Sudan University of Sciences and Technology

Collage of Graduate Studies

Study of The liver Diseases Using Computed Tomography in Sudanese Patients.

دراسة امراض الكبد باستخدام الاشعة المقطعية المحوسبة لدى المرضى السودانيين

A Thesis Submitted for Partial fulfillment for the Requirements of M.Sc. Degree in Diagnostic Radiological Imaging

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الآيـــــــــة:

قال تعالى:

"وَلَا تَقْفُ مَا لَيْسَ لَكَ بِهِ عِلْمٌ إِنَّ السَّمْعَ وَالْبَصَرَ وَالْفُؤَادَ كُلُّ أُولَئِكَ كَانَ عَنْهُ مَسْئُولًا"

صدق الله العظيم

سورة الاسراء الاية 36

Dedication

To Allah the merciful the glorious

Who gave me soul and spirit

To our parents

Who gave faith and confidence

To our teachers

To every one

Who helped and guided

To all of them we

dedicate this of

work

Acknowledgement

All the praises and thanks to allah for making dream come true.

We sincere thanks and appreciation to Dr. *Hussien Ahmed Hassan* for advice and great effort and support.

We sincere thanks and appreciation to Dr.Murtada Mohamed Ibraheem.

Also wethanks and appreciation to my parents,my husband and my sister aya

We wish to thank everyone helped us to make the search out this way.

Abstract

The study was retrospective study conducted in Khartoum state in Antalya medical center, radiology department from Ague 2017 to Oct 2017.

The problem of the study was increasing in the patients suffering from liver diseases.

The study aimed to study the pathological findings of liver in Sudanese patients in order to classify the most common .The data was collected from 54 patients classified and analyzed using SPSS.

The study found that the most common liver diseases is the masses and it is more common in male than female.

The study recommended that the researchers use larger group sample to achieve more specific results.

المستخلص

هذه دراسة وصفية لامراض الكبد الاكثر شيوعا باستخدام الاشعة المقطعية المحوسبة في المرضى السودانيين ، تمت في ولاية الخرطوم , مركز انطاليا الطبي وقد شملت 54 مريض وتم تضمين بياناتهم (العمر,النوع ,نتائج الفحص) في الفترة من اغسطس 2027 حتى اكتوبر2017, تكمن مشكلة الدراسة في ازدياد اعداد المرضى الذين يعانون من امراض الكبد .تم جمع البيانات وتصنيفها وتحليلها ,ووجدت الدراسة ان اكثر امراض الكبد شيوعا حسب نتائج الاشعة المقطعية المحوسبة هي اورام الكبد حيث كان المعدل اعلفي الذكور من الاناث وتمت مقارنة النتائج بدراسة سسابقة في نفس المجال وجدت ان نسبة المصابين بخلل فيالكبد اعلى بنسبة 1% .اوصت الدراسة الباحثين باستخدام عينة اكبر للحصول على نتائج اكثر دقة .

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1.1 Introduction

The liver diseases are characterized by the sudden onset either acute or chronic liver diseases, which requires emergency medical or surgical consultation. It can be caused by diseases of any of the liver organs or organ systems, and, as such, the acute liver represents a physical condition rather than a disease. However, extra abdomen may also lead cause an acute liver diseases. A rapid and accurate diagnosis is essential because various potentially life-threatening processes may be the underlying causes of the physical complaints. Because of the wide spectrum of diseases that may cause an acute abdomen, the use of imaging techniques, in particular, multi detector computed tomography (MDCT) is often warranted because of their ability to suggest alternative diagnoses if the suspected clinical diagnosis is unconfirmed by ultrasonography (US). Depending on the clinical pattern and basic diagnosis, the treatment of such injuries requires a balance between the quick availability, the possible diagnostic benefit of additional and potential radiation exposures by imaging, possible time delay. These circumstances are particularly relevant for patients with life-threatening illnesses, when MDCT should be immediately being performed, and for pregnant woman when dedicated MRI can be a diagnostic option. Thus, early use of MDCT has been shown to reduce the number of serious diagnoses that are missed. Advanced diagnostics that may be used to guide and treat both trauma and non-trauma patients include such techniques as endoscopy or selective angiography, e.g., for the treatment of gastrointestinal or visceral organ hemorrhage. Parenchymateous organ or hollow organ visceral bleeding, including perforations, is representative of classical, life-threatening

diagnoses secured by MDCT. However, advanced testing in patients that require surgery for abdominal emergencies will result in a delay in the necessary treatments. (Terkko navigator- 2001)

As the use of multi detector-row computed tomography (MDCT) becomes more widespread, potential applications continue to develop. In patients with acute liver diseases, MDCT has the potential to fill the roles currently served by the more invasive and time-consuming conventional digital subtraction angiography (DSA). Automated processing methods may also enable MDCT to image complex structures, such as the bowel in three dimensions, an advance with potential benefits not only in evaluating acute disease of the bowel, but also in overcoming the challenges posed by the large and complex MDCT data sets.**(** A. Daniel Sasson, June 2003)

Liver diseases are one of the most common reasons patients without malignancies undergo CT scanning. The modality is reproducible and offers high accuracy and sensitivity in depicting unsuspected alternative diagnoses. We can classify theses disease patients had appendicitis, acute cholecystitis, small-bowel obstruction, acute gynecologic disease, acute pancreatitis, acute renal colic, perforated peptic ulcer. (Keyzer C, Tack D, de Maertelaer V, et al.2004 :)

Liver diseases are usually caused by gastro duodenal ulcerative disease, cholelithiasis, or pancreatitis. These conditions require upper gastrointestinal endoscopy, ultrasound, and laboratory tests, respectively. Flank or lower abdominal pain usually suggests renal colic, appendicitis, or diverticulitis, all of which require CT (Tack D, Sourtzis S, Delpierre I, et al. 2003)

1.2Problem of the study

Increase patients suffering of liver diseases and the need for accurate diagnostic tools

1.3 Objectives:

1.3.1 General objectives

-To study the liver diseases using computed tomography in Sudanese patients.

1.3.2 Specific objectives

-To determine liver diseases using computed tomography.

-To find the frequencies of each liver disease.

-To detect the diagnostic value of CT in diagnosing the presence or absence of most common liver diseases.

- To identify whether CT can lead to accurate diagnose of liver diseases.

1.4 Importance of the study

-MDCT is the principal means of detecting the internal, diaphragmatic, and other non-palpable unsuspected hernias. Also MDCT are useful for preoperative demonstration of the hernias' contents and associated complications such as bowel obstruction or ischemia.

-The use of CT both facilitates more timely surgical intervention and reduces the number of patients requiring hospital admission , to give early diagnosis of liver diseases to harry treatment and reduce the number of patient requiring hospital admission

Chapter Two

Chapter Two

Theoretical Background and literature Review

2.1 Anatomy:

The liver may be divided into a large right lobe and a small left lobe by the attachment of the peritoneum of the calceiform ligament. The right lobe is further divided into a quadrate lobe and a caudate lobe by the presence of the gallbladder, the fissure for the ligamentum terse, the inferior vena cava, and the fissure for the ligamentum venosum. Experiments have shown that, in fact, the quadrate and caudate lobes are a functional part of the left lobe of the liver. Thus, the right and left branches of the hepatic artery and portal vein, and the right and left hepatic ducts, are distributed to the right lobe and the left lobe (plus quadrate plus caudate lobes), respectively. Apparently, the Two sides overlap very little. (Nina kowalczyk, 2001)

The liver is the largest organ in the body and is sheltered by the ribs in the right upper quadrant (RUQ) of the abdomen. It is kept in position by peritoneal ligaments and intra abdominal pressure from the muscles of the abdominal wall. The functions of the liver are multiple: metabolism of substances delivered via its portal circulation; synthesis of substances, including those concerned with blood clotting, storage of vitamin B, and other materials; and detoxification and excretion of various substances.(Richard w,etc,1998)

The liver has a double supply of blood, coming from the hepatic artery and the portal vein. The hepatic artery usually originates from the celiac axis and takes oxygenated blood to the liver. The portal vein is formed by the union of the superior mesenteric and splenic veins. It is located within the liver and serves to return venous blood from the abdominal viscera to the inferior

vena cava (IVC). Any interference with blood flow, which may occur with liver disease, results in consequences elsewhere in the abdominal viscera and spleen. (Richard w, etc, 1998)

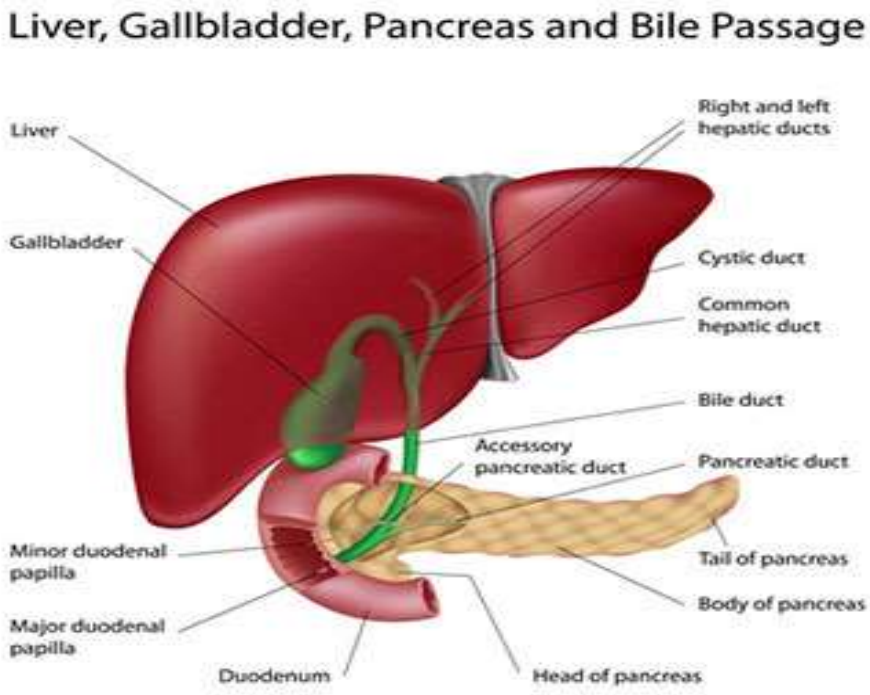

Figure (2.1): showing the anatomical structures for liver, gallbladder, pancreas and bile passage.

A system of ducts acts to drain bile produced in the liver into the duodenum Bile from the liver's two main lobes is drained by the right and left hepatic ducts. These unite to form the common hepatic duct, which is joined usually in its importation by the cystic duct from the gallbladder. Together, the cystic duct and the common hepatic duct form the common bile duct. The common bile duct descends posterior to the descending duodenum to enter at its posteromedial aspect. Before its entrance into the duodenum, the common bile duct may be joined by the pancreatic duct from the head of the pancreas. The short part of the common bile duct, after joining the

pancreatic duct, is known as the hepato pancreatic ampulla or, more commonly, the ampulla of Voter. The flow of both bile and pancreatic juice into the duodenum is regulated by the hepato pancreatic sphincter, more commonly known as the

Sphincter of Oddi. The release of bile into the duodenum is triggered by cholecy stokinin, a hormone released by the presence of fatty foods in the stomach. The purpose of bile is to emulsify fats so that they may be absorbed. Gallbladder (Richard, et al, 1998)

The gallbladder, a digestive organ, is a pear-shaped sac located on the undersurface on the right lobe of the liver. Normally, the walls are quite thin, but they often thicken in the presence of inflammation. The sole function of the gallbladder is to store and concentrate bile that has been produced in the liver. The gallbladder receives bile from the liver via the hepatic duct and empties bile into the duodenum to aid the digestion and absorption of fats in the gastrointestinal (GI) system (Richard, et al, 1998)

The anterior intersection of the right fifth the midclavicular plane marks the level of the highest point of the liver in the right hypochondriac region on full expiration , The porta hepatis of the liver's surface lies approximately at the level the celiac trunk ,The anteroinferior border of the liver is generally palpable along the right costal margin on full inspiration.

Ligaments .Most of the liver's exterior is covered with peritoneum. The margin of the liver's bare area is closely associated with five peritoneal ligaments that extend from the liver to the anterolateral abdominal wall and diaphragm ;namely: The falciform ligaments , The left and right coronary ligaments , The left and right triangular ligaments.

Lobes. The falciform ligament's margin of attachment to the liver's anterior surface demar-cates the border between the liver's left and right lobes.

Groove and fissures on the liver's visceral surface further subdivide the right lobe into its quadrate and caudate lobes.

Blood supply. The hepatic artery proper and portal vein supply the liver.

The left hepatic artery and left branch of the portal vein supply the liver's left lobe, quadrate lobe, and all of the caudate lobe expect for its caudate process. (Snell, 2004)

The right hepatic artery and right branch of the portal vein supply the reminder of the liver

The left hepatic duct collects bile from the liver's left lobe, quadrate lobe, and all of the caudate lobe expect for its caudate process.

The right hepatic duct collects bile from the remainder of the liver.

The left and right hepatic ducats units at the porta hepatis to form the common hepatic duct. (Snell, 2004)

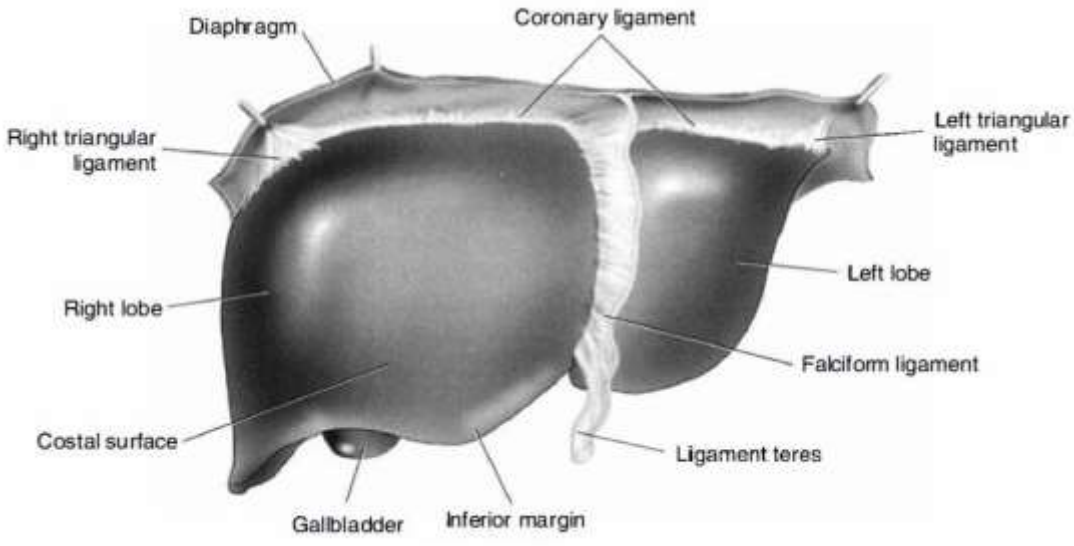

Figure (2.2) A: showing the anterior aspect of the liver.

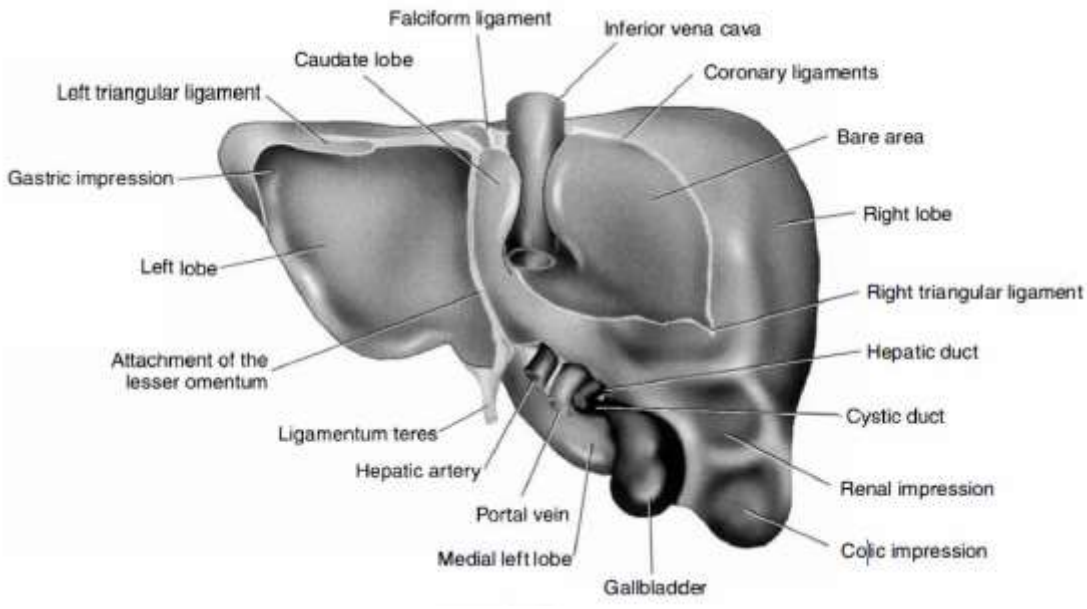

Figure (2.2) Bestowing the posterior aspect of the liver.

2.2 Physiology:

The liver is the largest gland in the body and has a wide variety of functions. Three of its basic functions are production and secretion of bile, which is passed into the intestinal tract; involvement in many metabolic activities related to carbohydrate, fat, and protein metabolism; and filtration of the blood, removing bacteria and other foreign particles that have gained entrance to the blood from the lumen of the intestine.(Nina kowalczyk,2001) The liver synthesizes heparin, an anticoagulant substance, and has an important detoxicating function. It produces bile pigments from the hemoglobin of worn-out red blood corpuscles and secretes bile salts; these together are conveyed to the duodenum by the biliary ducts. The liver is soft and pliable and occupies the upper part of the abdominal cavity just beneath the diaphragm the greater part of the liver is situated under cover of the right costal margin, and the right hemi diaphragm separates it from the pleura, lungs, pericardium, and heart. The liver extends to the left to reach the left

hemi diaphragm. Convex upper surface of the liver is molded to the undersurface of the domes of the diaphragm. The poster inferior, or visceral surface, is molded to adjacent viscera and is therefore irregular in shape; it lies in contact with the abdominal part of the esophagus, the stomach, the duodenum, the right colic flexure, the right kidney and suprarenal gland, and the gallbladder. (Nina kowalczyk, 2001)

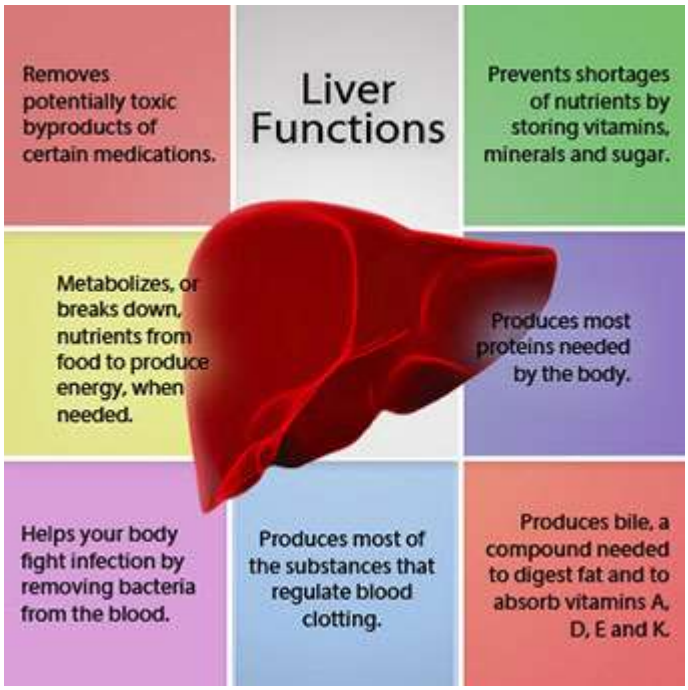

Figure (2.3): liver functions.

2.3Pathology:

2.3.1 Liver diseases:

Liver disease is any disturbance of liver function that causes illness. The liver is responsible for many critical functions within the body and should it become diseased or injured, the loss of those functions can cause significant

damage to the body. Liver disease is also referred to as hepatic disease (Honda, littman,2016)

2.3.1.1Cirrhosis:

Cirrhosis is a late-stage of liver disease. Scarring of the liver and loss of functioning liver cells cause the liver to fail. Significant amounts of liver cells need to be damaged before the whole organ fails to function (Honda, littman, 2016).

2.3.1.2 Drug-induced liver disease:

Liver cells may become temporarily inflamed or permanently damaged by exposure to medications or drugs. Some medications or drugs require an overdose to cause liver injury while others may cause the damage even when taken in the appropriately prescribed dosage.(Honda littman,2016)

2.3.2The causes of liver disease:

2.3.2.1Infectious hepatitis:

Hepatitis A is a viral infection that is spread primarily through the fecal-oral route when small amounts of infected fecal matter are inadvertently ingested. Hepatitis A causes an acute inflammation of the liver which generally resolves spontaneously. The hepatitis A vaccine can prevent this infection. Thorough hand washing, especially when preparing food is the best way to prevent the spread of hepatitis A. This is especially important for workers who work in the food and restaurant industries.

is spread by exposure to body fluids (needles from drug abusers, Hepatitis B contaminated blood, and sexual contact) and can cause an acute infection, but can also progress to cause chronic inflammation (chronic hepatitis) that can lead to cirrhosis and liver cancer. The hepatitis B vaccine can prevent this infection.

causes chronic hepatitis. An infected individual may not recall Hepatitis C any acute illness. Hepatitis C is spread by exposure to body fluids (needles from drug abusers, contaminated blood, and some forms of sexual contact). Chronic hepatitis C may lead to cirrhosis and liver cancer. At present, there is no vaccine against this virus. There is a recommendation to test all people born between 1945 and 1965 for Hepatitis C antibody to identify people who do not know that they have contracted the disease. Newer medications are now available to treat and potentially cure Hepatitis C.

Hepatitis D is a virus that requires concomitant infection with hepatitis B to survive, and is spread via body fluid exposure (needles from drug abusers, contaminated blood, and sexual contact).

Hepatitis E is a virus that is spread via exposure to contaminated food and water. (Honda littman, 2016)

2.3.2.2Cancers:

Primary cancers of the liver arise from liver structures and cells. Two examples include hepatocellular carcinoma and cholangiocarcinoma.

Metastatic cancer (secondary cancer of the liver) begins in another organ and spreads to the liver, usually through the blood stream. Common cancers that

spread to the liver begin in the lung, breast, large intestine, stomach, and pancreas. Leukemia and Hodgkin's lymphoma may also involve the liver (Honda k, littman, 2016).

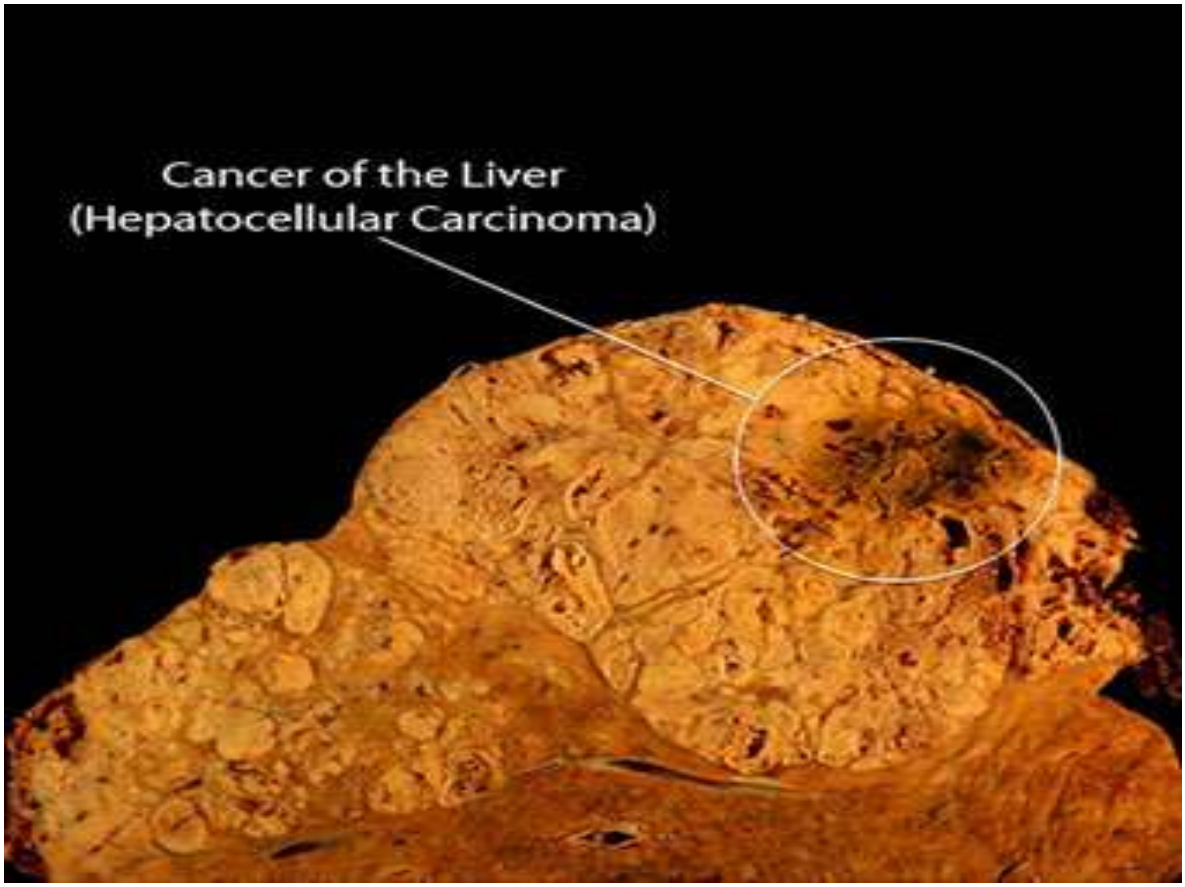

Figure (2.4): cancer of the liver

2.3.2.3 Blood flow abnormalities

Budd Chiari syndrome is a disease in which blood clots form in the hepatic vein and prevent blood from leaving the liver. This can increase pressure within the blood vessels of the liver, especially the portal vein. This pressure can cause liver cells to die and lead to cirrhosis and liver failure. Causes of

Budd Chiari syndrome include polycythemia (abnormally elevated red blood cell count), inflammatory bowel disease, sickle cell disease, and pregnancy.

Congestive heart failure, where poor heart function causes fluid and blood to back up in the large veins of the body can cause liver swelling and inflammation.

Normally, bile flows from the liver into the gallbladder and ultimately into the intestine to help with the digestion of food. If bile flow is obstructed, it can cause inflammation within the liver. Most commonly, gallstones can cause an obstruction of the ducts that drains bile from the liver.

Abnormalities of the opening of the bile duct into the small intestine (sphincter of Oddi) can lead to abnormalities of bile flow. The sphincter of Oddi acts as a "valve" that allows bile to flow from the common bile duct into the intestine.

Primary biliary cholangitis and primary sclerosing cholangitis can lead to progressive scarring of the bile ducts, causing them to become narrow, which results in reduced bile flow through the liver. Eventually, damage and scarring of the liver architecture occurs resulting in liver failure (Honda littman, 2016).

2.3.2.4 Other diseases and conditions:

Since the liver is responsible for the functions that affect so many other organs in the body, liver disease and failure may cause complications. Examples include:

- Hepatic encephalopathy: Increased ammonia levels due to the liver's inability to process and metabolize proteins in the diet can cause confusion, lethargy and coma.(Honda littman,2016)
- Abnormal bleeding: The liver is responsible for manufacturing blood clotting factors. Decreased liver function can cause increased risk of bleeding in the body.
- Protein synthesis or manufacture: proteins made in the liver are the building blocks for body function. Lack of protein affects many bodily functions.
- Portal hypertension: Because the liver has such a great blood supply, damage to the liver tissue can increase pressure within the blood vessels in the liver and adversely affect blood flow to other organs.(Honda littman,2016)

2.4 Spiral CT technique:

With a spiral scanner giving contrast medium at 1.5 to 2.5 ml/sec and beginning the injection 20 to 30 seconds before the scanning begins, and for the duration of the scan series, provides excellent opacification of vascular structures. The amount, rate, and scan delay can vary with indication for the study and with the protocol used. (Richard w,etc,1998)

2.4.1Abdomen:

GTT contrast media:

Nearly all CT scans of the abdomen require the administration of intraluminal contrast agents to opocify the GIT. The usual agents are radiopaque, consisting of dilute concentration of barium and iodinated agent. Concentration of 1% to 3% are optimal for CT, as compared with the 30% to 60% solution used for fluoroscopy. Barium mixtures and water-soluble

iodinated agents are equally effective. We routinely use dilutions of 3 ml of 60% iodinated oral contrast agent in every 100 ml of water our standard bowel preparation for CT includes a clear liquid diet beginning at midnight before the CT examination. The patient ingests only oral contrast agents for the last 4 hours before the examination oral contrast agent is given in four doses of 400 ml each; at 10 PM the night before, and at 2 hours, 30 minutes, and immediately before beginning the examination this dosage regimen will usually opacify the entire bowel including the colon and rectum opacification of upper GIT can be attained rapidly by giving 200 ml doses of oral contrast agents every 10 minutes for 30 to 40 minutes before the CT examination. The some dilution of water- soluble contrast agent can be given as an enema to rapidly opocify the colon. A basic rule of abdominal CT is that no one can receive "too much" oral contrast medium. Air provides both excellent contrast and bowel distention when used for CT of the GIT, the colon can be insufflated by placement of a miller air-tip enema tube, such as routinely used for double contrast barium enemas. The stomach and duodenum can be distended by use of effervescent granules that release carbon dioxide on contact with fluid in the stomach. (Bushing stewart,2001)

For most abdominal CT scans we use a 150ml dose of 60% iodinated agent given at 2.5 ml/sec. onset of scanning is delayed to allow for circulation of contrast medium into the abdominal vessels for helical scans, we begin scanning 60 to 70 seconds after initiation of contrast infusion, and for conventional scans, we delay scanning 40 to 50 second. The goal of contrast medium enhanced CT scanning of the abdomen is to scan during maximum contrast enhancement and to avoid scanning during the equilibrium phase of contrast enhancement when the contrast concentration with in blood vessels is equal to the contrast concentration in the extra

cellular space scanning during maximal enhancement improves the conspicuity of lesions, whereas equilibrium obscures lesions. Contrast equilibrium is reached in about 2 minutes after the onset of I.V contrast agent injection. (Bushing stewart,2001)

2.3 Liver technique:

Un enhanced liver CT is greatly inferior to contrast medium bolus CT for detection of most liver masses. However, on some occasions, especially with suboptimal contrast medium administration, a liver mass will be isodense with enhanced liver parenchyma and will escape detection if scans are performed only after contrast medium administration. Sixty percent iodine contrast agents are used in a 150 ml dose administered intra venously by power injector at 2 to 3 ml/sec. In conventional CT technique scanning the entire liner with in the first 2 to 3 minutes after contrast bolus administration is essential to avoid masking lesion due to the equivalent contrast medium enhancement of the lesion and liver parenchyma. To further characterize the enhancement pattern of a liver mass, single-level, bolus contrast, dynamic scanning may be performed, a single slice level through the mid portion of the mass is selected, contrast agent is given by power injector with a 100 ml dose at 2.5 ml /sec. A minimum of six scans per minutes are obtained for the first 2 minutes, then three scans per minute for the next 5 minutes, and final scans at 15,20 and 25 minutes after injection. (Bushing stewart,2001)

2.3.4 Technical consideration (usage, dose and enhancement)

Intravenous contrast media are some time used in CT because iodine further attenuate the X-Ray beam, which makes structure a contain the contrast medium appear denser, in particular, normal structure with a rich vascular supply, such as the blood vessels, choroids plexus, and dura, appear

denser with contrast enhancement. This is an advantage when highlighting normal anatomy in the head and neck, because it allows differentiation of vessels from lymph nodes in the spine by out lining the epidural venous plexus in the lumber spine, a contrast medium can be used to help distinguish scar tissue from a recurrent disk herniation because the later generally dose not enhance, whereas the scar tissue does. A contrast medium also may be used because it increases the CT density of more vascular lesions, making them easier to see. A meningioma for example, typically vascular and therefore reading increases in density when an IV contrast medium is used. Intra cerebral tumors, such as a glioblastoma; do not have a normal blood- brain barrier, and contrast media passes into the tumor but not into normal brain tissue, thus these tumor show increased density or "enhancement" similarly, the wall of a cerebral abscess shows enhancement. I.V contrast medium is used to show vascular anatomy to distinguish vessels from a mass or normal structure, general tissue enhancement, following the vascular phase, contrast medium rapidly enters the extracellular space by diffusion. Parenchymal enhancement of tissue is partly due to contrast medium remaining in the vascular tree and partly due to extra vascular contrast medium.(Bushing stewart,2001)

2.4.Computed Tomography Machine :

2.4.1 System components :

It is convenient to identify the three major components of a CT scanner ; the gantry , the computer and the operating console , each component has several sub system .

The gantry include the x-ray tube , the detector array , the voltage generator , the patient support couch , and the mechanical support for each .

these sub systems receive electronic commands from the operating console and transmit data to computer for image production and analysis.

The computer is a unique subsystem of the CT scanner if it were not for the ultra – high speed digital computer , CT scanning would be impossible . depending on the image format as many as 250,000 equations must be solved simultaneously , thus a large – capacity computer is require computer cost can easily run to third the cost of the entire CT scanner

Many CT scanners are equipped with two or three console ; one for CT Radiologic technologist to operate the scanner , one for another technologist to post process images for filming , and one for physician to view the images and manipulate it .(Richard w,1998)

2.4.2 Spiral computed tomography :

The Spiral CT improve the imaging of anatomy that would other wise be compromised by voluntary and involuntary patient motion . in addition , spiral CT can perform conventional transverse imaging for regions of the body when motion is not problem . spiral CT can also image more tissue in single examination . (Richard w,1998)

2.4.3 Image principle :

When the examination begins , the x-ray tube is rotate continuously without reversing , while the x-ray tube is rotating the couch moves the patient through the plane of the rotating x-ray beam the x-ray tube energized continuously and data continuously colleted this data can be reconstructed at any desired z-axis position along the patient . (Richard w,1998)

2.5 Previous study:

Hepatic Lesions Spectrum in Sudanese Patients by using Computed Tomography Maram A. Fagiri1 , Mustafa Z. Mahmoud2, 3, Ikhlas Abdelaziz Hassan3 , Leina Mhmoud4,2013, This retrospective cohort study was performed in the period of September 2012 to May 2013. A total of 125 consecutive patients referred to the Radiology Department of Fedail Hospital at Khartoum State In conclusion, liver CT enables detection and characterization of a large variety of focal liver lesions, including the benign and malignant liver lesions that occur most frequently, also in the presence of different pathologic conditions and multilevel disease. Our results demonstrate that 32% primary or metastatic malignancies involved the liver. Of these 32%, 10.4% were primary hepatic malignancies (HCC and hepatoblastoma) and 21.6% were metastatic tumor to the liver. In the remaining 41.4% of the 125 total studies, benign liver abnormalities were detected. Theses 41.4% are benign lesions included 1.6% cases each of liver abscess, fatty fibrotic changes, adenoma, haemengioma and hepatic calcifications. Beside 2.4% solitary/multiple cystic lesions and 4% liver cirrhosis are also benign conditions.

Spectrum of CT Findings after Radiofrequency Ablation of Hepatic TumorsMi-hyun Park, Hyunchul Rhim, Young-sun Kim, Dongil Choi, Hyo K. Lim, Won Jae Lee2008,

The typical CT finding in the RF ablation zone is a nonenhancing area of low attenuation that encompasses the index tumor and that gradually involutes. However, atypical findings also may be observed in the ablation zone at follow-up. These include residual tumor tissue, delayed complications, and local tumor progression requiring further management.

Interventional radiologists should be aware of both the typical and the atypical CT findings in the RF ablation zone and their clinical significance.

Chapter Three

Chapter Three

Materials and Methods

This study is experimental one, specially designed to assess and evaluate the standard protocol and administration of liver diseases of the patients in CT department. Study conducted in CT centers in Khartoum city, which serves referred patient and individuals from all over the Sudan.

3.1. Materials:

3.1.1 Study population

This study included 54pts presented with liver diseases were selected randomly from different age and gender and all patients undergo abdominal CT .

3.1.2 Study design:

The study is experimentally study carry out in radiology department (antalia medical hospital)

3.1.3. Study duration:

The study carry out in three month from *26/8/2013 to 18/10/2017*

3.1.4. Study variable or image interpretation:

The variable that collected from each subject includes age, gender, body site, U/S finding, clinical finding, CT finding, site of pain and radiological feature.

3.1.5. Data collection:

Data sheets, reference, internet

3.1.6. Image diagnosis or interpretation:

All data were collected from medical reports in radiology department.

3.2. Methods:

3.2.1. CT technique used:

Slice thickness: 5 mm was used.

Contrast amount: 80-100 ml IV.

40 ml oral.

Rate of contrast: 3.0 ml\sec flow rate.

Usage of contrast: Oral and intravenous were used.

A collimation of 5-7 mm and a pitch of 1.0-1.5. The data are reconstructed at intervals of 3-7 mm, depending on the clinical indication.

Between 125 and 150 ml of 60% iodinated IV contrast material should be injected at a rate of at least 3 ml/sec. Scans are obtained during the portal venous phase using a 60- to 70-sec delay. Arterial phase imaging is useful in patients with suspected hemorrhage, bowel ischemia, and arterial thrombosis. Delayed scans through the kidneys and pelvis can reveal renal masses and bladder disease that might be overlooked during earlier phases.

For most patients, we prefer to give 800-1000 ml of a 2% solution of oral diluted water-soluble contrast material at least 1 hr before scanning. Oral contrast material is administered primarily to differentiate bowel loops from abdominal and pelvic masses and abscesses.

*3.2.2 CT Machin*e:

Computed Tomography (CT) Instrument*e:*

GE Bright speed 8 slice CT machine was used. Scanner features include 70 cm aperture, 50 cm scan field and a patient table that can hold patients up to 440 pounds. Also the scanner offers an image reconstruction on the fly with up to 8 slices per second.

3.2.3 Principle of operation:

The CT scanner is an invaluable Radiologic diagnostic tool. It is revolutionary in that it does not record an image in the conventional way.

The basic principle, can demonstrate if you consider the simplest of CT system, consisting of a finely collimated x-ray beam and a single detector .the x-ray source and detector connected so that they move synchronously. When the source – detector assembly make one sweep or translation across the patient, the internal structure of the body attenuate the x-ray beam according to their mass density and effective atomic number, the intensity of radiation detected varies according to this attenuation pattern and forms (frank slaby, etc,1987).

3.3. Ethical consideration:

The study population are agree and sign constant, the contrast and protocol were revised by staff in our CT department.

Chapter Four

Chapter Four

Table (4. 1): shows the frequency and percentage in gender:

Percentage	Frequency	Gender
44.4%	23	Male
54.96%	31	Female

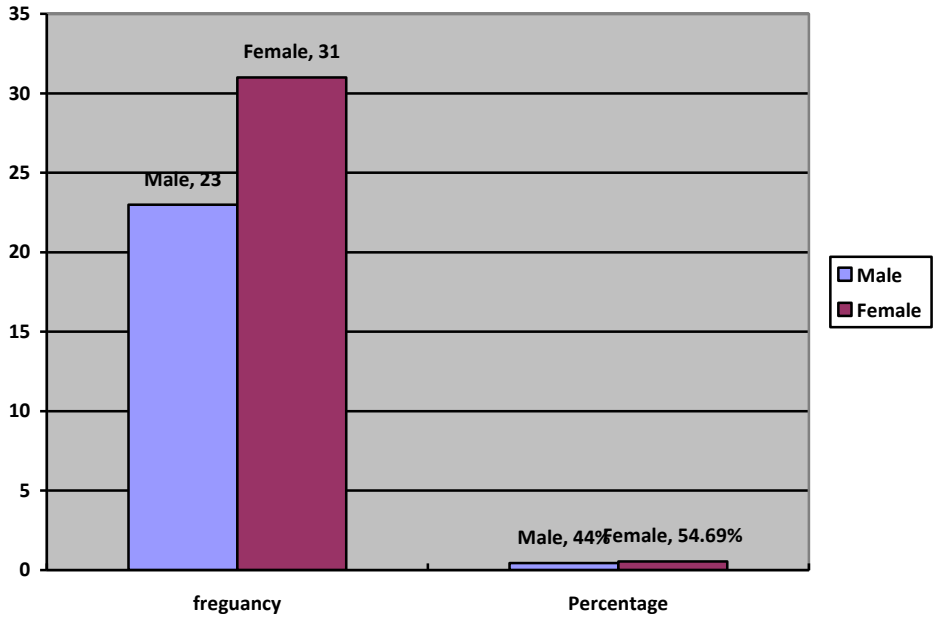

Figure (4.1): shows the frequency and percentage in gender

Table (4 .2): shows the frequency and percentage in age groups

Percentage	Frequency	Age groups
6.2	3	0-20
18.7	10	20-40
43.7	24	40-60
31.25	17	60-80

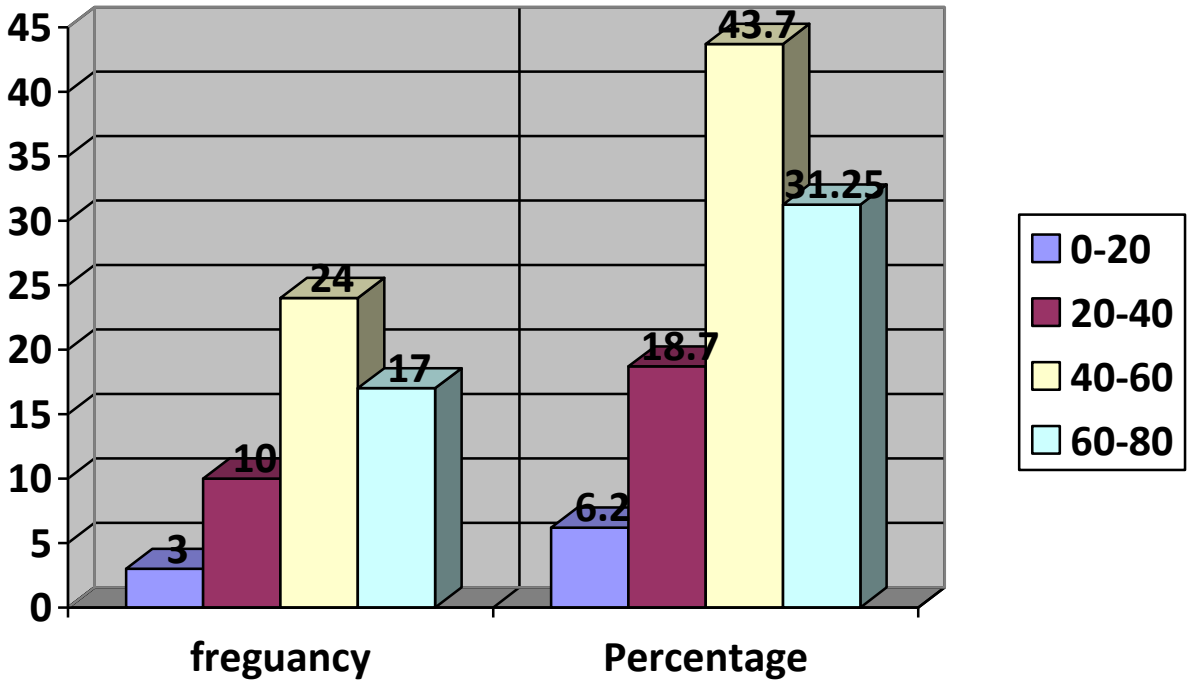

Figure (4 .2): shows the frequency and percentage in age group

Table (4. 3): shows the frequency and percentage of findings of diseases

Percentage	Frequency	Findings
26.5	17	Mass
15.6	10	Cysts
20.3	13	Liver lesions
21.8	14	Others

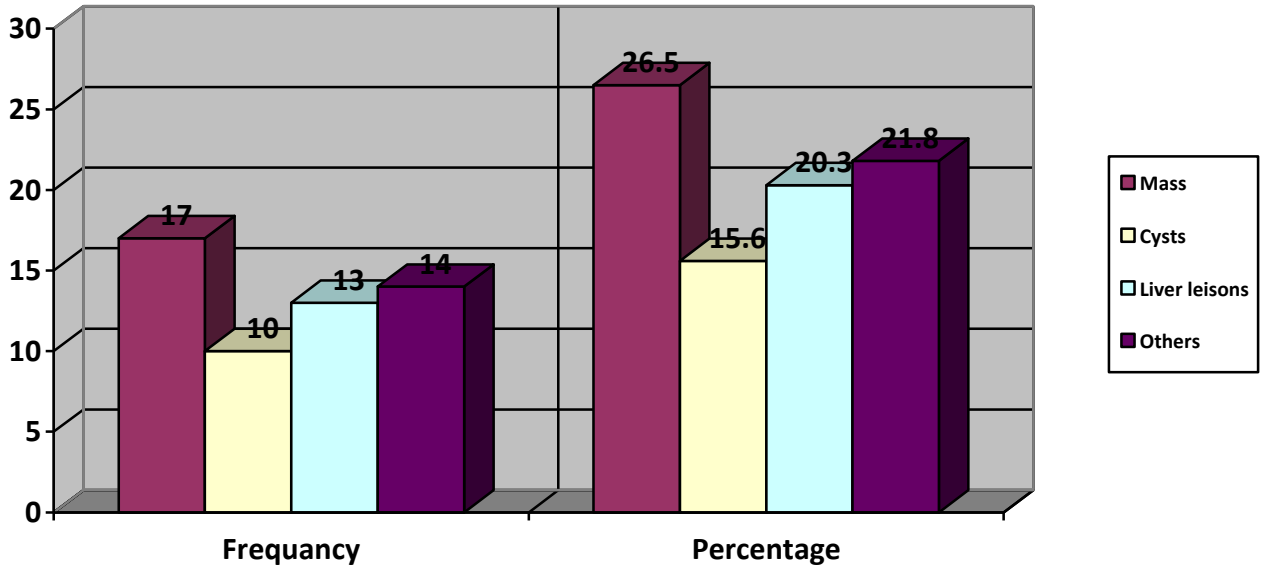

Figure (4 .3): shows the frequency and percentage of findings of diseases.

Table (4 .4): shows the correlation between gender and diseases.

Others	Liver lesions	Mass	Cyst	Gender
5	5	14	3	Male
9	8	3	7	Female

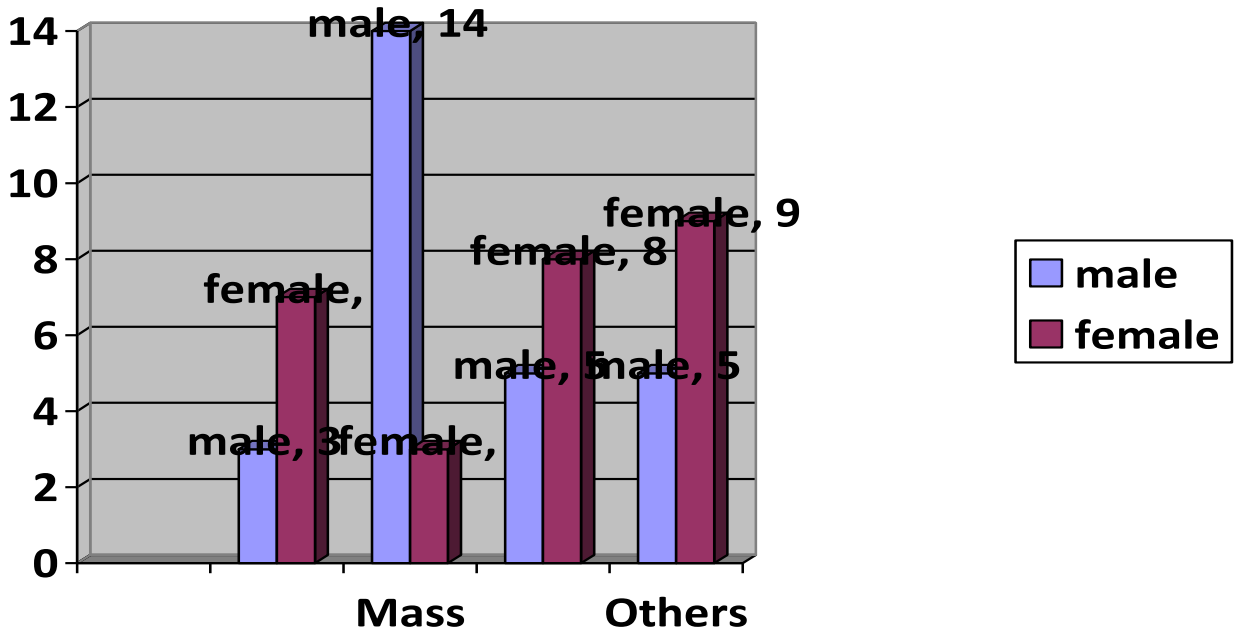

Figure (4.4): shows the correlation between gender and diseases

Table. (4.5): Show age groups of examination with different liver diseases.

Others	Liver lesions	Mass	Cyst	Age groups
-	-	-	1	0-20
2	2	1	1	20-40
9	8	8	2	40-60
7	3	9		60-80

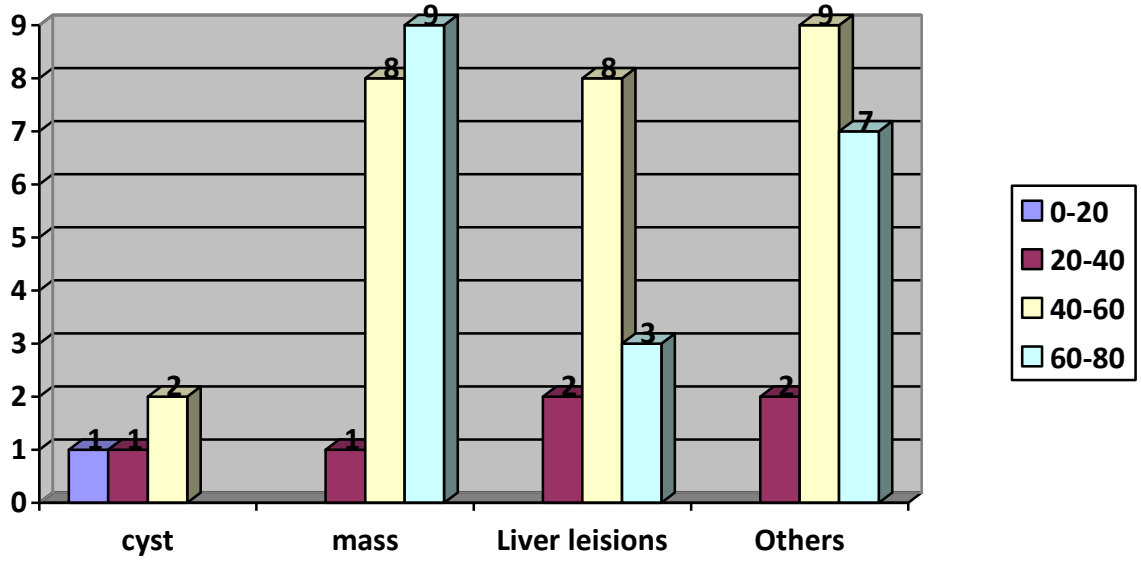

Figure (4.5): Show age groups of examination with different liver diseases.

Table (4. 6): shows the image enhancement with different densities:

Post-contrast	Pre-contrast	Densities
80	49	Mass
102	54	Cysts
97	55	Liver lesions
94	44	Others

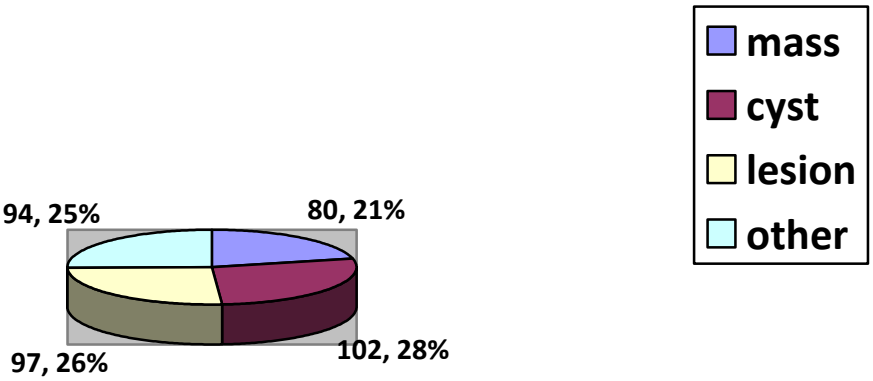

Figure (4.6): shows the image enhancement with different densities

Chapter Five

Chapter Five

Discussion Conclusion and Recommendation

5.1 Discussion:

The liver is a common site for cysts, masses and other benign malformations, which become more prevalent with increasing age and dose no threat to health, but create difficulty in the early diagnosis of significant pathologies, particularly malignancy, this study choose multi-detector CT using thin slice reconstructions to evaluate the findings and to detect increasing numbers of smaller lesions of liver diseases. The total number of cases and percentage of each one (54patient) the male (44.04%) and female (54.96%) regarding figure (4.1). The range of age groups and percentage of cases, at the age less than 20 yrs (6.2%), (20-40) 18.7%, (40-60) 43, 7%, and (60-80) 31, 25% regarding figure (4.2) .

Also table (4.3). Shows the frequency of findings and percentage of it, mass (17) 26.5%, cyst (10) 15.6%, lesions (13) 20.3% and others (14) 21.8.

table (4.4)show the correlation between gender and findings ,in male, cyst (3) ,mass (14),lesions(5) and others (5) ,in female, cyst (7) ,mass(3) , lesions(8) and others (9).

table (4.5) shows number of findings within age groups, at the age less than 20 yrs., cysts (1), mass(0), lesions(0) and others (2),from (20- 40),cyst (1) ,mass (8)lesions (2),and others (2),from (40-60) ,cyst (2) ,mass (8) ,lesions(8) and others (9) ,and from (60-80) ,cysts (0) ,mass (9) ,lesions (3) and others (7).

Our study showed, the 26.5% of detecting hepatic lesions were mass and most frequently in male. About 43.7% of detecting lesions were found in age

group from 40 to 60. Also the hepatic cyst were found in female doubling than male.

The research findings compare with the previous study, (normal 10)15.6 %(mass 17)26.5 %(cysts 10)15.6 %(liver lesions 13)20.3 %(others 14)21.8%

In other study: Hepatic lesions spectrum in Sudanese patients: *CT findings Percentage (%) out of 100 samples* Metastatic liver lesions 21.6% HCC 9.6% Liver cirrhosis 4% Solitary/Multiple cystic lesions 2.4% Liver abscess 1.6% Fatty fibrotic changes 1.6% Liver adenoma 1.6% Haemengioma 1.6% Hepatic calcifications 1.6% Hepatoblastoma 0.8%

5.2 Conclusions:

The study found that 26.5% of detecting hepatic lesions were mass and most frequently in male. About 43.7% of detecting lesions were found in age group from 40 to 60. Also the hepatic cyst were found in female doubling than male.

5.3 Recommendations:

*Further studies should be done by large sample size.

*We must compare between CT and other complementary modality to make a curate diagnosis.

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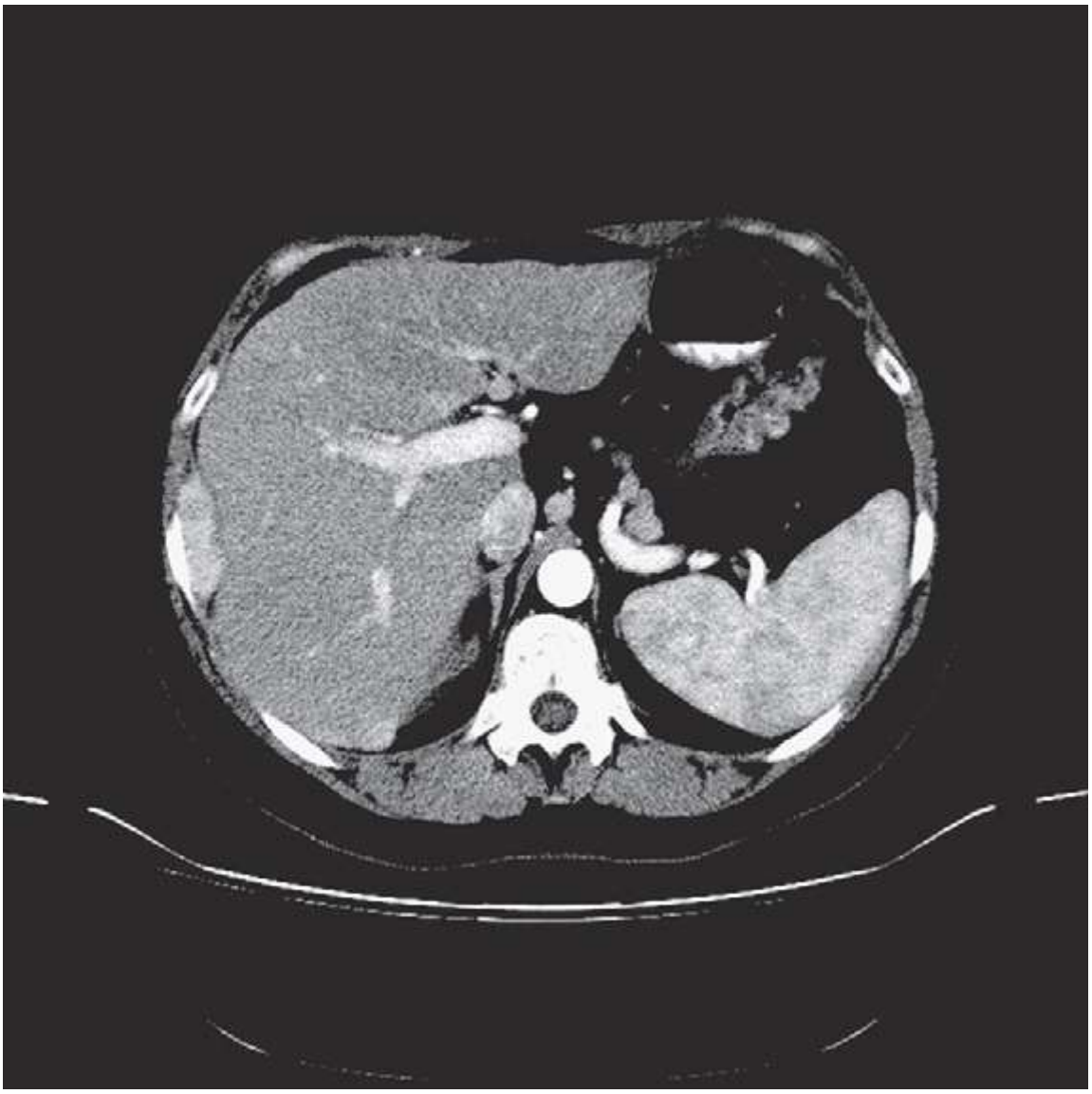
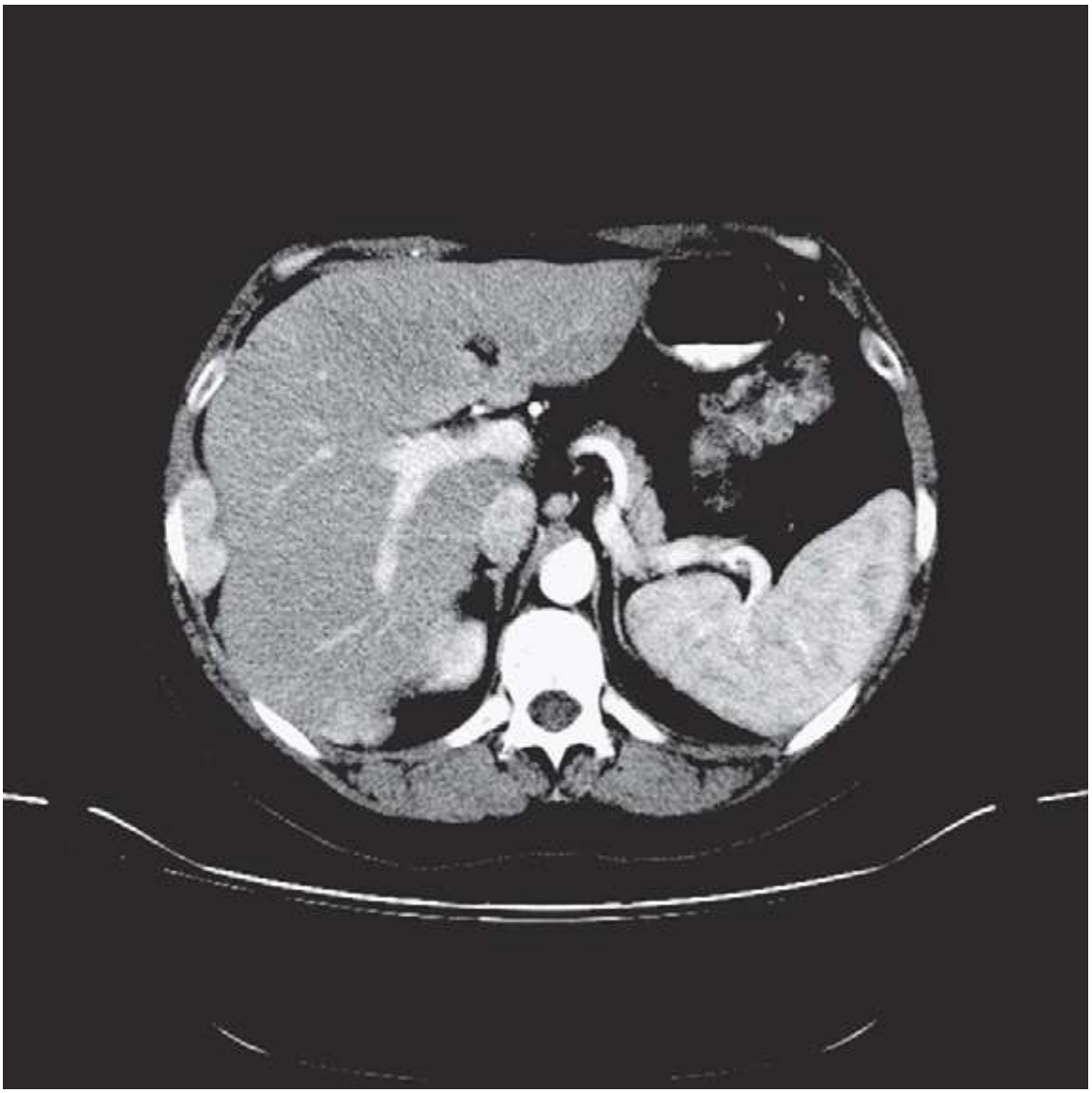
Appendix:

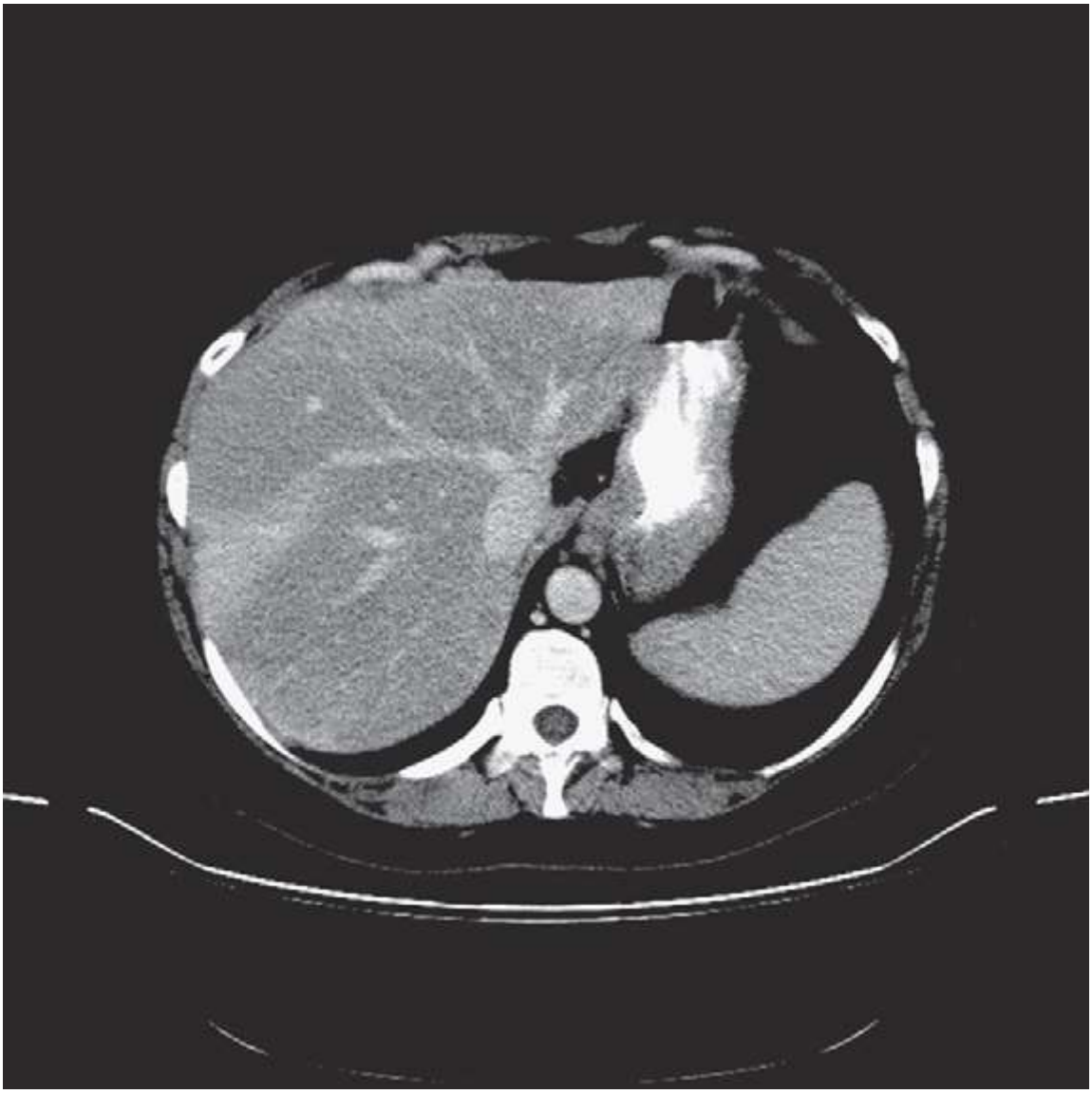
3.9.1 Phases of technique:



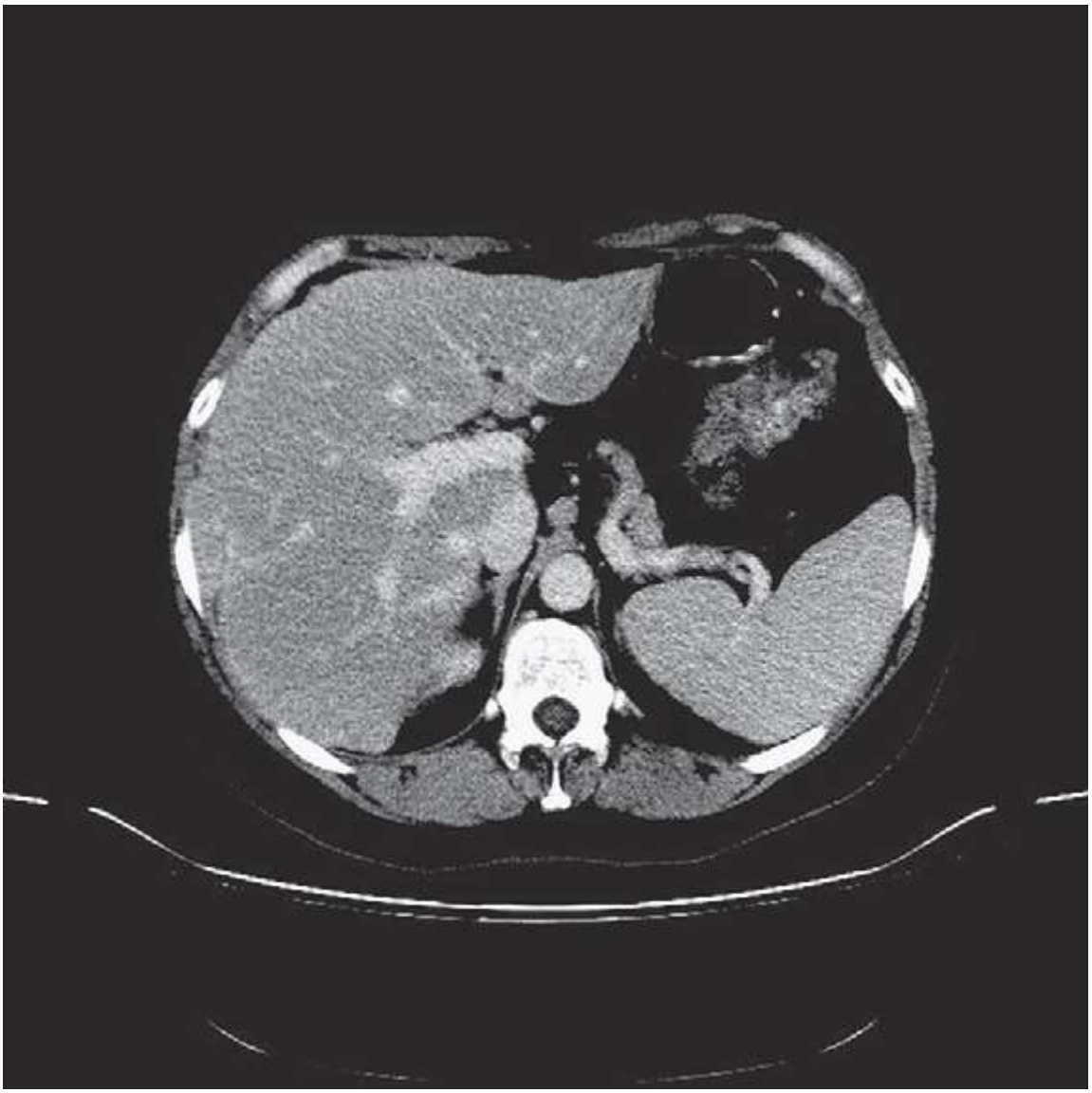
Figure(4.11)A: Three-phase computed tomography (CT) of the liver following a bolus injection of intravenous contrast, demonstrating the arterial circulation.



Figure(4.11.1)B: Three-phase computed tomography (CT) of the liver following a bolus injection of intravenous contrast, demonstrating the arterial circulation.



Figure(4.11.2)C: Three-phase CT of the liver, delayed images demonstrating the portal venous flow.



Figure(4.11.**3)d:** Three-phase CT of the liver, delayed images demonstrating the portal venous flow.(Nina kowalczyk,2001)

Figure(4.12)A :M 43Y Pre-contrast ,venous phase showing metastasis

Figure(4.12)B :M 43Y post-contrast, venous phase: showing Metastasis

Figure(4.13)A:M 61Y Pre-contrast,venous phase,showing Ascities

Figure(4.13)B:M 61Y post contrast, Venous phase ,showing Ascities

Figure(4.14)A:M 74Y Pre-contrast: Showing multiple cysts

Figure(4.14)B:M 74Y Venous phase: Showing multiple cysts .

Figure(4.15)B:F 47Y post contrast, Venous Phase: Normal Result

Figure(4.15)A:F 47Y Pre-contrast venous phase, Normal Result

Figure(4.16)A:M 38Y Pre-contrast, venous phase Liver Mass

Figure(4.16)B:M 38Ypost contrast, Venous Phase: Liver Mass