Sudan University of Sciences & Technology

Collage of graduate studies

Evaluation of liver metastases pattern Using Ultrasound

تقويم انماط ثانويات اورام الكبد بالموجات فوق الصوتية

A Thesis submitted in Partial Fulfillment for the Requirement of the Degree of M.Sc IN Diagnostic Medical Ultrasound

:by

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بسم الله الرحمن الرحيم

الآيـة

قال تعالى :

(تبَارَكَ الَّذِي بِيَدِهِ الْمُلْكُ وَهُوَ عَلَى كُلِّ شَيْءٍ قَدِيرٌ* الَّذِي خَلَقَ الْمَوْتَ وَالْحَيَاةَ لِيَبْلُوَكُمْ أَيُّكُمْ أَحْسَنُ عَمَلا وَهُوَ الْعَزِيزُ الْغَفُورُ)

صدق

الله العظيم

سورة تبارك الآية 1 - 2

Dedication

,Praise and love be to my family

Soul of my father

My respective mother

Lovely sisters and brother

My daughter

To my husband who have been my constant source of

.inspiration

.To all who care and believe in me

ACKNOWLEDGEMENT

Alhamdulillah, all praises to Allah for granting the will and .determination to completing this work

I acknowledge my family who supported me throughout my whole life, Dr. **IKhlas Abdelaziz** whose support encouragement and guidance paved my way for this long .journey

I am very grate full to the staff in Radiation isotope center of .Khartoum for their cooperation and patience

Thank you all for being the stem of my work and the light .. .which guided me through this journey

Abstract

This study aimed to evaluate the ultrasound patterns of .liver metastases in affected patients

Abdominal ultrasound collected from all patients referred to radiation isotope center of Khartoum and some clinical data were collected from the request forms in period .between October 2015 to January 2016

This study included 65 patients. The age range of patients was between 21-89 years.. Females were 41 patients, .while males were 24 patients

The number of lesions were found multiple in 53.5%, .single in 44.6% and diffuse 1.5%

The detected metastases were categorized into solid in(32.3%), cystic in (55.4%), mixed solid and cystic in .((10.8%) and calcified in(1.5%

The sonographic pattern of detected metastases were categorized into (63.1%) had hypo echoic lesions, (26.2%) had hyper echoic lesions , (6.2%) had infiltrative .and(4.6%) had halo lesion

The result shows the commonest primary tumors that give liver metastases are breast tumors fallowed by GIT cancers

The majority of the liver metastases are multiple, The consistency of liver metastases are predominantly cystic lesions and pattern of liver metastases are hypo echoic and more common from breast cancer, The hyper echoic liver metastases are more common from colonic cancer fallowed by mandible and lung carcinoma and Small percentage of metastases are solid

ملخص البحث

هدفت هذه الدراسة لتقويم أنماط ثانويات اورام الكبد بالموجات فوق الصوتية في مرضى السرطان تم جمع الموجات الصوتية للبطن لجميع المرضى الذين حضروا لمركز الخرطوم للعلاج بالاشعه والطب النووي في الفترة من اكتوبر 2015 إلى يناير 2016 وبعض البيانات السريريه جمعت من استمارات طلب الفحص.

تضمنت هذه الدراسة 65 مريض مدى عمر المرضى كان بين 21-89 سنه الإناث كن 41 مريض بينما الذكور كانوا 24 مريض.

ثانويات اورام الكبد وجدت مضاعفه (53.8%) وحيدة في (44.6%) ومستفيضه في (1.5%).

وجدت صلبة في (32.3%) كيسية في (55.4%) ومختلط في (10.8%) ومتكلسة في(1.5%) و (63.1%) كانت لديهم ثانويات سوداء و (26.1%) لديهم ثانويات بيضاء و (6.2%) لديهم ثانويات متخلل و(4.6%) ثانويات مع هالة.

اوضحت الدراسه ان اكثر الاورام انتشار في الكبد هي اورام الثدي والجهاز الهضمي و اغلب ثانويات الاورام مضاعفه و محتويات الورم متكيسه وان اكثر ثانويات الاورام ذات المظهر الاسود ومصدرها اورام الثدي تليها ذات المظهر الابيض ومصدرها اورام الجهاز الهضمي والفك والرئه وان نسبة الاورام الصلبه قليله جدا.

Abbreviations

US	Ultrasound
Mets	Metastases
CT	Computed Tomography

MAGNETIC RESONANCE IMAGINE	MRI
RENAL CELL CARCINOMA	RCC
GALL BLADDER	GB
GASTROINTESTINAL	GI
CARCINOMA	CA
HEPATOCELLULAR CARCINOMA	HCC
ACUTE LYMPHOCYTE LEUKEMIA	ALL
GENDER	G
NUMBER	NO
FEMALE	F
MALE	M
RIGHT HEPATIC VEIN	RHV
LEFT HEPATIC VEIN	LHV
CYSTIC AND SOLID	C&S
COLORECTAL CARCINOMA	CRC
STATISTICAL PACKAGE FOR SOCIAL SCIENCE	SPSS
BANGA BANDHU SHEIKH MUJIB MEDICAL UNIVERSITY	BSMMU

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:INTRODUCTION 1.1

The liver is an important organ from an oncologic perspective. Primary hepatic neoplasms are common, especially in the presence of diffuse liver disease such as cirrhosis, hemochromatosis, and steatohepatitis. The liver is the most common site of metastasis from gastrointestinal tumors. High blood flow (about 25% of cardiac output), a favorable microscopic anatomy (liver sinusoids and gaps in sub endothelial basement membrane), and a rich biochemical environment favor the rapid growth of metastatic deposits in the liver(Robinson

(PJ 2000

The objectives of liver imaging in oncology include detection of the liver disease, characterization of liver lesions, staging of neoplasm's, evaluation of biliary ductal status, evaluation of treatment response, and assessment of vascular anatomy for surgical planning and

(chemotherapy pump placement(Sic GTandetal 2000

It is important to understand the utility of various imaging modalities to optimally address and answer the clinical

.question and queries

Ultrasonography (US) is inexpensive and available. It is an excellent test to screen the liver for biliary obstruction, gall bladder disease and to assess vascular patency. It is highly sensitive at differentiating a cyst from a solid liver lesion. However, it is not as sensitive as computerized tomography (CT) or magnetic resonance imaging (MRI) at detecting focal, solid liver lesions (Glover C, Douse P, Kane

(P et al. 2002

Though a few experienced operators have quoted high detection rates for colorectal liver metastases (Lamb G,

.(Taylor I 1982

and hepatocellular carcinoma (HCC) (Teefey SA, Hildeboldt CC, Dehdashti F et al. 2003) with ultrasound, similar results could not be reproduced in the United States, which may be due to the patient body habitus and subspecialty practice patterns. The reported sensitivity of ultrasound for the detection of liver metastases varies

.(from 40%–70% (Paulson EK. 2001

The main limitations of US are high operator dependency, inability to detect lesions <1 cm in size, and low specificity. The presence of diffuse liver disease also lowers the sensitivity of US for the detection of focal lesions. Similarly, pseudolesions, such as focal fatty infiltrations or focal fatty sparings, are sometimes difficult to differentiate from other pathologic liver lesions. On the other hand, intraoperative US (IOUS) and the recently introduced laparoscopic US are highly sensitive for detecting liver lesions not seen on routine preoperative imaging, for assessing the relationship between tumors and hepatic vessels, and for assessing vascular patency

(Schmidt J, Strotzer M, Fraunhofer S et al. 2000,Catheline
(JM, Turner R 2000

Likewise, endoscopic US (EUS) is useful for assessing the left lobe of the liver and the lymph nodes in the gastrohepatic ligament, and fine-needle aspiration of liver lesions can be performed under EUS guidance (DeWitt J, LeBlanc J, McHenry L et al 2003).The recent addition of US contrast agents (not yet approved in the United States) for imaging the liver has shown promise in the characterization of various hepatic tumors(Furuse J,
(Nagase M, Ishii H et al. 2003

Justification

Ultrasound is noninvasive imaging modality for the detection of malignant
.liver disease

Ultrasound is available, inexpensive, quick, and portable, and it
.may depict lesion as small as1cm

The clinical impact of Ultrasound on assessment of disease progression, response to treatment, and determining
.prognosis of disease

Problem of the study 1.2

The problem of the study due to increase the percentages of cancer , morbidity among patients with liver lesions worldwide, therefore accurate detection and proper prognosis with ultrasound may emerge as powerful diagnostic tools in patient management and to aware the .significant of u/s in detect ca and follow up

1.3Objectives

:1.3.1General objectives

To evaluate liver metastases in Adult Sudanese patients with .known primary

:Specific objectives 1.3.2

To identify the most common Ultrasound pattern of liver .metastases

To identify the most common primary cancers that causes .liver metastases

.To correlate liver metastases patterns with primaries

1.4over view of the study

Chapter one include introduction

Chapter two shows theoretical background and previous study

Chapter three explains material and method

Chapter four show results

Chapter five disscussion, conclusions and recommendation

Chapter two

Chapter two

Literature review

2.1Theoratical background

1.1Anatomy of the Liver .2

The liver is a roughly triangular organ that extends across the entire abdominal cavity just inferior to the diaphragm. Most of the liver mass is located on the right side of the body where it descends inferiorly toward the right kidney. The liver is made of very soft, pinkish-brown tissues encapsulated by a connective tissue capsule. This capsule is further covered and reinforced by the peritoneum of the abdominal cavity, which protects the liver and holds it in

.place within the abdomen

The peritoneum connects the liver in four locations: the coronary ligament, the left and right triangular ligaments, and the falciform ligament. These connections are not true ligaments in the anatomical sense; rather, they are condensed regions of peritoneal membrane that support the liver.(Tim Taylor, Inner body.com\image\digeov.html .(human

The wide coronary ligament connects the central superior .portion of the liver to the diaphragm

Located on the lateral borders of the left and right lobes, respectively, the left and right triangular ligaments .connect the superior ends of the liver to the diaphragm

The falciform ligament runs inferiorly from the diaphragm across the anterior edge of the liver to its inferior border. At the inferior end of the liver, the falciform ligament forms the round ligament (ligamentumteres) of the liver and connects the liver to the umbilicus. The round ligament is a remnant of the umbilical vein that carries .blood into the body during fetal development

The liver consists of 4 distinct lobes – the left, right, .caudate, and quadrate lobes

The left and right lobes are the largest lobes and are separated by the falciform ligament. The right lobe is about 5 to 6 times larger than the tapered left lobe

(HEPATIC SEGMENTS (COUINAUD CLASSIFICATION 2.1.1.1

The Couinaudclassification describe the functional liver .(anatomy (preferred over morphological liver anatomy

The middle hepatic vein also demarcates the true right and left lobes. The right lobe is further divided into an anterior and posterior segment by the right hepatic vein. The left lobe is divided into the medial and lateral segments by the left hepatic vein. The fissure for the ligamentumteres also separates the medial and lateral segments. The medial segment is also called the quadrate lobe. In the widely used Couinaud (or “French”) system, the functional lobes are further divided into a total of eight subsegments based on a transverse plane through the bifurcation of the main portal vein. The caudate lobe is a separate structure which receives blood flow from both the right- and left-sided vascular branches.(R. Badea and SimonaIoanitescu 2012)Caudate,Superiorsub segment of the lateral segment, Inferior sub segment of the lateral segment(Superior sub segment of the medial segmen,Inferiorsub segment of the medial segment),Inferior sub segment of the anterior segment, Inferior sub segment of the posterior segment Superior sub segment of the posterior segment and Superior sub segment of the anterior segment

The small caudate lobe extends from the posterior side of .the right lobe and wraps around the inferior vena cava

The caudate lobe receives numerous small branches from the right hepatic artery (RHA), the LHA, the portal vein, and the confluence; bile ducts drain similarly. A caudate .process connects the caudate lobe to the right lobe

The small quadrate lobe is inferior to the caudate lobe and extends from the posterior side of the right lobe and wraps

.around the gallbladder

2.1.1.2Bile Ducts

The tubes that carry bile through the liver and gallbladder are known as bile ducts and form a branched structure known as the biliary tree. Bile produced by liver cells drains into microscopic canals known as bile canaliculi. The countless bile canaliculi join together into many larger

.bile ducts found throughout the liver

These bile ducts next join to form the larger left and right hepatic ducts, which carry bile from the left and right lobes of the liver. Those two hepatic ducts join to form the common hepatic duct that drains all bile away from the liver. The common hepatic duct finally joins with the cystic duct from the gallbladder to form the common bile duct, carrying bile to the duodenum of the small intestine. Most of the bile produced by the liver is pushed back up the cystic duct by peristalsis to arrive in the gallbladder for storage, until it is needed for digestion.(. Tim Taylor,. Inner

(body.com\image\digeov.html human

2.1.1.3Blood Vessels

The blood supply of the liver is unique among all organs of the body due to the hepatic portal vein system. Blood traveling to the spleen, stomach, pancreas, gallbladder, and intestines passes through capillaries in these organs and is collected into the hepatic portal vein. The hepatic portal vein then delivers this blood to the tissues of the liver where the contents of the blood are divided up into smaller vessels and processed before being passed on to .the rest of the body

Blood leaving the tissues of the liver collects into the hepatic veins that lead to the venacava and return to theheart. The liver also has its own system of arteries and arterioles that provide oxygenated blood to its tissues just .like any other organ

2.1.1.4Lobules

The internal structure of the liver is made of around 100,000 small hexagonal functional units known as lobules. Each lobule consists of a central vein surrounded by 6 hepatic portal veins and 6 hepatic arteries. These blood vessels are connected by many capillary-like tubes called sinusoids, which extend from the portal veins and .arteries to meet the central vein like spokes on a wheel

Each sinusoid passes through liver tissue containing 2 .main cell types: Kupffer cells and hepatocytes

Kupffer cells are a type of macrophage that capture and break down old, worn out red blood cells passing through .the sinusoids

Hepatocytes are cuboidal epithelial cells that line the sinusoids and make up the majority of cells in the liver.

Hepatocytes perform most of the liver's functions – metabolism, storage, digestion, and bile production. Tiny bile collection vessels known as bile canaliculi run parallel to the sinusoids on the other side of the hepatocytes and drain into the bile ducts of the liver(. Tim Taylor Inner (body.com\image\digeov.html human

Physiology of the Liver 2.1.2

2.1.2.1Digestion

The liver plays an active role in the process of digestion through the production of bile. Bile is a mixture of water, bile salts, cholesterol, and the pigment bilirubin. Hepatocytes in the liver produce bile, which then passes through the bile ducts to be stored in the gallbladder. When food containing fats reaches the duodenum, the cells of the duodenum release the hormone cholecystokinin to stimulate the gallbladder to release bile. Bile travels through the bile ducts and is released into the duodenum where it emulsifies large masses of fat. The emulsification of fats by bile turns the large clumps of fat into smaller pieces that have more surface area and are .therefore easier for the body to digest

Bilirubin present in bile is a product of the liver’s digestion of worn out red blood cells. Kupffer cells in the liver catch and destroy old, worn out red blood cells and pass their components on to hepatocytes. Hepatocytes metabolize hemoglobin, the red oxygen-carrying pigment of red blood cells, into the components heme and globins. Globins protein is further broken down and used as an energy source for the body. The iron-containing heme group cannot be recycled by the body and is converted into the pigment bilirubin and added to bile to be excreted from the body. Bilirubin gives bile its distinctive greenish color. Intestinal bacteria further convert bilirubin into the brown .pigment stercobilin, which gives feces their brown color

2.1.2.2Metabolism

the hepatocytes of the liver are tasked with many of the important metabolic jobs that support the cells of the body. Because all of the blood leaving the digestive system passes through the hepatic portal vein, the liver is responsible for metabolizing carbohydrate, lipids, and .proteins into biologically useful materials

Our digestive system breaks down carbohydrates into the monosaccharide glucose, which cells use as a primary energy source. Blood entering the liver through the hepatic portal vein is extremely rich in glucose from digested food. Hepatocytes absorb much of this glucose and store it as the macromolecule glycogen, a branched polysaccharide that allows the hepatocytes to pack away large amounts of glucose and quickly release glucose between meals. The absorption and release of glucose by the hepatocytes helps to maintain homeostasis and protects the rest of the body from dangerous spikes and

.drops in the blood glucose level

Fatty acids in the blood passing through the liver are absorbed by hepatocytes and metabolized to produce energy in the form of ATP. Glycerol, another lipid component, is converted into glucose by hepatocytes through the process of gluconeogenesis. Hepatocytes can also produce lipids like cholesterol, phospholipids, and lipoproteins that are used by other cells throughout the body. Much of the cholesterol produced by hepatocytes

.gets excreted from the body as a component of bile

Dietary proteins are broken down into their component amino acids by the digestive system before being passed on to the hepatic portal vein. Amino acids entering the liver require metabolic processing before they can be used as an energy source. Hepatocytes first remove the amine groups of the amino acids and convert them into ammonia and eventually urea. Urea is less toxic than ammonia and can be excreted in urine as a waste product of digestion. The remaining parts of the amino acids can be broken down into ATP or converted into new glucose molecules .through the process of gluconeogenesis

2.1.2.3Detoxification

As blood from the digestive organs passes through the hepatic portal circulation, the hepatocytes of the liver monitor the contents of the blood and remove many potentially toxic substances before they can reach the rest of the body. Enzymes in hepatocytes metabolize many of these toxins such as alcohol and drugs into their inactive .metabolites

And in order to keep hormone levels within homeostatic limits, the liver also metabolizes and removes from .circulation hormones produced by the body's own glands

2.1.2.4Storage

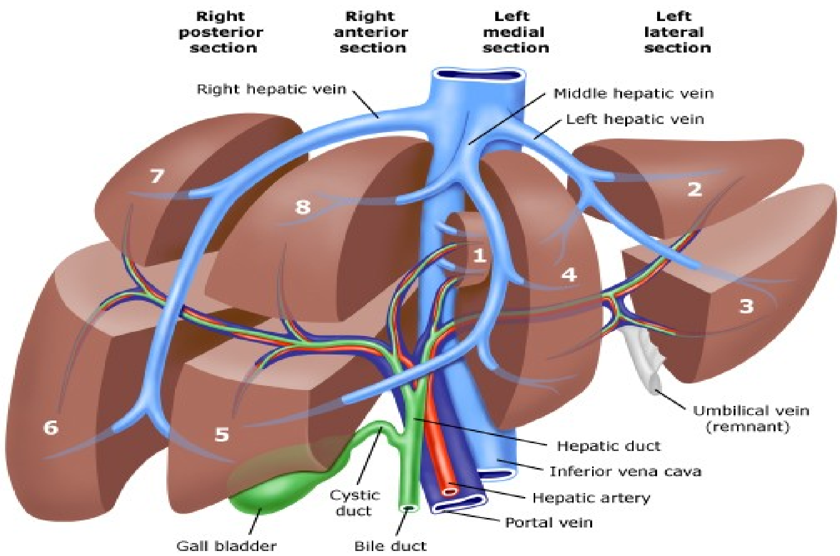
The liver provides storage of many essential nutrients, vitamins, and minerals obtained from blood passing through the hepatic portal system. Glucose is transported into hepatocytes under the influence of the hormone insulin and stored as the polysaccharide glycogen. hepatocytes also absorb and store fatty acids from digested triglycerides. The storage of these nutrients allows the liver to maintain the homeostasis of blood glucose. Our liver also stores vitamins and minerals - such as vitamins A, D, E, K, and B12, and the minerals iron and copper - in order to provide a constant supply of these .essential substances to the tissues of the body

2.1.2.5Production

The liver is responsible for the production of several vital protein components of blood plasma: prothrombin, fibrinogen, and albumins. Prothrombin and fibrinogen proteins are coagulation factors involved in the formation of blood clots. Albumins are proteins that maintain the isotonic environment of the blood so that cells of the body .do not gain or lose water in the presence of body fluids

2.1.2.6Immunity

The liver functions as an organ of the immune system through the function of the Kupffer cells that line the sinusoids. Kupffer cells are a type of fixed macrophage that form part of the mononuclear phagocyte system along with macrophages in the spleen and lymph nodes. Kupffer cells play an important role by capturing and digesting bacteria, fungi, parasites, worn-out blood cells, and cellular debris. The large volume of bloodpassing through the hepatic portal system and the liver allows Kupffer cells to clean large volumes of blood very quickly(Tim Taylor, Inner body.com\image\digeov.html (human



Figure(2.1) Shows: Normal liver anatomy

2.1.3Pathology

Liver metastases 2.1.3.1

Liver metastases are cancerous tumors that have spread to the liver from somewhere else in the body, almost any cancer can spread to the liver, and the risk of cancer spreading to the liver depends on the site of original cancer. The liver is a common site for metastatic disease, which is 20 times more common than primary ones. The frequent involvement of the liver is probably due to its inherent characteristics, such as its blood supply from both the portal vein and the hepatic artery, the high volume of blood flow, its major role in biochemical activities and its anatomy, which provides several different possibilities for tumor cells to become trapped. These factors all create an ideal environment for the rapid

(growth of malignant cells in the liver(Robinson PJ. 2000

2.1.3.2Metastasis Process

There are six steps in the metastasis process. Not all .cancers follow this process, but most do

Local invasion: Cancer cells move from the primary site

.into nearby normal tissue

Intravasation: Cancer cells move through the walls of

.nearby lymph vessels and blood vessels

Circulation: Cancer cells migrate through the lymphatic

.system and the bloodstream to other parts of the body

Arrest and extravasation: Cancer cells stop moving when they reach a distant location. They then move through the capillary (small blood vessel) walls, and invade nearby

.tissue

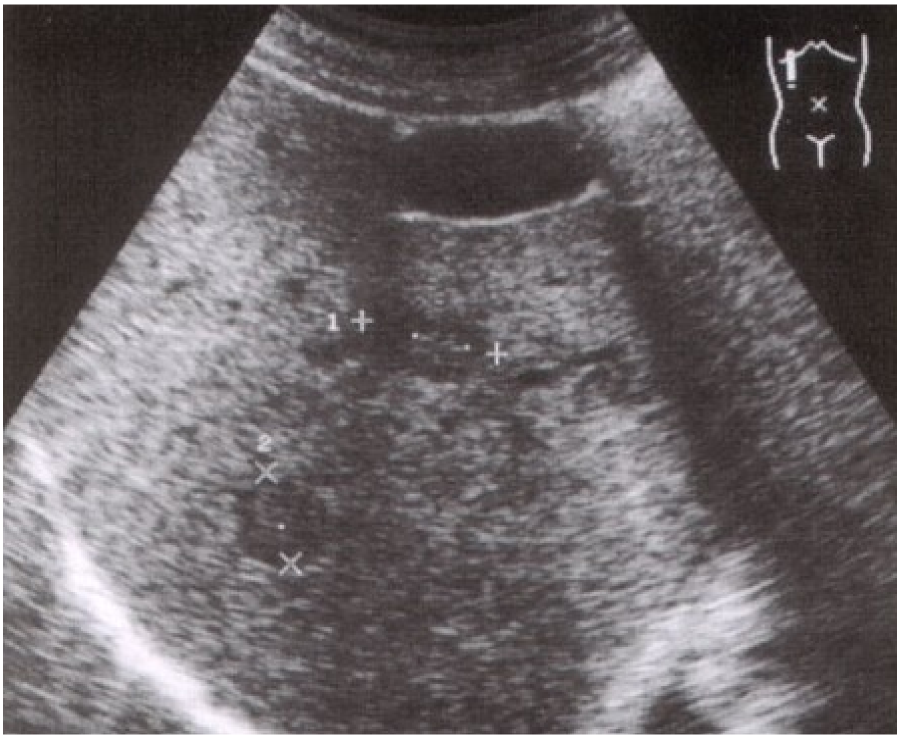
Proliferation: Cancer cells grow at the distant location and .create small tumors called micro metastases

Angiogenesis:Micro metastases (small tumors created by cancer cells) stimulate the creation of new blood vessels, which supply the nutrients and oxygen needed for tumor (growth(American Cancer Society. 2012

Classifications of liver metastases according 2.1.3.3 to echogenicity

:Hypoechoicmetastases 2.1.3.3.1

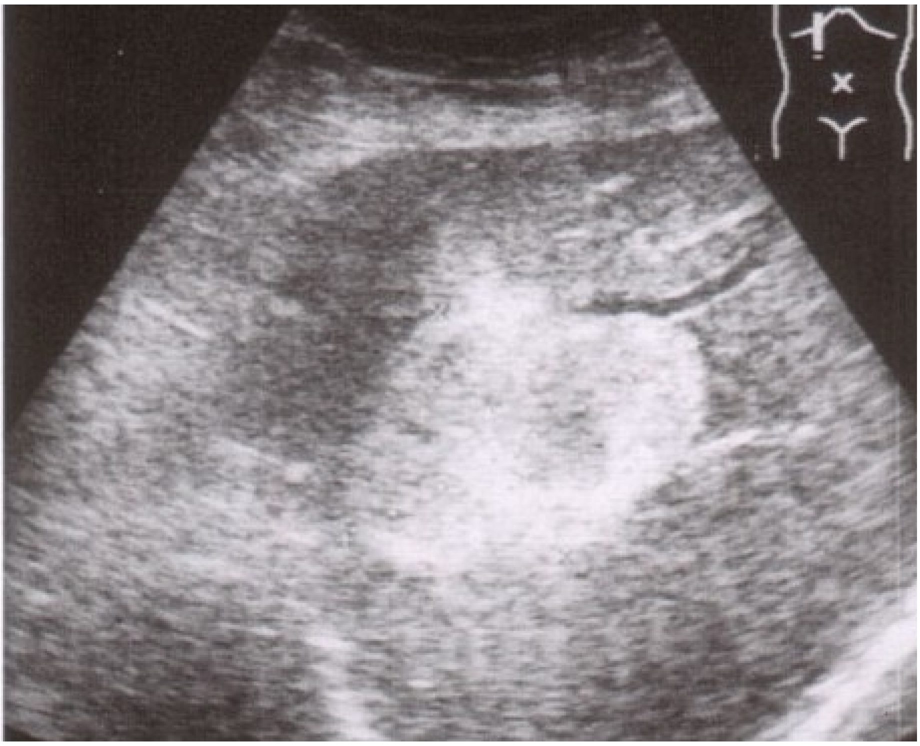
most common 65% & are generally hypo vascular, they comprise a uniform tissue, cellularity, or both. Any primary tumor can cause this pattern, but those particularly likely to have this pattern are (Dr Antoine Micheau and etal 1983)lung cancer ,lymphoma ,Melanomas ,Pancreas and Cervix



Figure(2.2) Shows: Hypo echoic liver metastases

2.1.3.3.2Hyperechoic metastases

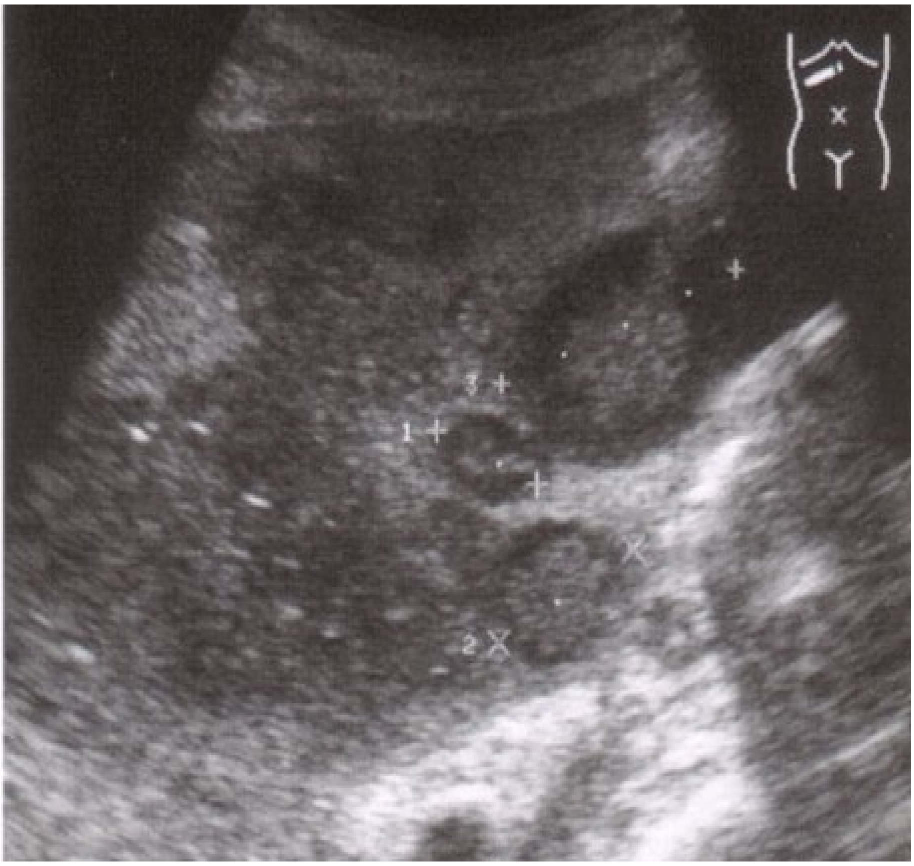
Metastases containing multiple tortuous vessels tend to be hyper vascular, and their echogenicity is most probably related to the number of blood – tissue interface rather than the blood vessels walls itself Dr Antoine Micheauand etal),colorectal carcinoma (CRC) ,renal cell carcinoma (RCC) ,choriocarcinoma ,Kaposi sarcoma ,neuroendocrine .tumors,carcinoid and pancreatic islet cell tumors



Figure(2. 3)Shows: Hyper echoic liver metastases

:2.1.3.3.3Target lesion metastases

In target metastases, the halo is most probably related to a combination of compressed normal hepatic parenchyma around the mass and a zone of cancer cell proliferation. The presence of halo usually suggests aggressive behavior (Pickren JW and etal 1982)bronchogenic carcinoma ,breast .and colon



Figure(2.4) Shows: Halosign liver metastases

Calcified metastases 2.1.3.3.4

Calcified metastases are markedly echogenic, they may shadow. The calcification and echogenicity result from intratumoralmucin, necrosis, or phosphates activity. This pattern may occur from many primary sites, but it is particularly common withcarcinoma of the colon of the mucin secreting type, pseudomucinouscystadenocarcinoma of the stomach, adenocarcinoma of the breast and melanoma.(. Cosgrove

(DO 2001

Figure(2. 5) Shows : Calcify liver metastases

Cystic metastases 2.1.3.3.5

Cystic metastases may display a degree of complexity in the form of mural nodules, thickened walls and septa, and

(fluid\debris level.(Karhunen PJ1986

Two groups tend to get cystic metastases those who have a primary neoplasm with cystic component such as (mucinous cystadenocarcinoma of the colon,Stomach ,pancreas and ovary and those with metastases that are undergoing central necrosis, in this case low-level echoes and wall irregularity are seen in(squamous cell carcinoma ,leiomyosarcoma, melanoma and testicular

.(carcinoma have a propensity to undergo central necrosis

Figure(2. 6) Shows: Cystic liver metastases

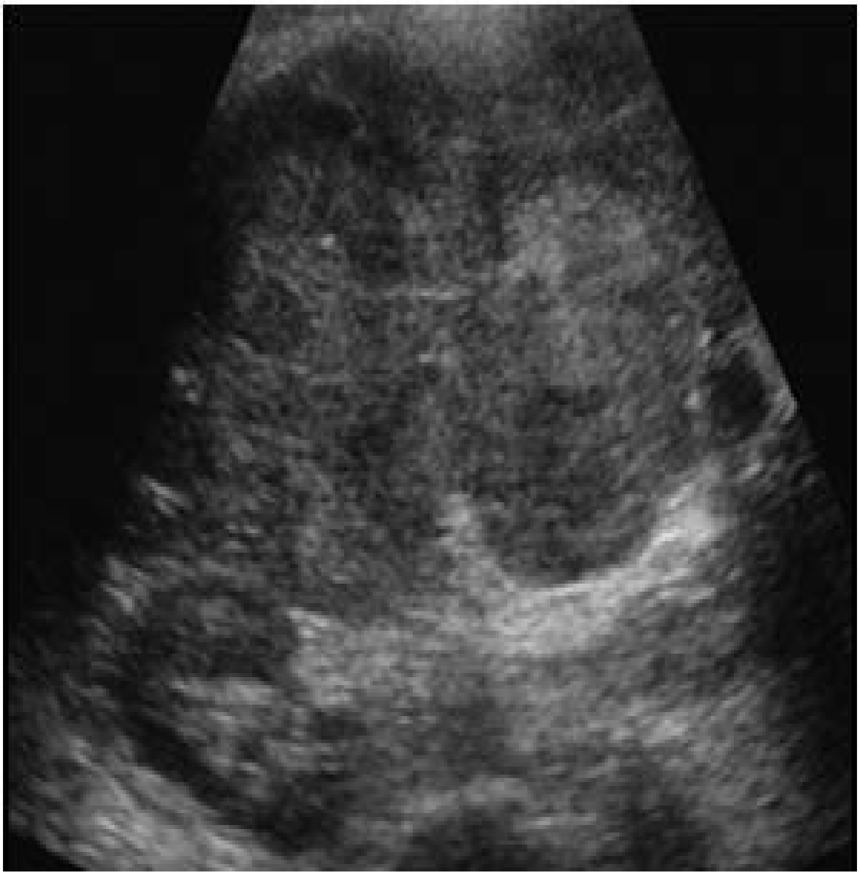
:(**poorly defined (infiltrative** 2.1.3.3.6

Poorly defined were found in melanoma cancer and Lung cancer

Diffuse disease 2.1.3.3.7

may be the result of the confluence of areas of focal disease, infiltrating tumor, or military metastatic deposits, diffuse disease is seen less frequently than focal disease, the liver may appear moth eaten or diffusely heterogeneous , leukemia and lymphoma are particularly prone to diffuse disease(Edmondson HA and etal 1987and.

(AJR Am J Roentgenol. 1992



Figure(2.7)Shows: Diffuse liver metastases

:Ultrasound Nomenclature

Echogenic: the ability of a structure to produce echoes

Anechoic: no echoes and son lucent appears black on .ultrasound

Hypoechoic: less reflective and low amount of echoes when compared with neighboring structures appears .as varying shades of darker gray

Hyperechoic: highly reflective and echo rich when compared with neighboring structures, appears as varying shades of lighter gray; the term echogenic is often used .interchangeably

Isoechoic: having similar echogenicity to a neighboring .structure

US technique

Conventional real time ultrasound produces images of thin slices of the liver on the screen, and so it is essential that the operator scans the entire organ systematically/ritually,

in at least two anatomical planes, to be entirely

Convinced that the entire volume of the liver tissue and .structures has been imaged

The patient should be examined from sub- and intercostally in the decubitus position as well in modified slightly oblique positions with the right arm above the head and the right leg stretched during all respiration cycles to identify the best approach and to avoid artifacts .caused by the thorax

Examination in the standing position is additionally helpful due to its weight, the liver moves caudally by gravity, and scanning from sub- or intercostal probe positions – according to the individual anatomy - avoids the interposed lung which is mainly true for the right posterolateral (superficial) parts of the liver using the intercostals' approach.(F. Dietrich, Carla Serra, .(MaciejJedrzejczyk. Ultrasound of the live

:2.2Previous study

A study done by salih, 2007at national cancer institute at gazera university, central Sudan using gray scale ultra sonography ,serious of 108 female patient with breast .cancer and liver metastases

The review include liver ultra sonography pattern (single, multiple) and echogenicity pattern (hypoechoic,hyperechoic,mixed,isoechoic) ,data analysis using excel and finding multiple liver metastases were pattern upon ultra sonography in 92 of cases and single 8% .and the echogenic of liver metastases from breast cancer was hypoechoic,hyperechoic,mixed and isoechoic in70,21,6 and 3 of case respectively (IOSR Journal of .((Dental and Medical Sciences (IOSR-JDMS (. 2014

A study done by Dr malaz included 100 patients, Females were 65 patients, while males were 35 patients. Asymptomatic patients were 95 (95%) Frequency of the known primary were GI tumors 38%, breast cancer 28%, RCC 8%,Ca ovary 8%,Ca cervix 5%, prostate cancer 4%, nasopharyngeal carcinoma 4%, lymphoma 2%, melanoma .1%, and eye lid cancer 1%

The liver size is found normal in 65%, enlarged in 34% and .small in 1%

The number of lesions were found multiple in 70%, single . .in 24% and diffuse 6%

The detected metastases were categorized into solid , .cystic and mixed lesions

solid in 94%, cystic in 4% and mixed solid with cystic in2%.s) The sonologic pattern of detected metastases were categorized into hypo echoic, hyper echoic, halo sign and cystic,83 patients (83%) had hypo echoic lesions, 13 patients (13%) had hyper echoic lesions and 4% patient had halo lesion (4%) ,two patients (2% of patients with liver Mets) had cystic necrosis. One patient have RCC and .one patient have Ca esophagus as primaries

A previous study done at 2013 by DrVishwanath&T.Thimmaiah, showed that 38% of liver Mets were hypoechoic, 23% were mixed, 19.2% were hyper echoic, and 19.2% were target lesion. ((Dr.Vishwanath .T. Thimmaiah.,2013

Sulfana,Alazad and etal aimed to evaluate the role of u/s in the diagnosis of hepatic metastases of 52 patient from bangabandhu sheikh mujib medical university (BSMMU)and ofdhaka medical collage hospital (DMCH)during the period between juli 2006june 2007 ,and age range from 21to 69y the male and female Ratio 3.7:1and hepatic metastases foundunivocal in7.7% and multifocal in 92.3% cases, the echo pattern was found 57.7 hyper echoic 28 hypo echoic 13.5%mixed pattern

(((Dr sultana (2015

A previous study done by MichlleL.De Oliveira, in US appearances in colorectal cancer liver mets, showed that 41% of liver metastases from colonic cancer were hypoechoic, 44% isoechoic and 14.3% hyperechoic.

(((DeOliveira ML[1], PawlikTMandetal (2007

Chapter three

Chapter three

Materials and Methods

3.1Materials

Study design

.Cross sectional institutional/hospital based study

:Study area

The study will be done in radiation isotope center of .Khartoum

Study sample :31.1

Patients referred to abdomen US in radiation isotope center of Khartoum .Analytical descriptive study carried out of 65 patient whose undergone abdominal u/s,41 female and 24male

:Study period

October 2015– January 2016

3.1.2Ultrasound machine characteristic

Ultrasound machine use is e saoteand images of abdominal u/s done by 4.6HRzmachineuse in ultra sound: (US) with usual frequencies of 2 - 5 - 12 MHz's can penetrate a cross biological environments and us waves are reflected at the demarcation limit between structures of different consistencies. The current procedure of ultrasound examination called "scanning" is based on the analysis of every plane from the region of interest in the human body. Each plane contains a high number of points with different brightness (within the limit of the grayscale used by the equipment) and their sum makes a defining "echo structure" for each organ. Ultrasound diagnosis is based on changes in tissue density due to pathological changes, resulting in echo structure transformation. Ultra sonography is an anatomical, .hemodynamic and functional exploration

Methods 3.2

:Liver US technique :3.2.1

Conventional real time ultrasound produces images of thin slices of the liver the screen, and so it is essential that the operator scans the entire organ systematically, in atleast two anatomical planes, to be entirely convinced that the entire volume of the liver tissue and structures has been .imaged

The patient should be examined from sub- and intercostally in the decubitus position as well in modified slightly oblique positions with the right arm above the head and the right leg stretched during all respiratory cycles to identify the best approach and toavoid artifacts caused by the thorax. Examination in the standing position is additionally helpful due to its weight, the liver moves caudally by gravity, and scanning from sub- or intercostals probe positions – according to the individual anatomy – avoids the interposed lung. this is true for the right posterolateral (superficial) parts of the liver .using the intercostals approach

3.2.2Image interpretation was done by radiologist and most hypo echoic pattern are oval in shape come from breast and .infiltrative are ill define in shape appear in last stage of mets

:3.2.3Data analysis

Data will be managed using the computer data base management and analysis will be performed by using the

.(statistical package for social science (SPSS

Chapter four

Chapter four

Results

the following table and figurer presented the data obtained from 65 patient with liver Mets who were

examined by abdomen ultrasound

Table 4.1. : demonstrates gender distributions

Percent	Frequency	Gender
36.9%	24	Male
63.1%	41	Female
100.0%	65	Total

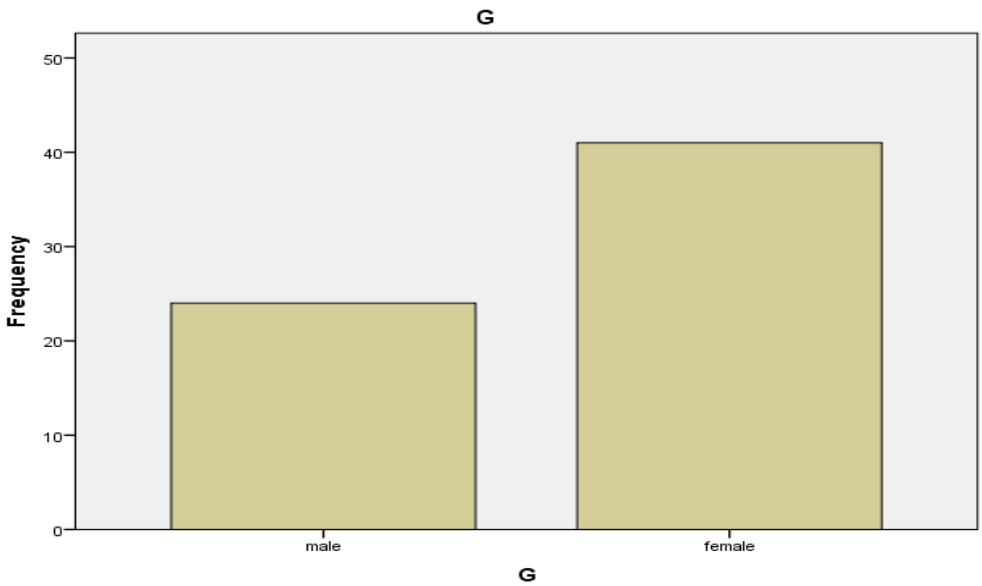


Figure4.1: Shows Gender distributions

Table 4.2: demonstrates age distributions

Percent	Frequency	Age
9.2%	6	30-39
23.1%	15	40-49
33.8%	22	50-59
16.9%	11	60-69
15.4%	10	70-79
1.5%	1	80-89

100.0%	65	Total

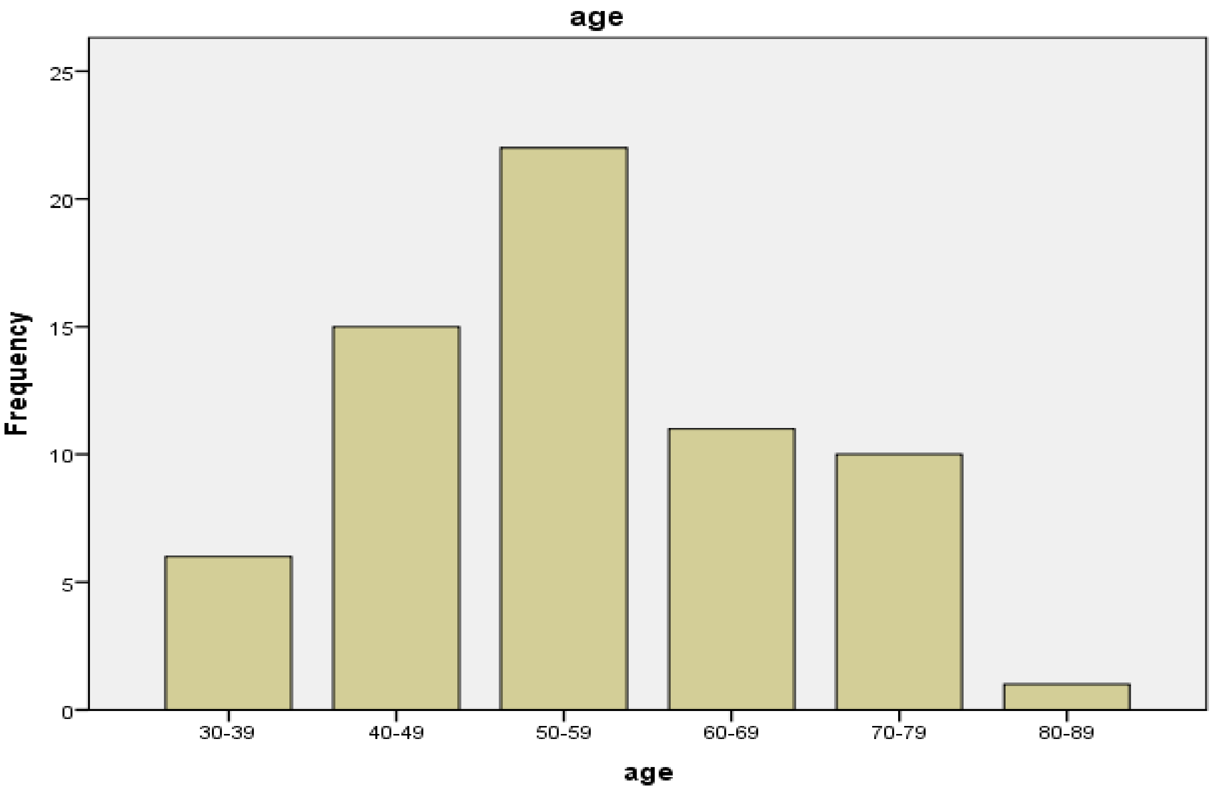


Figure4.2: Shows age distributions

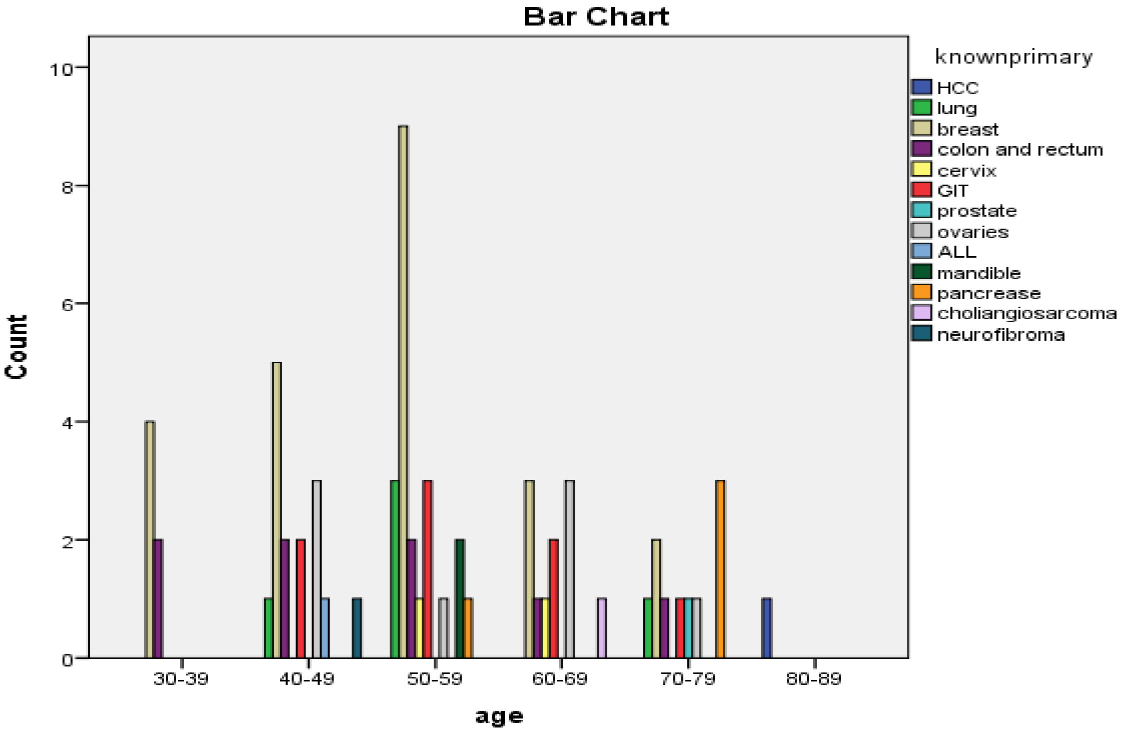


Figure4.3: Shows incidence of primary Ca with age

.Table 4.3: demonstrates single lesions with age

Total **SINGLE**

	Positive	Negative	Variables	
6	2	4	30-39	**Age**
15	8	7	40-49	
22	12	10	50-59	
11	5	6	60-69	
10	2	8	70-79	
1	0	1	80-89	
65	29	36	Total	

Correlation were significant at $p<0.05$, $p=0.427$

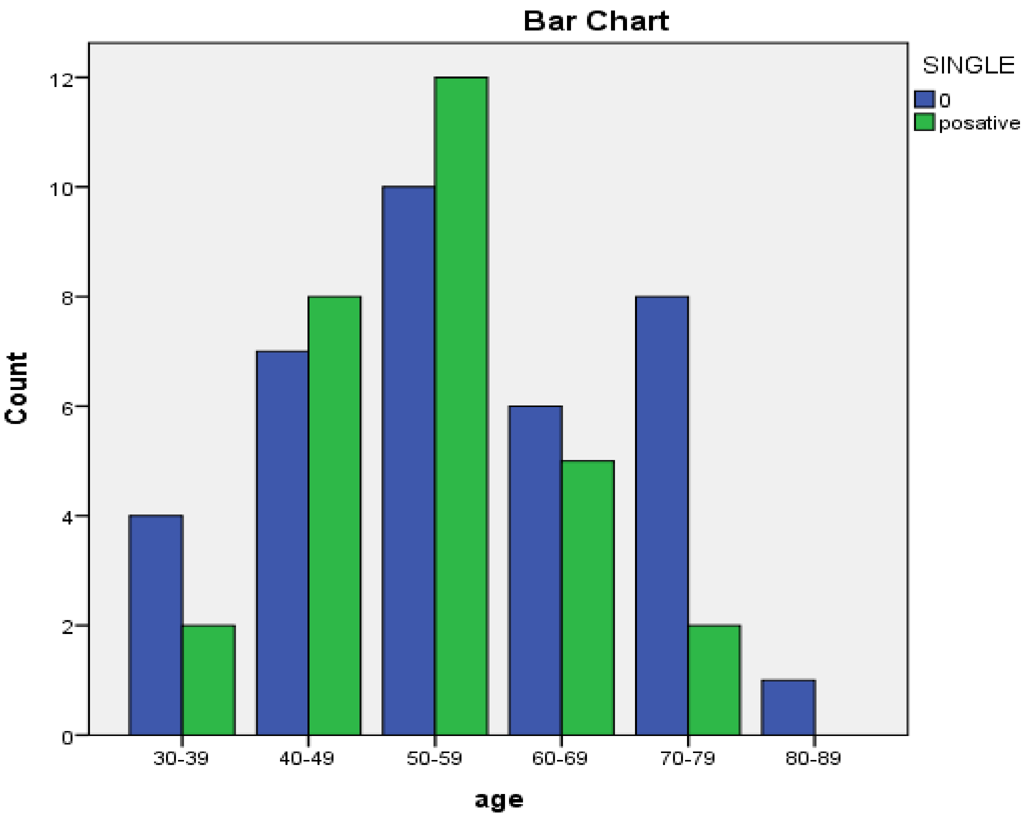


Figure 4.4: Shows single lesions with age

.Table 4.4: demonstrates multiple lesions with age

Total		Multiple	age * Multiple	
	Positive	0		
6	4	2	30-39	Age
15	7	8	40-49	
22	10	12	50-59	
11	5	6	60-69	
10	8	2	70-79	
1	1	0	80-89	
65	35	30		Total

Correlation is significant at $p<0.05$, $p=0.386$

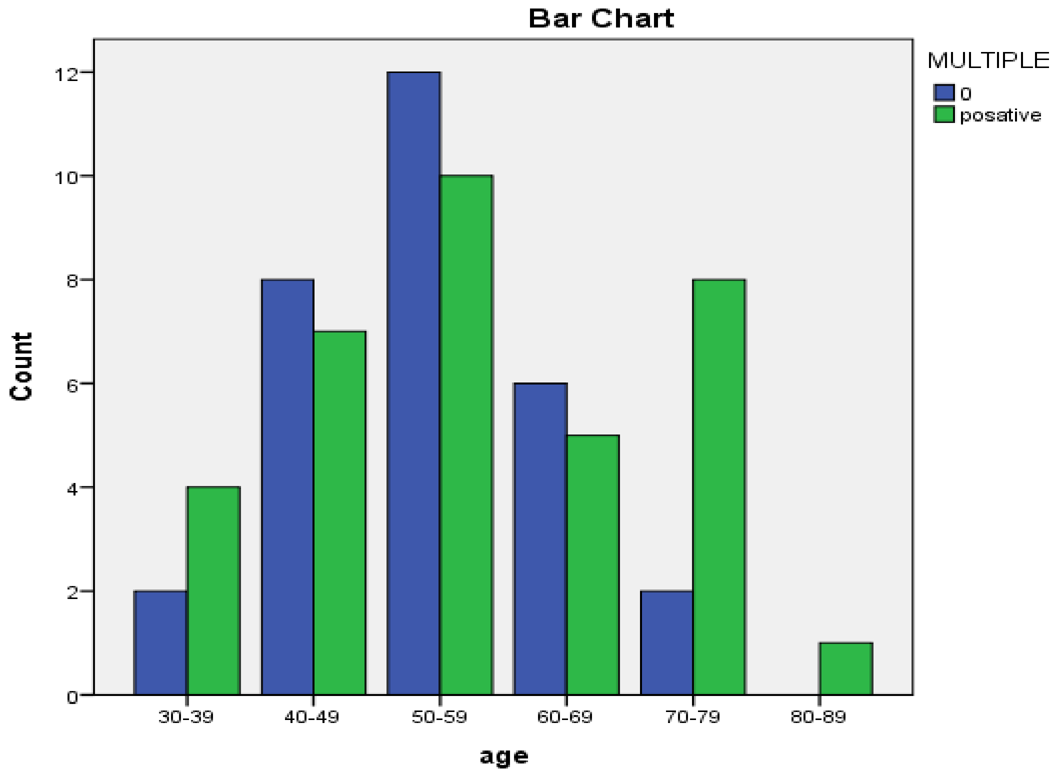


Figure 4.5: Shows multiple lesions with age

.Table 4.5: demonstrates diffuse lesions with age

Total		**Diffuse**	**Age vs. Diffuse**	
	Positive	0		
6	0	6	30-39	Age
15	0	15	40-49	
22	0	22	50-59	
11	1	10	60-69	
10	0	10	70-79	

1	0	1	80-89
65	1	64	Total

Correlation is significant at $p<0.05$, $p=0.41$

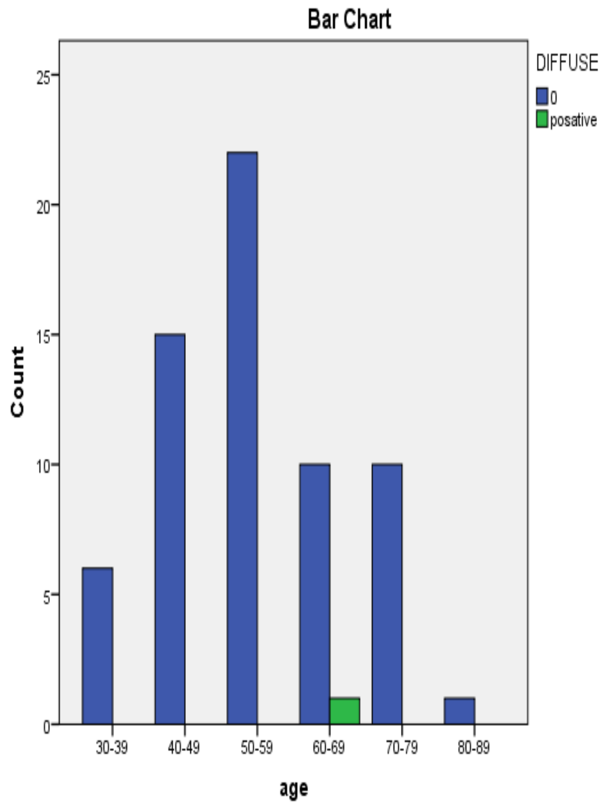


Figure 4.6: Shows diffuse lesions with age

.Table 4.6: demonstrates solid consistency with age

Total		**Solid**	**Age vs. Solid**	
	Positive	0		
6	0	6	30-39	Ag

e

15	4	11	40-49
22	7	15	50-59
11	2	9	60-69
10	7	3	70-79
1	1	0	80-89
65	21	44	Total

Correlation is significant at $p<0.05$, $p=0.027$

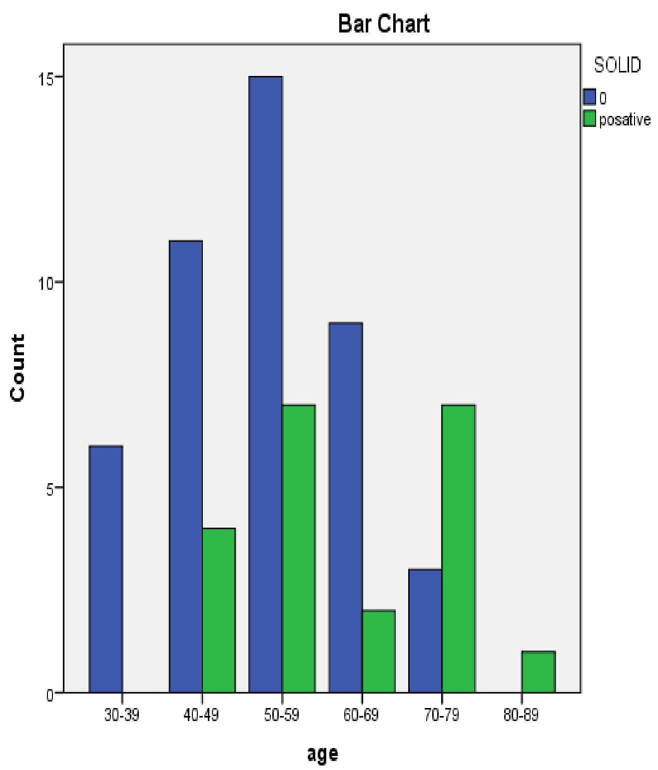


Figure 4.7: Shows solid consistency lesions with age

Table 4.7: demonstrates Cystic consistency with .age

Total		Cystic		Age vs. Cystic
	positive	0		
6	5	1	30-39	Age
15	7	8	40-49	
22	13	9	50-59	
11	8	3	60-69	
10	3	7	70-79	
1	0	1	80-89	
65	36	29		Total

Correlation is significant at $p<0.05$, $p=0.175$

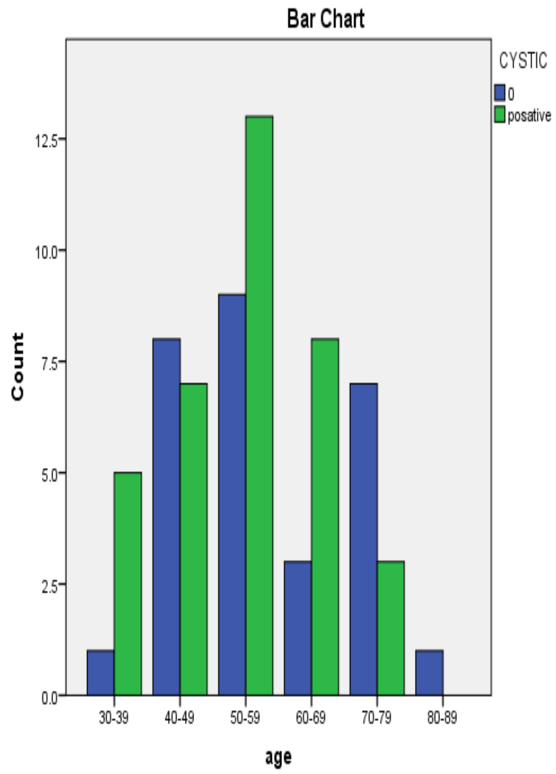


Figure 4.8: Shows Cystic consistency lesions with age

.Table 4.8: demonstrates C &S consistency with age

Total	**S&C**		**Age vs. C&S**	
	positive	0		
6	1	5	30-39	Age
15	3	12	40-49	
22	2	20	50-59	
11	1	10	60-69	

10	0	10	70-79
1	0	1	80-89
65	7	58	Total

Correlation is significant at $p<0.05$, $p=0.704$

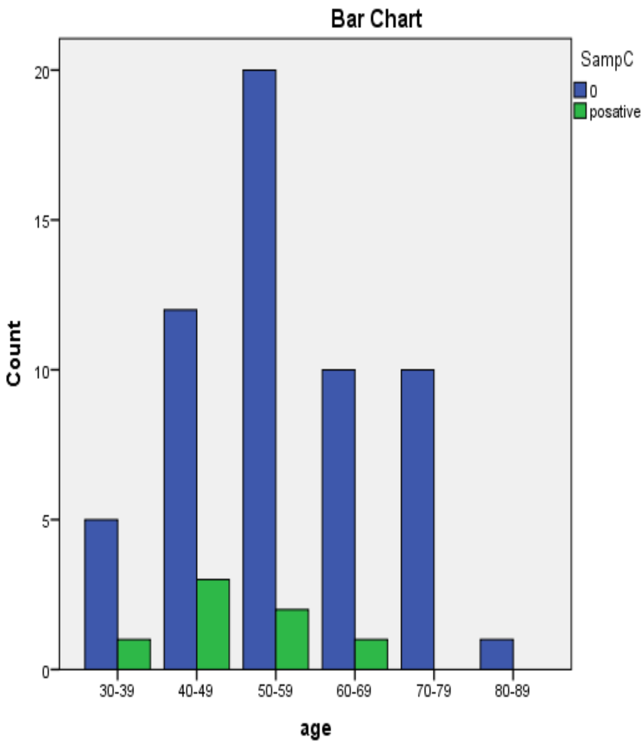


Figure 4.9: Shows C&S consistency lesions with age

Table 4.9: demonstrates calcified consistency with .age

Total	**Calcified**

	Positive	0		**Age vs. Calcified**
6	0	6	30-39	Age
15	1	14	40-49	
22	0	22	50-59	
11	0	11	60-69	
10	0	10	70-79	
1	0	1	80-89	
65	1	64		Total

Correlation is significant at $p<0.05$, $p=0.641$

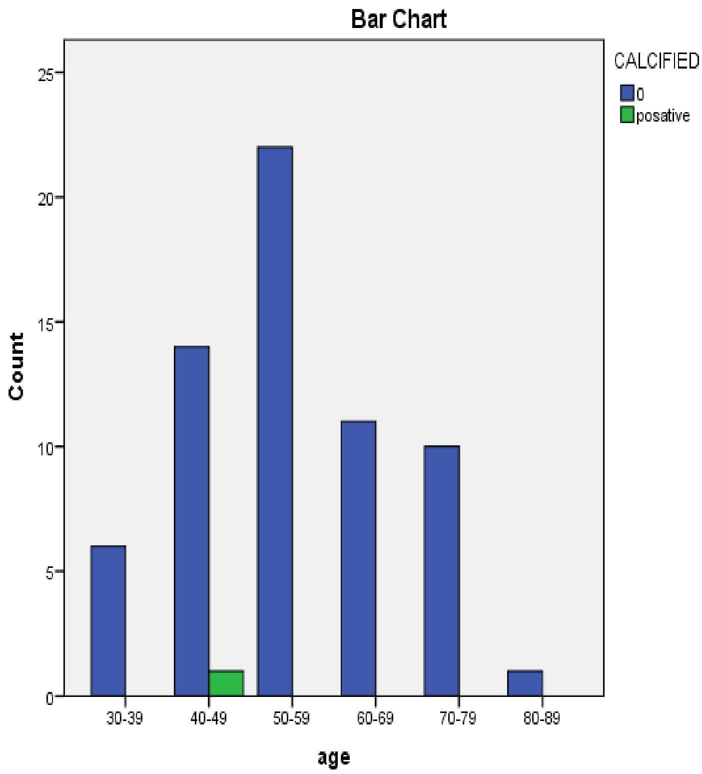


Figure 4.10: Shows calcified consistency lesions with age

Table 4.10: demonstrates hypoechoic pattern

.consistency with age

Total		**Hypoechoic**		**Age vs.Hypoechoic**	
	o	1	0		
6	0	5	1	30-39	Age
15	1	9	5	40-49	
22	0	14	8	50-59	
11	0	8	3	60-69	
10	0	5	5	70-79	
1	0	0	1	80-89	
65	1	41	23		Total

Correlation is significant at $p<0.05$, $p=0.686$

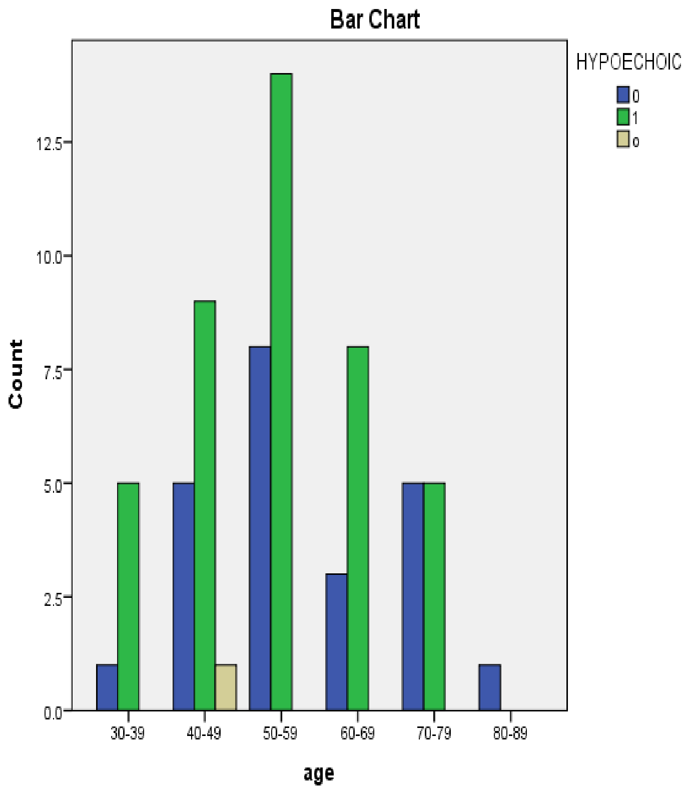


Figure 4.11: Shows hypoechoic pattern lesions with age

Table 4.11: demonstrates hyper echoic pattern of lesion with age

Total	**Hyperechoic**		**Age vs. Hyperechoic**	
	Positive	0		
6	1	5	30-39	Age
15	4	11	40-49	
22	6	16	50-59	
11	2	9	60-69	

10	4	6	70-79
1	0	1	80-89
65	17	48	Total

Correlation is significant at p<0.05, p=0.848

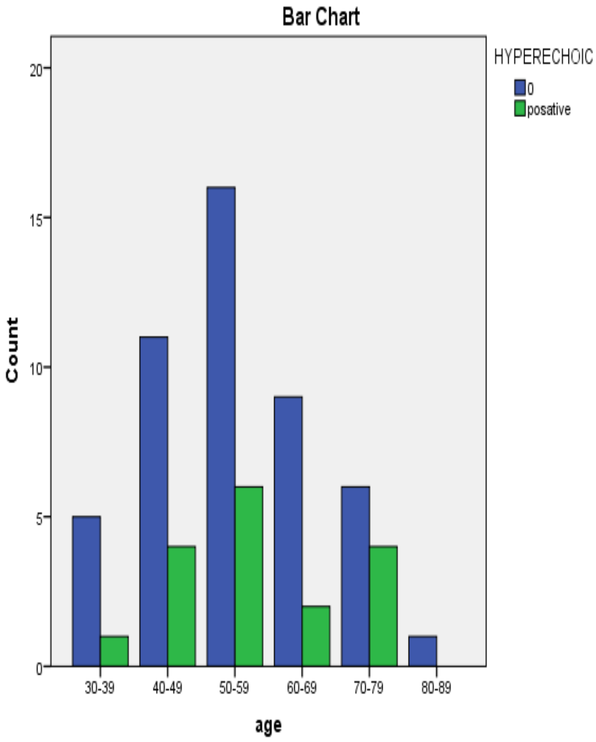


Figure 4.12: Shows hyperechoic pattern lesions with age

Table 4.12: demonstrates halo sign pattern of lesion with age

Total	**Halo sign**	**Age vs. Halo sign**

	Positive	0		
6	0	6	30-39	Age
15	1	14	40-49	
22	1	21	50-59	
11	0	11	60-69	
10	0	10	70-79	
1	1	0	80-89	
65	3	62		Total

Correlation is significant at $p<0.05$, $p=0.000$

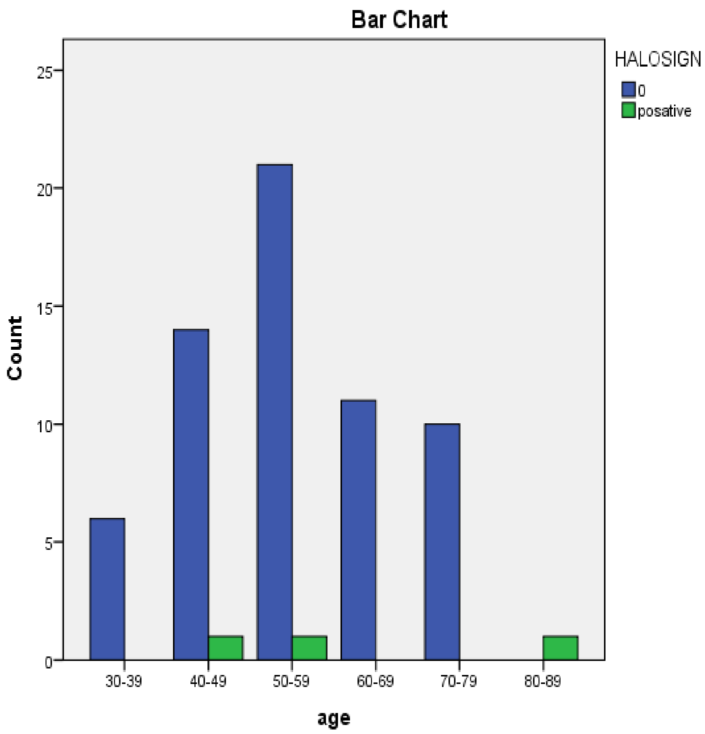


Figure 4.13: Shows halo sign pattern lesions with age

Table 4.13: demonstrates infiltrative pattern of lesion with age

Total	Infiltrative			
	positive	0		
6	0	6	30-39	Age
15	1	14	40-49	
22	1	21	50-59	
11	1	10	60-69	
10	1	9	70-79	
1	0	1	80-89	
65	4	61		Total

Correlation is significant at $p<0.05$, $p=0.964$

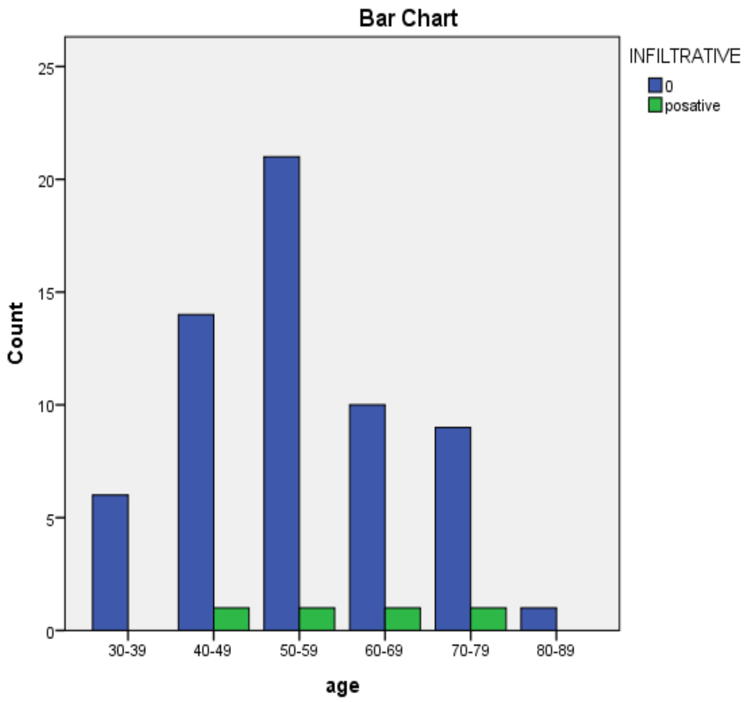


Figure 4.14: Shows infiltrative pattern lesions with age

Table 4.14: demonstrates known primary Ca with single lesions

Total	**Single**			
	Positive	0		
1	0	1	HCC	Known primary
5	1	4	Lung	
23	8	15	Breast	
8	3	5	Colon& rectum	

2	1	1	Cervix
8	5	3	GIT
1	0	1	Prostate
8	5	3	Ovaries
1	1	0	ALL
2	2	0	Mandible
4	2	2	Pancreas
1	0	1	Choliangiosarcoma
1	1	0	Neurofibroma
65	29	36	Total

Correlation is significant at $p<0.05$, $p=0.461$

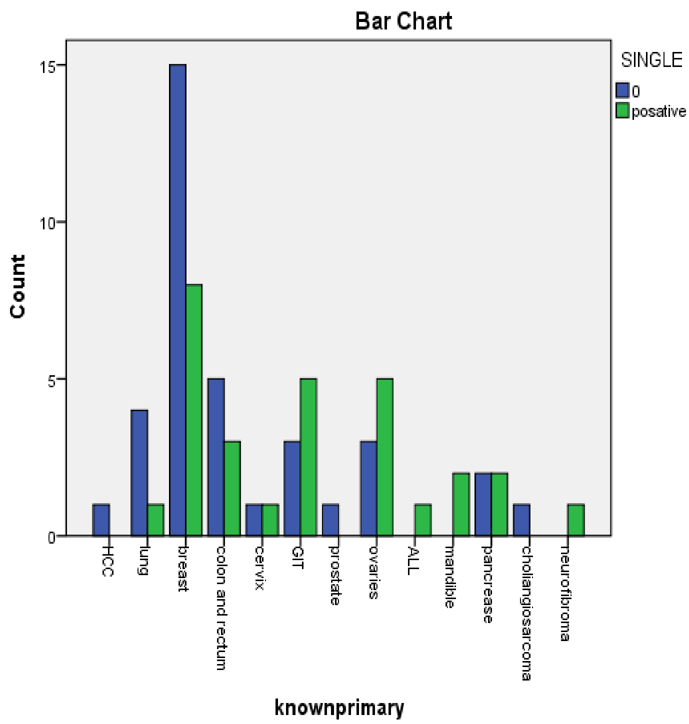


Figure 4.15: Shows known primary Ca with single lesions

Table 4.15: demonstrates known primary Ca with multiple lesions

Total	**Multiple**			
	Positive	0		
1	1	0	HCC	Known primary
5	4	1	Lung	
23	15	8	Breast	
8	4	4	Colon& Rectum	
2	1	1	Cervix	

8	3	5	GIT
1	1	0	Prostate
8	3	5	Ovaries
1	0	1	ALL
2	0	2	Mandible
4	2	2	Pancreas
1	1	0	Choliangiosarcoma
1	0	1	Neurofibroma
65	35	30	Total

Correlation is significant at $p<0.05$, $p=0.477$

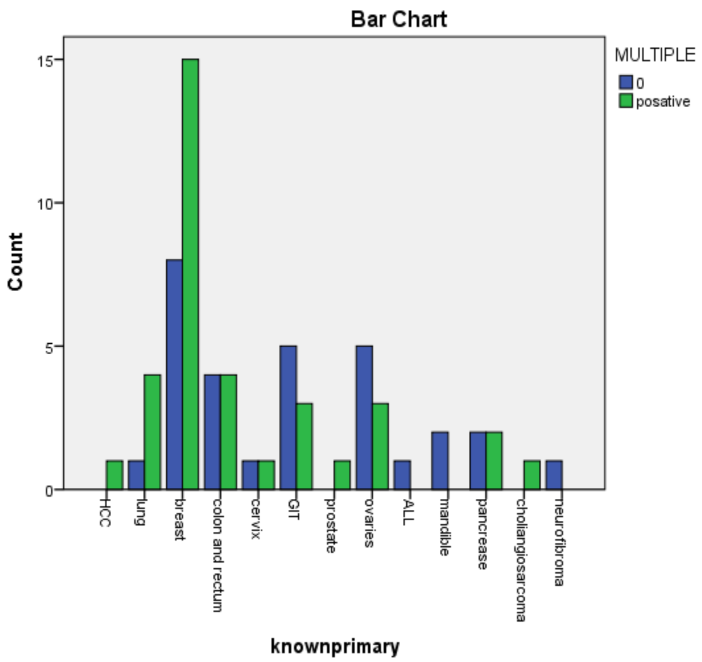


Figure 4.16: Shows known primary Ca with multiple lesions

Table 4.16: demonstrates known primary Ca with diffuse lesions

Total		**Diffuse**		
	Positive	0		
1	0	1	HCC	Known primary
5	0	5	Lung	
23	0	23	Breast	
8	1	7	Colon and Rectum	
2	0	2	Cervix	
8	0	8	GIT	
1	0	1	Prostate	
8	0	8	Ovaries	
1	0	1	ALL	
2	0	2	Mandible	
4	0	4	Pancreases	
1	0	1	Choliangiosarcoma	

1	0	1	Neurofibroma	
65	1	64		Total

Correlation is significant at $p<0.05$, $p=0.842$

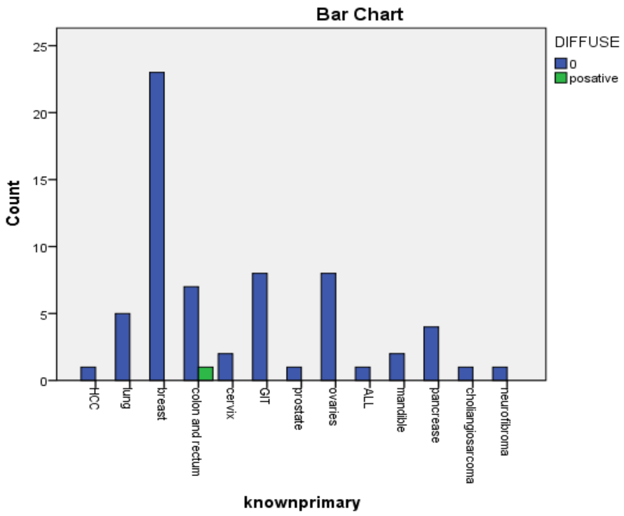


Figure 4.17: Shows known primary Ca with diffuse lesions

Table 4.17: demonstrates known primary Ca with solid lesions

Total		SOLID		
	Positive	0		
1	1	0	HCC	Known primary
5	1	4	Lung	

23	5	18	Breast
8	4	4	Colon&Rectum
2	1	1	Cervix
8	3	5	GIT
1	1	0	Prostate
8	0	8	Ovaries
1	1	0	ALL
2	2	0	Mandible
4	2	2	Pancreas
1	0	1	Choliangiosarcoma
1	0	1	Neurofibroma
65	21	44	Total

Correlation is significant at $p<0.05$, $p=0.092$

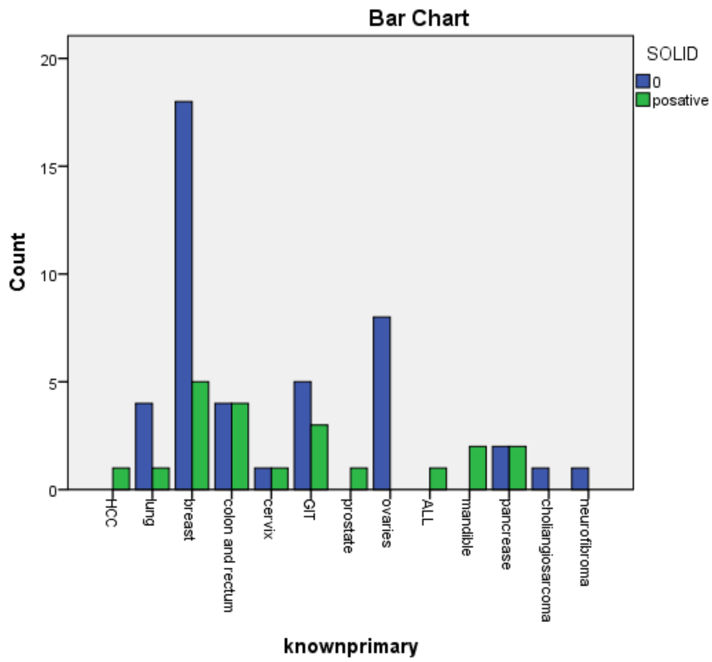


Figure 4.18: Shows known primary Ca with solid lesions

Table 4.18: demonstrates known primary Ca with cystic lesions

Total	**Cystic**			
	Positive	0		
1	0	1	HCC	Known primary
5	2	3	Lung	
23	18	5	Breast	
8	2	6	colon and Rectum	
2	1	1	Cervix	

8	4	4	GIT
1	0	1	Prostate
8	5	3	Ovaries
1	0	1	ALL
2	0	2	Mandible
4	2	2	Pancreas
1	1	0	Choliangiosarcoma
1	1	0	Neurofibroma
65	36	29	Total

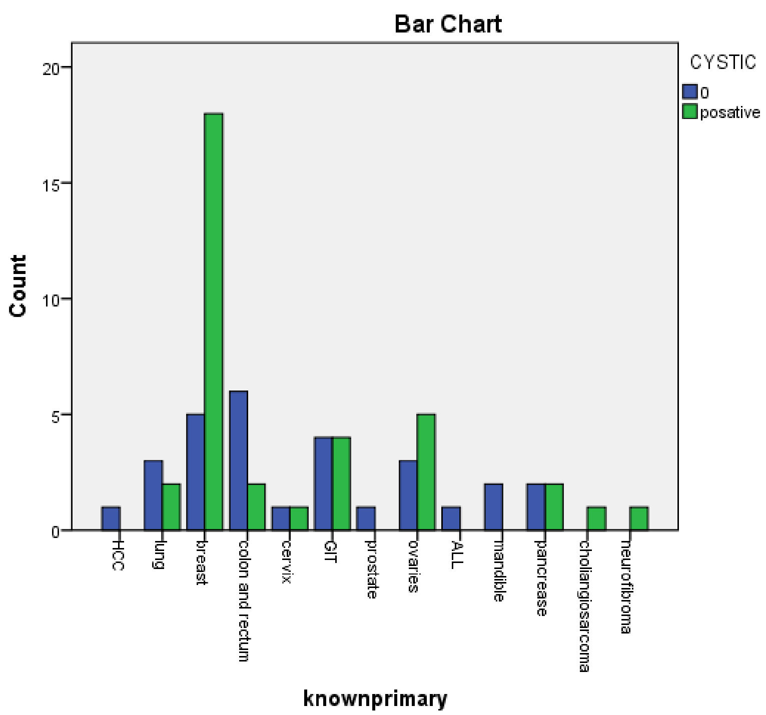


Figure 4.19: Shows known primary Ca with Cystic lesions

Table 4.19: demonstrates known primary Ca with C&S lesions

Total	Positive	C&S 0		
1	0	1	HCC	Known primary
5	2	3	Lung	
23	0	23	Breast	
8	2	6	Colon and Rectum	
2	0	2	Cervix	
8	0	8	GIT	
1	0	1	Prostate	
8	3	5	Ovaries	
1	0	1	ALL	
2	0	2	Mandible	
4	0	4	Pancreas	
1	0	1	Choliangiosarcoma	
1	0	1	Neurofibroma	
65	7	58		Total

Correlation is significant at $p<0.05$, $p=0.135$

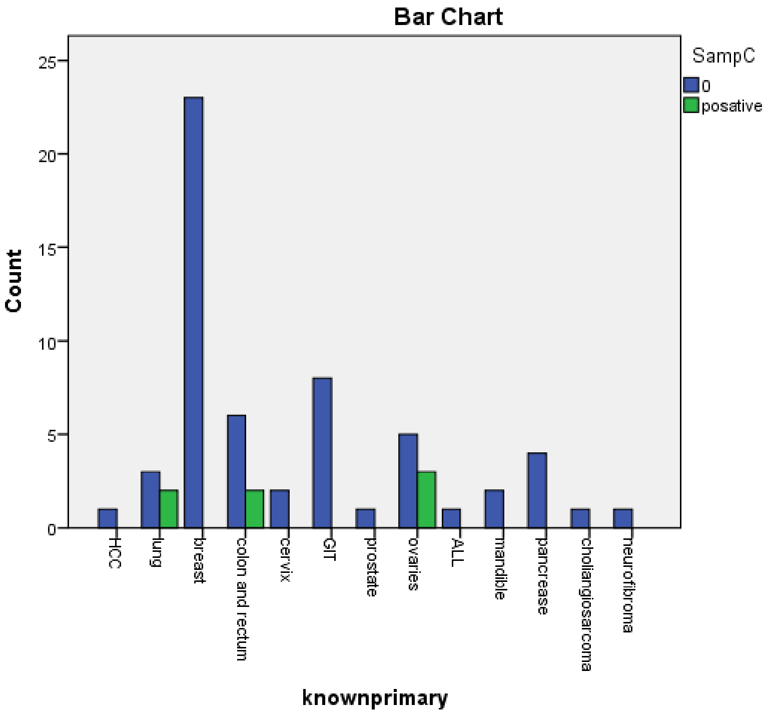


Figure 4.20: Shows known primary Ca with C&S lesions

Table 4.20: demonstrates known primary Ca with Calcified lesions

Total	**Calcified**			
	Positive	0		
1	0	1	HCC	Known primary
5	0	5	Lung	
23	0	23	Breast	

8	0	8	Colon and Rectum	
2	0	2	Cervix	
8	1	7	GIT	
1	0	1	Prostate	
8	0	8	Ovaries	
1	0	1	ALL	
2	0	2	Mandible	
4	0	4	Pancreas	
1	0	1	Choliangiosarcoma	
1	0	1	Neurofibroma	
65	1	64		Total

Correlation is significant at $p<0.05$, $p=0.842$

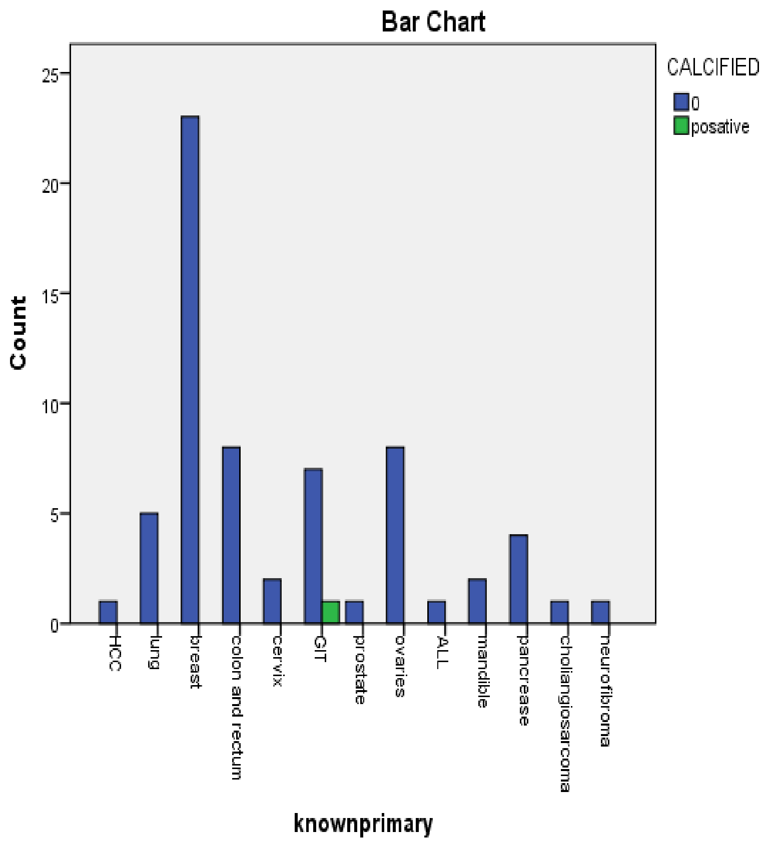


Figure 4.21: Shows known primary Ca with Calcified lesions

Table 4.21: demonstrates known primary Ca with Hypoechoic lesions

Total	Hypoechoic			
	1	0		
1	0	1	HCC	Known primary
5	2	3	Lung	
23	21	2	Breast	

8	3	5	Colon and Rectum
2	1	1	Cervix
8	2	5	GIT
1	0	1	Prostate
8	5	3	Ovaries
1	1	0	ALL
2	0	2	Mandible
4	4	0	Pancreas
1	1	0	Choliangiosarcoma
1	1	0	Neurofibroma
65	41	23	Total

Correlation is significant at $p<0.05$, $p=0.097$

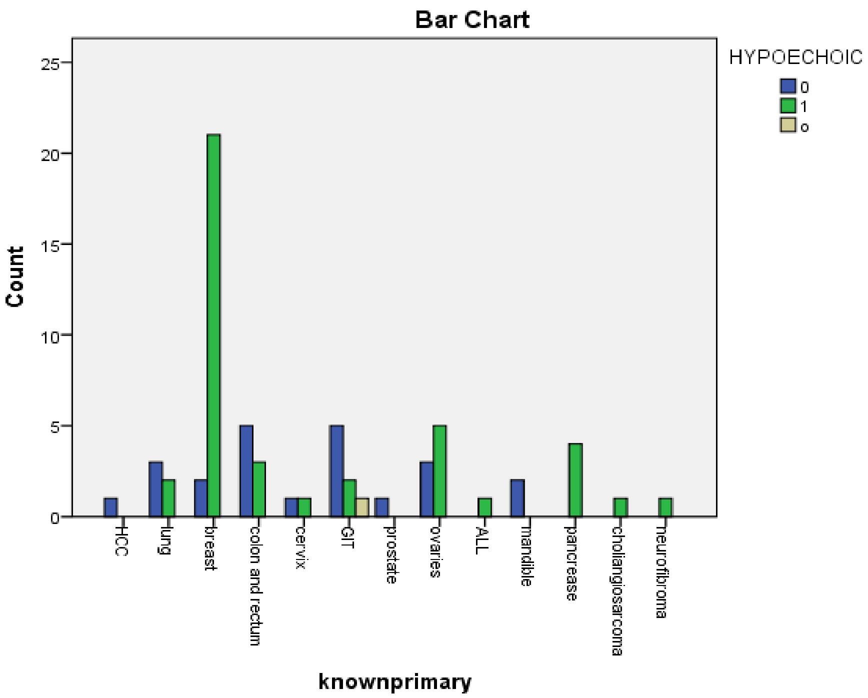


Figure 4.22: Shows known primary Ca with hypoechoic lesions

Table 4.22: demonstrates known primary Ca with hyperechoic lesions

Total	**Hyperechoic**			
	Positive	0		
1	0	1	HCC	Known primary
5	2	3	Lung	
23	1	22	Breast	
8	3	5	Colon and Rectum	
2	1	1	Cervix	
8	6	2	GIT	

1	1	0	Prostate
8	1	7	Ovaries
1	0	1	ALL
2	2	0	Mandible
4	0	4	Pancreas
1	0	1	Choliangiosarcoma
1	0	1	Neurofibroma
65	17	48	Total

Correlation is significant at $p<0.05$, $p=0.004$

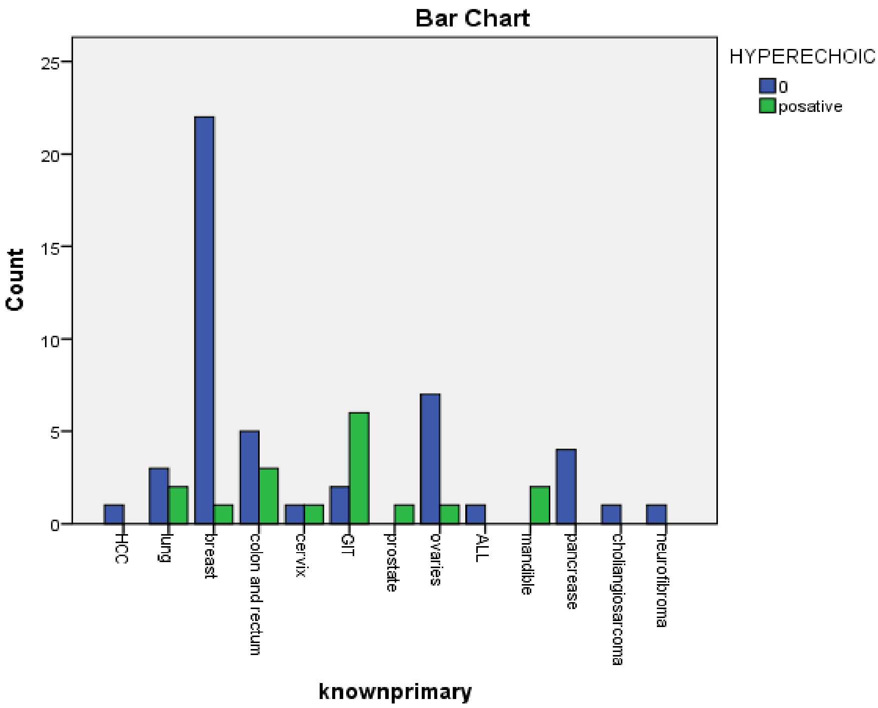


Figure 4.23: Shows known primary Ca with hyperechoic lesions

Table 4.23: demonstrates known primary Ca with halo sign lesions

Total	Halosign			
	Positive	0		
1	1	0	HCC	Known primary
5	0	5	Lung	
23	0	23	Breast	
8	1	7	colon and rectum	
2	0	2	Cervix	
8	0	8	GIT	
1	0	1	Prostate	
8	1	7	Ovaries	
1	0	1	ALL	
2	0	2	Mandible	
4	0	4	Pancreas	
1	0	1	Choliangiosarcoma	
1	0	1	Neurofibroma	
65	3	62		Total

Correlation is significant at $p<0.05$, $p=0.014$

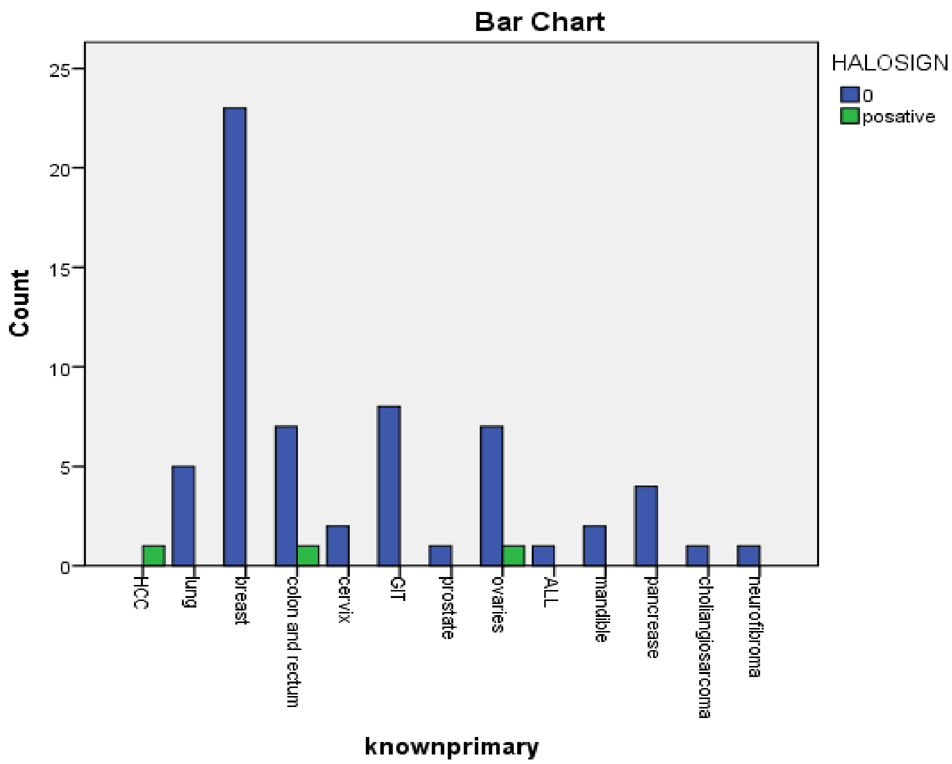


Figure 4.24: Shows known primary Ca with halo sign lesions

Table 4.24: demonstrates known primary ca with infiltrative lesions

Total	**Infiltrative**			
	Positive	0		
1	0	1	HCC	Known primary
5	1	4	Lung	
23	1	22	Breast	

8	1	7	colon and rectum
2	0	2	Cervix
8	0	8	GIT
1	0	1	Prostate
8	1	7	Ovaries
1	0	1	ALL
2	0	2	Mandible
4	0	4	Pancreases
1	0	1	Choliangiosarcoma
1	0	1	Neurofibroma
65	4	61	Total

Correlation is significant at $p<0.05$, $p=0.978$

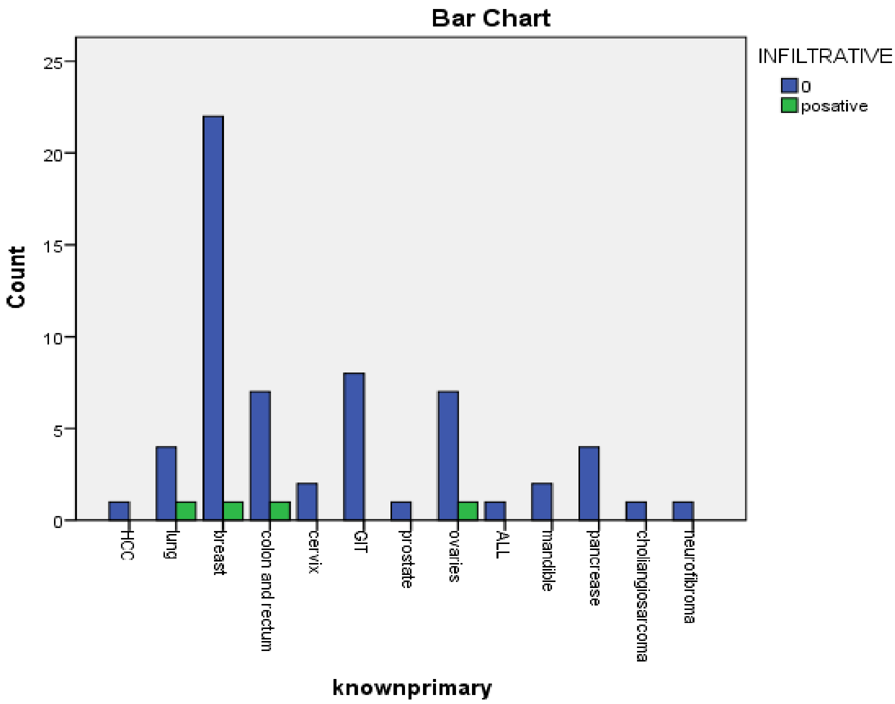


Figure 4.25:p Shows known primary Ca with Infiltrative lesions

Chapter five

Chapter five

Discussion, Conclusions and Recommendations

Discussion 5.1

The 65 patients, who were included in this study, were known canceric patients and referred to radiation isotope center of Khartoum for abdominal ultra sound. Patients below 39 years of age were 6 (9.2%) ,below of49 years of age were 15 (23.1%),below 59years of age were 22 (33.8%),below 69years of age were11(1 6.8%),below 79 years of age were 10(15.4)and below 89 years of age were .(1(1.5

In this study my result similar in echo pattern to previous study done by DrVishwanath&T.Thimmaiah, showed that 38% of liver Mets were hypoechoic, 23% were mixed, 19.2% were hyperechoicand 19.2% were target lesion and previous study of US pattern of liver Mets from breast cancer done by Salih&, showed that 70% of Mets were hypoechoic, whilst 21% were hyperechoic,6% were mixed, and 3% were isoechoic. As the study was done exclusively in breast cancer patients, it showed more variable .patterns

In this study u/s appearance of colonic cancer were hyper echoic differ from

previous study done by MichlleL.De Oliveira, in US appearances in colorectal cancer liver Mets, showed that 41% of liver metastases from colonic cancer were hypoechoic, 44% isoechoic and 14.3% hyperechoic.and study done by Drmalaz, , Showed that 83 patients (83%) had hypoechoic lesions, 13 patients (13%) had hyper echoic lesions and 4% patient had halo lesion (4%) ,two patients (2% of patients with liver Mets) had cystic .necrosis

The number of lesions were found multiple in 70%, single in 24% and diffuse 6%Similar to my result but the size of sample in small

Conclusion 5.2

This study concluded that: the commonest primary tumors that give liver metastases are breast tumors fallowed by .GIT cancers

.Females affected more than males

.The majority of the liver metastases are multiple

The consistencies of liver metastases are predominantly .cystic lesions

The majority of pattern of liver metastases are hypoechoic .and more common from breast cancer

The hyperechoic liver metastases are more common from .colonic cancer fallowed by mandible and lung carcinoma

Small percentages of metastases are solid

.The majority of Ca beginning over forty years

Recommendations 5.3

Liver is a common site for metastatic disease so close follow up by ultrasound is recommended especially over .40 years

Further research should be encouraged to correlate .ultrasound patterns and CT features of liver metastases

Further researches should be encouraged to determine the role of contrast enhanced ultrasound in detection and .characterization of liver metastases

References

References

American Cancer Society. (2012). Liver cancer survival

.rates. American Cancer Society

Catheline ,Turner Champault.(200

. Laparoscopic ultrasound of the liver. Eur J Ultrasound (0

Cosgrove DO. Malignant liver disease. In: Meire HB, Cosgrove DO, Dewbury KC, Farrant P, editors,(2001). Clinical ultrasound: a comprehensive text, 2nd ed. London: .Churchill Livingstone

DeOliveira ML[1], Pawlik TM, Gleisner AL, Assumpcaom L, Lopes-Filho GJ, Choti MA. J Gastrointest Surg. (2007) Echogenic appearance of colorectal liver metastases on intraoperative ultrasonography is associated with survival .after hepatic resection

DeWitt, LeBlanc, McHenry L et al. (2003) Endoscopic ultrasound-guided fine needle aspiration cytology of solid liver lesions: a large single-center experience. Am J ..Gastroenterol

Dr Antoine Micheau(1983) Hepatic-segments-Couinaud-classification2 Tong **D**, Russell AH, Dawson LE, Wisbeck W. Second laparotomy for proximal colon cancer.Sites of .recurrence and implications for adjuvant therapy

Dr.Vishwanath . Thimmaiah.Scholars Journal of Applied Medical Sciences (SJAMS).Sch. J. App. Med. Sci.,(2013); Evaluation of Focal Liver Lesions by Ultrasound as a Prime Imaging Modality

Edmondson HA,(1987) Craig JR. Neoplasm's of the liver. In: Schiff L, editor. Diseases of the liver, 8th ed. ,Philadelphia: Lippincott

Furuse and et al.(2003)Contrast enhancement patterns of hepatic tumors' during the vascular phase using coded harmonic imaging and Levovist to differentiate hepatocellular carcinoma from other focal lesions. Br J Radiol 2003;76:385–39

Gilbert JM, Jeffrey I, Evans M, Kark AE.(1984) Sites of recurrent

Glover and et al.(2002) Accuracy of investigations for asymptomatic colorectal liver metastases

IOSR Journal of Dental and Medical Sciences (IOSR-JDMS) e-ISSN: 2279-0853, p-ISSN: 2279 -0861.Volume 13, Issue 4 .Ver. VII. (Apr. 2014), PP 95-98

Karhunen.(1986) Benign hepatic tumours and tumour like .conditions in men. J Clinical Pathology

Lamb Taylor I.(1982)An assessment of ultrasound scanning in the recognition of colorectal liver metastases. . Ann R CollSurgEngl

Lencioni Riccardo, Dania Cioni and Carlo Bartolozzi(2005) .Focal liver lesions. Springer

Paulson(2001)Evaluation of the liver for metastatic .disease. Semin Liver Disease

Pickren ,(1982) Tsuka Y, Lane WW. Liver metastases. In: Weiss L, Gilbert HA, editors. Liver metastasis. Boston: GK ,Hall Medical Publischers

R. Badea and SimonaIoanitescu (2012). Ultrasound Imaging of Liver Tumors – Current Clinical Applications,Liver Tumors, Prof. Alexander Julianov (Ed.), ISBNChristoph F. Dietrich, Carla Serra, MaciejJedrzejczyk.

Ultrasound of the liver

Robinson.(2000) Imaging liver metastases: current

.limitations and future prospects. Br J Radiol

Russell and etal (1984). Adenocarcinoma of the proximal colon. Sites of initial dissemination and patterns of

.recurrence following surgery alone

Schmidt J, Strotzer M, Fraunhofer S et al. (2000) Intraoperative ultrasonography versus helical computed tomography and computed tomography with arterioportography in diagnosing colorectal liver

.metastases: lesion-by-lesion analysis. World J Surg

Sica GT, Ji H, Ros PR (2000) CT and MR imaging of hepatic

. metastases. AJR Am J Roentgenol

Teefey et al.(2003)Detection of primary hepatic malignancy in liver transplant candidates: prospective

.comparison of CT, MR imaging, US, and PET. Radiology

Tim Taylor, Anatomy and Physiology Instructor. Inner body.com\image\digeov.html human

WerneckeK, et-al…(1992) The distinction between benign and malignant liver tumors on sonography: value of a .hypoechoic halo. AJR Am J Roentgenol

www.banglajol.info/index.php/JDMC/article/viewFile/25398/ 17049 by F Sultana - 2015

Appendixes

(Appendix (A

NO	age	G	known primary	SINGLE	MULTIPLE	DIFFUSE	SOLID	CYSTIC	S&C	CALCIFIED	HY

(Appendix(B

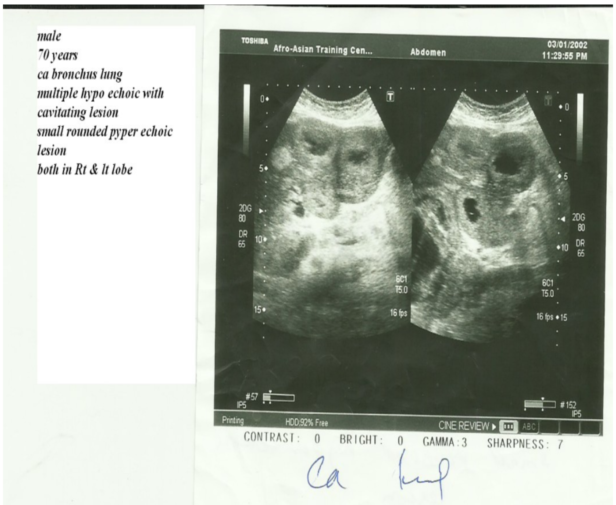


Figure (B.1): ca bronchus lung multiple hypo echoic with cavitations lesion small rounded pyper echoic .lesion both in Rt & Lt lobe

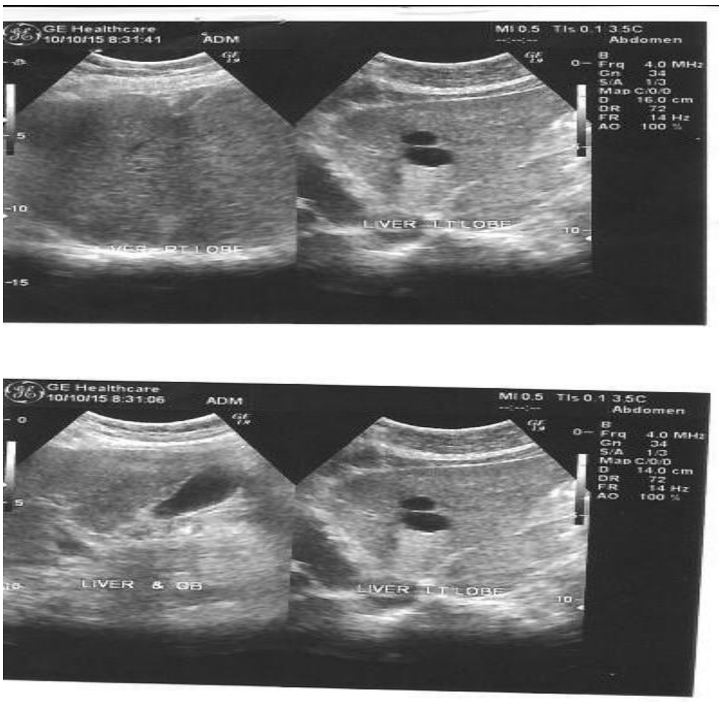


Figure (B.2): biloculated cystic lesion in Lt lobe .(primary uterine mass (liomyosacroma

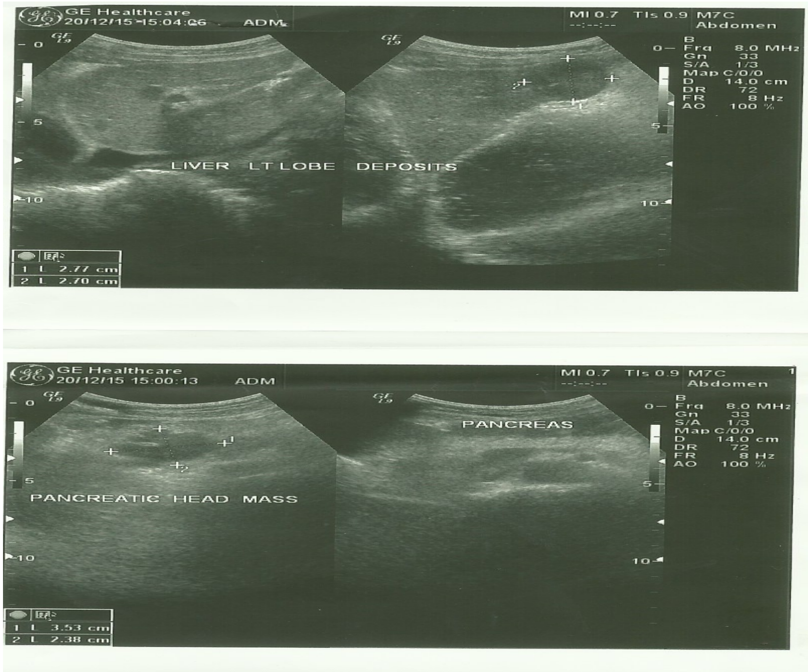


Figure (B.3): rounded hypo echoic lesion 2*2 .moderate ca head of pancreas

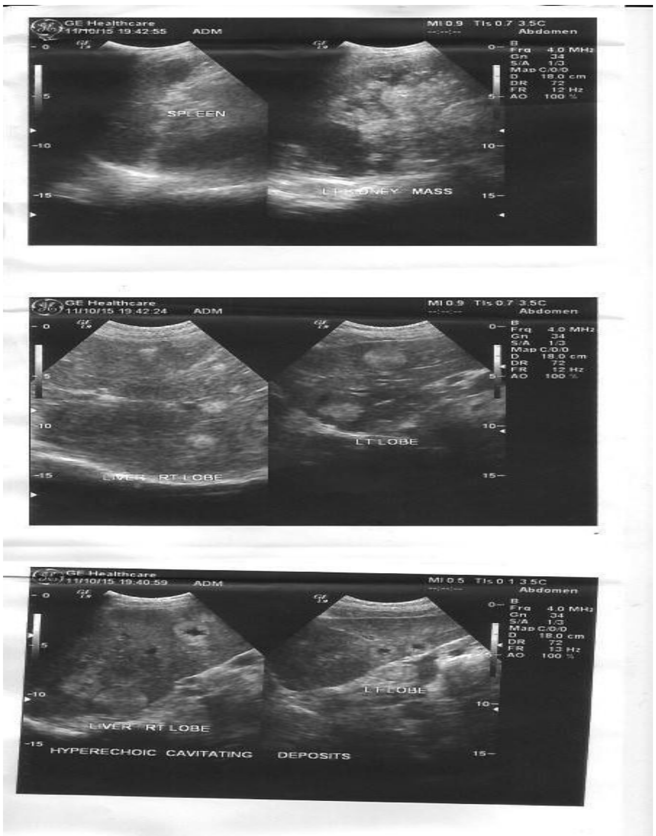


Figure (B.4): Multiple rounded hyper echoic lesions , hyper echoic cavitations deposit primary .renal cell carcinoma in right lobe

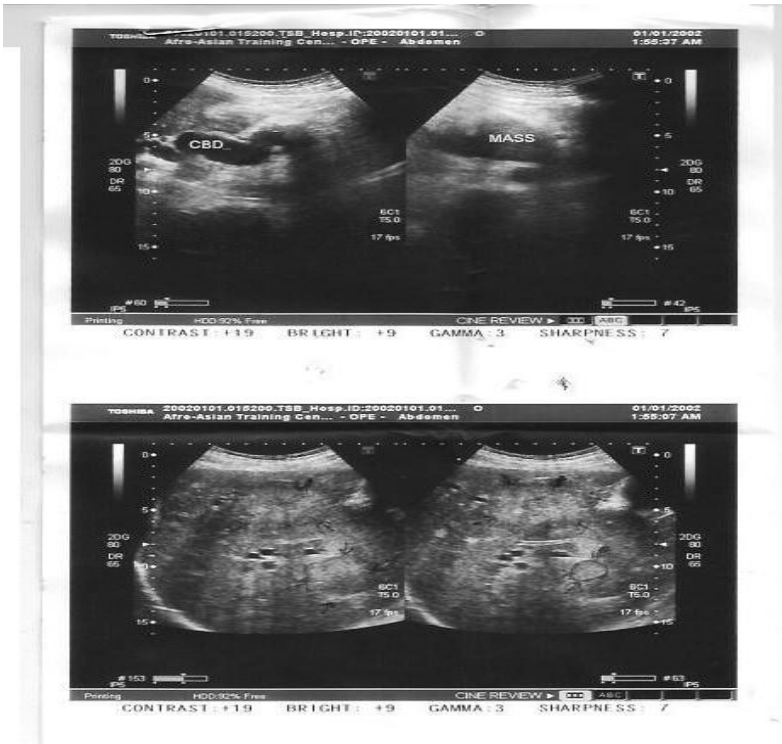


Figure (B.5): Multiple hyper echoic lesion different .sizes in right lobe

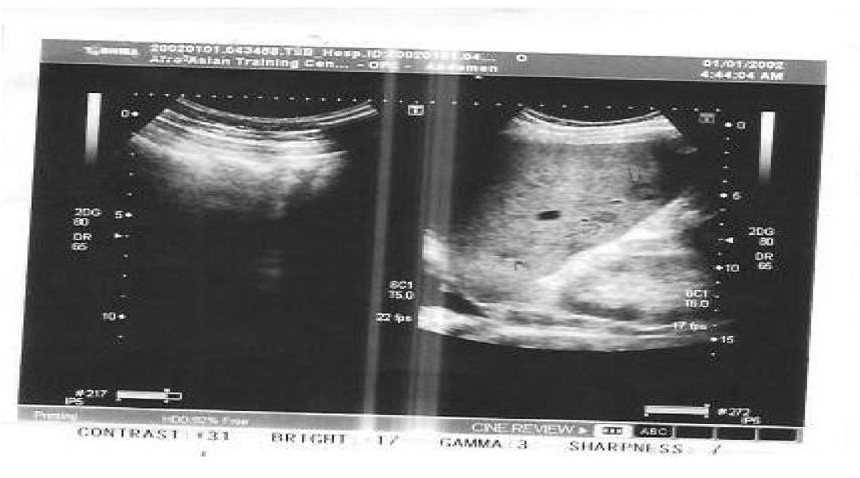


Figure (B.6): Multiple rounded hypo echoic lesion .different sizes in right lobe the primary ca stomach