39	Dilated CBD (stone)	Dilated CBD With filling defect (stone)
6 (F)66	Pancreatitis	Normal biliary tree normal pancreas
7 (M)63	Pancreatitis	Normal biliary tree normal pancreas
8 (M)23	Pancreatitis	Normal biliary tree normal pancreas
9 (F)29	Pancreatic cyst	Normal
10 (F)60	Pancreatitis	Pancreatic duct obstructed
11(F)50	Infection	Normal
12(M)55	Stone	Dilated hepatic duct filling defect (stone)
13 (F)42	CBD stone	Dilated common bile duct (stone)
14 (F)29	CBD stone	Dilated common bile duct (stone)
15 (F)37	Gallstones	Dilated common bile duct (stone)
16 (F)54	Cysts of ducts	Obstructed biliary tree
17 (F)45	Gallstones	Dilated common bile duct (stone)
18 (M)40	Pancreatic cyst	Obstructed biliary tree
19 (F)30	Gallstones	Dilated common bile duct (stone
20 (M)31	Gallstones	Dilated common bile duct (stone
21 (M)33	Lymph node enlargement	Obstructed biliary tree
22 (M)60	CBD stone	Dilated CBD filling defect (stone)
23 (M)50	Cholangiocarcinoma	Obstructed biliary tree
24 (F)52	Cholangiocarcinoma	Obstructed biliary tree
25 (F)55	Pancreatitis	Normal biliary tree normal pancreas

26 (M)71	Gallstones	Dilated common bile duct (stone
27 (M)77	Gallstone	Normal biliary tree &gallstone
28 (M)78	Gallstone	Normal biliary tree &gallstone
29 (M)80	CA head of pancreas	Obstruted CBD
30 (F) 45	CA head of pancreas	Dilated CBD
31 (F) 60	Mutiple gall bladder stones	Moderate dilated CBD andCHD.Destended gall bladder with multiple stones
32 (F) 45	Multiple liver sycts	There are multiple difusedhepatic sycts involving all liver
33 (F) 40	Normal	Normal GB wall thi
34 (F) 65	Dilated CBD with distended GB Impacted CBD stone	Distended GB as well as CBD .Ampuula of vaterobstruction (stone not excluded)ERCP advised
35 (F) 57	Normal study	Slight CBD dilatation post surgical change normal intrahapatic &pancreatic ducts
36 (F) 71	Obstructed billairy tree Ca pancreas	Dilated intrahepatic/CBD&pancreatic duct.with distal pancreatic mass(4x4x4) (Ca head pancrease)
37(F) 48	Large soft tissue mass seen infiltrating the anatomical region of CBD and GB fossa causing biliary obstruction	Dilated intra hepatic biliary duct (hepatic-cholangiocarcinoma)
38(M)60	Neoplasm? Colangio carcinoma	Tide stricture at the confluence of the CHD and the CBD with proximal biliary carcinoma
39(M) 45	Multiple GB stones .dilated CBD S	Gall bladder contains multiple stones CBD up to (10mm)with multiple stones .at least 3 in number seen in distal CBD.ERCP is suggested
40(M)37	Gall bladder showed multiple stones	Multiple GB stones with distal CBD stone, but no significant intra or extra hepatic biliary dilatation
41(F)41	Normal	Post operative changes are noted RT hypochondria with fibrotic tissue and subcutaneous loculated fluid collection at LT hypochondrium

42(80) M	Gall bladder stones other normal	Filling defect seen in the gall bladder due to stones. normal CBD
43(4)34 F	Normal GB dilated CBD CHD FLUID.	Cal ducal cyst type one
44(65)F	Dilated intra hepatic duct With stones in the common bile duct	Diffused dilation seen proximal CBD stones with dilated CBD &HBDs
45 (37)M	Gall stones &CBD stones	Multiple GB stones with distal CBD stones
46 (65) F	GB bladder distended as well as CBD &HD with cut of distal part CBD &and pancreatic duct filling defect	Ampulla of vater obstruction (stone not excluded ERCP is advised
47(60) M	Normal	Moderate dilated CHD&CHD with regular out line highly suggestive of filling defect (stone)or stricture.
48(45)F	Distended gall bladder and common hepatic duct	There are mild dilatation in intrahepatic bile duct ERCP is suggested
49(48) M	Dilated CBD with sludge No stricture or filling defect	Marked dilatation of intra hepatic duct And dilated common bile duct with abrupt cut off due to pancreatic mass involving the head and the body of it.
50(67)F	Distended gall bladder ?? intra ductual carcinoma For ERCP	There a marked dilation of intra hepatic And common hepatic bile ducts are dilated CBD not visualized features Suggestive of inra ductual cholangio carcinoma for ERCP to confirm
51(71)M	Acute on chronic calcular Cholecysitis .	Moderate dilatation intrahepatic duct CBD slightly dilated .
52(46) F	normal	Dilated lt hepatic duct normal remains
53(80)F	Multiple GB stones dilated CBD	Dilated CBD with prominent inra hepatic biliary ducts with two signal voids filling defect in the mid CBD causing partial CBD obstruction suggestive of CBD stones. Signal void filling defect noted GB lumen representing GB stones.

54(60)F	Dilated intra hepatic bile ducts and proximal of common hepatic ducts	Dilated intra hepatic bile ducts and proximal of common hepatic ducts .Gall with cut
55(26)M	Gall bladder stones	Normal caliper and singal intensity of Intrahepatic CBD and pancreatic ducts Gall bladder with multiple stones
56(46) M	Normal ducts gall bladder is not visualized (removed)	Normal ducts gall bladder is not visualized (removed) No abnormal soft tissue mass.
57(50)F	Gall stones .c p d &c h d are prominent. ERCP IS suggested. for assessment of the area of ampulla of vater	Gall stones .c p d &c h dare prominent. ERCP IS suggested for assessment of the area of ampulla of vater.
58(49)M	Slightly distended Gall bladder but no filling defect	No any obstructive change
59(60)F	Stones in the gall bladder	Dilated gall bladder with multiple small stones
60(30)F	Dilated gall bladder with multiple stones CBD STONES .	Dilated gall bladder with multiple stones CBD STONES .marked dilatation of intra hepatic duct .ampullary carcinoma ? pancreatic head mass showed be considered for ERCP
61(65)F	Mild dilatation of CBD an hepatic ducts with normal intrahepatic ducts	Mild dilatation of CBD an hepatic ducts with normal intrahepatic ducts feature of ampullary obstruction ? impacted stone (ERCP) Isuggested.
62 (66)M	Cholangio carcinoma	Showed all dilatation of inrahepatic ducts feature suggestive of distal cholangio carcinoma
63(47)M	Normal	Normal MRCP
64(26)F	Normal	Normal MRCP
65(50)M	Normal	Normal MRCP
66(31)F	Normal	Normal MRCP
67(66)F	Normal	Normal MRCP
68(28)F	Normal	Normal MRCP
69(24)F	Multiple impacted GB	The gallbladder shows average

	STONES	capacity with multiple filling defect seen adjacent in the neck region stones
70(30)F	Gb not seen other normal	Gb removed surgically .no intrahepatic or extra hepatic biliary dilatation normal pancreatic ducts
71(55)F	Normal	The gall bladder shows normal content Small cystic lesion
72(60) F	Normal	Minimal dilatation of intrahepatic and CBD seen.stricture of common hepatic duct seen at the junction of the cystic duct level
73(45)F	Normal	Fluid collection seen around the lower part of the GB others normal
74(49)M	Cholystasis	Slightly distended GB but no filling defects.slightly dilated common bile duct .
75(45) F	Gall bladder stone	Normal
76(35)F	Normal	Normal MRCP
77(35)M	Normal	Normal MRCP
78(50)F	GB stones	Multiple GB stones noted free bilary tree
79(76)M	Normal	Normal MRCP
80(76)F	Normal	Normal MRCP

Table (4-2): Shows distribution of samples by age

Age group	Frequency	Percentage	
20 – 30	12	15%	
31 – 41	13	16.25%	
42 – 52	23	28.75%	
53 – 63	14	17.5%	
64 – 74	11	13.75%	
75-80	7	8.75%	
Total	80	100%	

Table (4-3):

Show distribution of samples by gender:

gender	Frequency	percentage	.
Male	32	40	
female	48	60	
Total	80	100%	

Table (4-4)

Comparison of diagnostic accuracy in patients with suspected obstructed jaundice

No	Causes of obstruction	USG	Usg accuracy	MRCP	MRCP accuracy	Final diagnoses
1	choledocholithiais	20	80%	25	100%	25
2	GB Mass	5	100%	5	100%	5
3	Cholangiocarc	10	66%	15	100	15

	inoma					
4	Stricture	6	50%	10	83%	12
5	Cyst	3	100%	1	33%	3
6	Pancreatic pathology	5	100%	1	20%	5
7	Normal	4	40%	8	80%	10

CHAPTER FIVE

Chapter Five

5.1 Discussion:

In our study 42-52 years (28%) was the most common age group of patients presenting with obstructive jaundice in which males were in majority. All the cases of obstructive jaundice were evaluated on the basis of calculi, cause of obstruction, any mass lesion and the type of CBD narrowing or dilatation by both the modalities USG and MRCP. Majority of cases of biliary obstruction were due to Choledocholithiasis (31%) followed by strictures(12%), then cholangiocarcinoma (18%) then GB mass (6%), then choledochal cyst (3%), and pancreatic pathology (6%). Calculus disease-On MRCP calculus appeared as a focal round or linear low signals voids partially or completely surrounded by high T2 signal within the duct (Hekimoglu et al., 2008). The accuracy for diagnosing CBD calculus by USG was 80% and accuracy for diagnosing CBD calculus by MRCP was 100%. This result was in line with the previous studies (Munir et al., 2004). Choledochal cyst is a fusiform dilatation of the biliary tree. It appeared as a uid filled structure which is in continuity with the bile ducts and is separate from the GB (Schindera et al., 2007). In our study, there were 3 cases of choledochal cyst. The accuracy for diagnosing choledochal cyst by USG and MRCP were 100% and 33% respectively. Cholangiocarcinoma is a most common cause of malignant stricture (Kim et al., 2007). It is an intrahepatic mass with irregular borders and satellite nodules as hypo on T1W images and hyperintense on T2W images (Center, 2009). In our study, the accuracy for diagnosing cholangiocarcinoma was 66% on USG and on MRCP was 100%. This result was consistent with previous studies (Vivek et al., 2015). GB mass is a most common lesion of biliary tract. It had hyperintense signal on T2W images and hypointense signal on T1W images. It appeared as a mass which enhanced rapidly and retained contrast (Mendler et al., 1998). In our study there were five cases of GB mass. The accuracy for diagnosing GB mass by USG and MRCP was 100%. MRCP has proved to be more accurate and sensitive in the diagnosis of cause of CBD obstruction and for the accurate diagnosis and for proper differentiation between benign and malignant lesion.

5-2CONCLUSION

In patients with suspected biliary and pancreatic pathology, USG is a good screening method but it is less accurate for diagnosing the distal CBD obstruction. MRCP on the other hand has the high sensitivity and specificity (approaching 100%) for diagnosing the level, cause and extent of biliary obstruction and hence should be the modality of choice for all the patients presenting with obstructive jaundice.

5-3 Recommendation:

- MRCP has a good roll in the evaluation of obstructive jaundice without using ionizing radiation & contrast media or sedation.
- It is important to start with MRCP before doing ERCP in any patient which did not conformed with U/S.
- It is important to do plain ct scan abdomen complementary if MRCP failed to demonstrate the stones.

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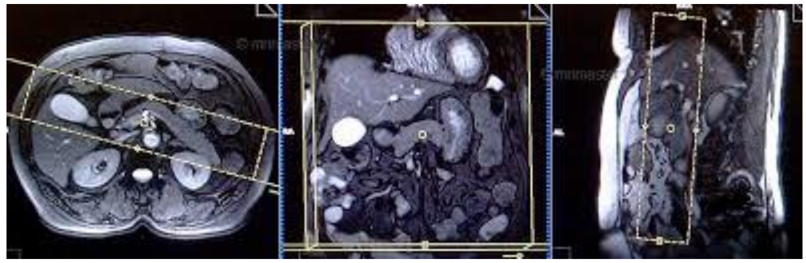
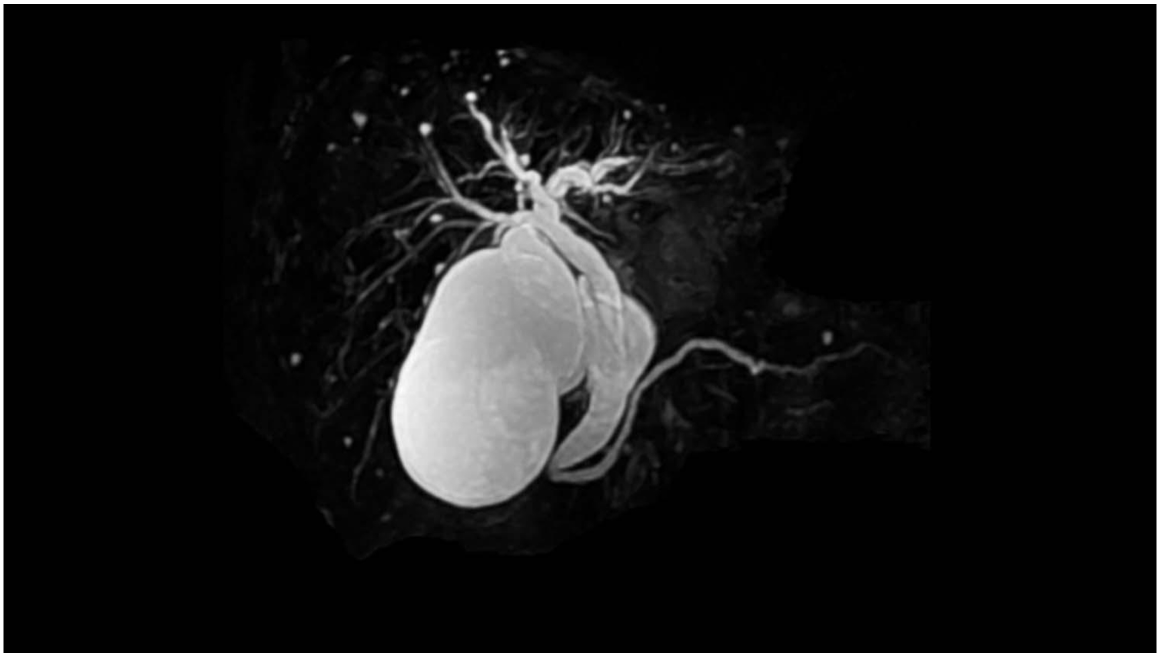
APPENDIX



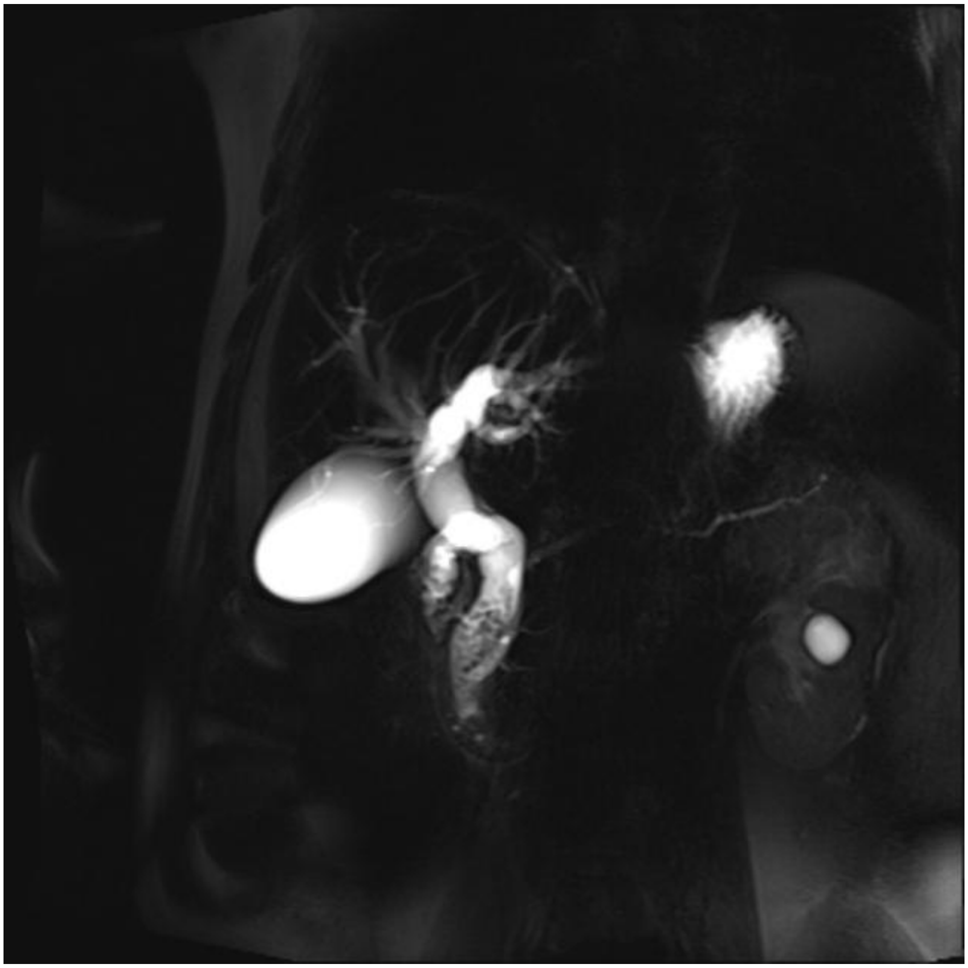
Localizer for planning to Mrcp protocol

Normal Mrcp study

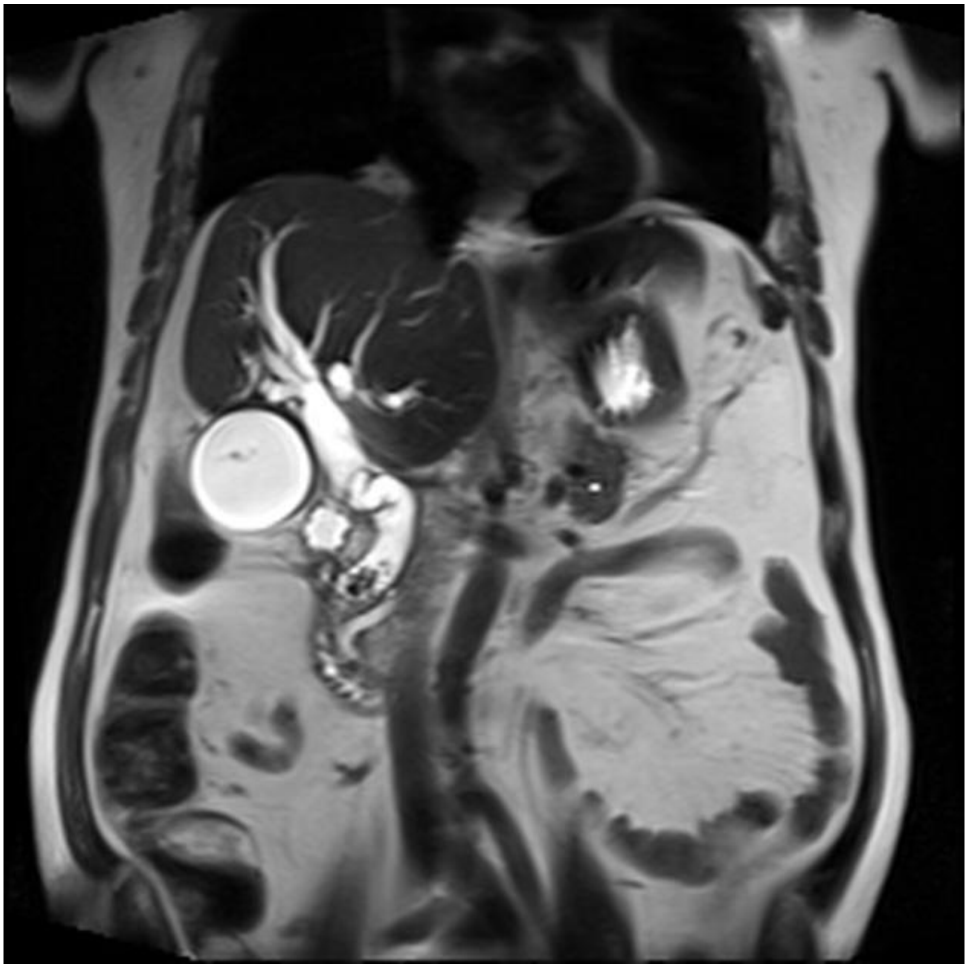
MRCP with cholangiocarcinoma



Distended gallbladder due to obstruction



T2 cor Case of CBD stones



Case No1 cor t2 CBD stones

MRCP With complimentary ct scan abdomen obstructive jaundice(ca head pancreas)