Characterization of Benign and Malignant Liver Lesions Using Ultrasound

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ABSTRACT:
Objectives:
The general aims of this study were to characterize benign and malignant liver lesions using ultrasonography in order to analyze the imaging spectrum of focal hepatic lesions by identifying the lesions distribution as number, location, shape, size, and echo texture.
A prospective study was investigate the patient with suspected hepaticlesion using ultrasound machine Toshiba Xario diagnostic ultrasound system, using 3.5Mhz curvilinear probe in period from 2016 to 2018 at ibn-sina teaching hospital and Dr. Osman abdal wahab private clinic. Abdominal ultrasound of 260 patients with clinical diagnosis of liver lesions was performed. The data collected include all patient ad disease related character which are: gender ,age ,lesion(type , size, shape, site, number vascularity, and echotextures), liver (size and echotexture.)
Result: Out of 260 patients there wer156 (60%) male and104 (40%) were female**.** The most common liver lesions diagnosed by ultrasound were 112 (43%) cases as metastases, followed by 49 (18.85%) cases as HCC,43(16.5%) cases as hemangioma, 21 cases, 22(8.5%) as cyst,16(6.2%) cases as abscesses, 12(4.6) cases as hydrated cyst while the other as lymphoma, and intrahepatic choliangiocarcinoma with 3 (1.2%), 2 (0.8%). And1 (0.4%) respectively.
Metastases reveal hypoechoic echotexture with no peripheral or central vascularity, also HCC diagnosed with heterogeneous texture with both central and peripheral vascularity, haemangiomas reveal hyperechoic echopattern with minimal or on vascollarity and all abscesses showed hypoechoic echotexture, while the cyst and hydated cyst appear anechoic with no vascularity.
The majority of liver lesions were hypoechoic in metastases .followed by hyper echoic appear in haemangioma, heterogenous echopattern in hepatocllelular carcinoma (HCC)while the remaining appear an echoic more in 22 cyst and 12 Hydated cyst and few were appear as mixed 6 cases in mets as cystic and 3 isoechoic also in mets
CONCLUSSION:
The most common distribution of liver lesion in Sudanese population was liver metes, then HCC, then haemangiomas, then, cysts ,then abscesses, then Hydated cyst and rarelylymphoma and intrahepatic choleangiocarcinoma. ultrasound is consider as first line of liver lesion diagnosis.

Keywords: liver lesions, metastases, ultrasound

I. INTRODUCTION

Liver is the large organ in the body that cleans the blood and produces bile which helps the body deal with the fats we eat.how ever liver tissue is prone to disease such as cyst, alcoholic cirrhosis and carcinoma (Sugany, R and S.Rajaram 2012).

Liver diseases are considered seriously because of the livers vital importance to human beings. There are tow classes of liver tumors :benighn and malignant.(Kumar S.S, and Dr Moni R.S 2010)

Focal liver lesions are defined as solid or liquid –containing masses foreign to the normal anatomy of the liver that may be told a part from the latter organ using imaging techniques.(Pons F,andLiovet JM 2004)
They may be benign, malignant or metastatic in origin,commonly encountered benigh lesions include pyogenic abscess, focal nodular hyperplasia, simple, cyst, Hydated, cyst and haemangiomas. (Kumar BNK et al 2014). Malignant lesions include hepatocellullar, metastatic lesions include secondaries from colon, lung,breast, stomach, pancreas, prostateetc(Kumar BNK et al 2014)

B-mode ultrasound is the first choice for characterization of focal liver lesions mainly due to its non-radioactive, non- invasive, inexpensive nature and real time imaging capabilities.(bates 2004). Differential

diagnosis in patients with focal liver lesions using B-mode ultrasound images is a broad due to the existence of a wide variety of son graphic appearance even with individual classes of FLLs.(Martin D,et al 2007) .

Liver metastases are the most common malignant liver neoplasm and canoriginate from many different types of cancer, in ultrasound images it may be appear cystic,hypo,iso,orhyperechoic

(Navenkarla et al 2011).Doppler ultrasound is unhelp full in characterizing liver metastases most of them which appear poorly vascular or a vascular (Jane bêtes 2011).

HCC is the most common primary malignant FLL ,which mostly developes on top of coarse and nodular cirrhotic liver background (Harding.J 2011, Baert,a.J and Sertocr,k, 2005,Vermani et al 2013, and Khanderwell et al 2013).The ultrasound appearancelof HCC is variable ,the massesmay be hypoechoic, complex or echogenic . most small HCC (<5 cm)are hypoechoic, a thin peripheral hypoechoic halowhic corresponds to afibrouscapsule,is seen most often in small HCC.with time and iincreasing in size ,the masses tendf to become more complex and heterogeneous as a result of necrosis and fibrosis.(Fuscorni F et al 1992)

Haemangiomas are the most frequent benign tumors,being occurring in 0.4-20%of the general population in autopsy series .haemangiomas are common in middle aged women .occur more frequently in the right lobe of the liver , are usually single and rarely greater than 5 cm (Karhunen PJ 1986) .at ultrasound , the most common appearance is of a well circumscribed , uniformly hyperechoic lesions,this is caused by multiple interfaces between walls of the cavernous spaces and blood with in them.(Mcardle CR 1978)/.

At color Doppler ultrasound haemanguomausually showminimal or no detectable vascular signal , being by large sinusoidal spaces filled by slowly moving red cells (Okudfa et al 1990)

Simple cyst is one of most frequently seen in the liver , the simple cyst is either congenital (from abnormal developed of a biliary radical),or acquired (from trauma or previous infection). (Jane Bates 2011). The simple cyst has three acaustic properties ,it is an echoic ,has a well defined smooth capsules and exhibit posterior enhancement.(Jane Bates 2011)

Liver aabscess result from bacterial ,fungal ,or parasitic infections (Jane Bates2011). liver abscesses may either multiple or single ,andusually present hypoechogenic masses withbn strong backwall,irregular outline and internal depris. There may be internal gasses.(Palmer 2002).

Hydated disease come from a parasite echinococcusgranulosus (Jane Bates 2002). Ultrasound may demonstrste a spectrum of appearances from cystic through to solid. The hydated cyst has tow layers to its capsule which may appear thickenedseptarated or detached on ultrasound. Daughter cysts may arise from the inner capsule ,the honeycomb or car wheel appearance, and the cyst may containing floating membranes and fine sand or depris.(Dogra et al 2008)

II.   METHODOLOGY

This is was a three years prospective study conducted at Ibn Sina teaching hospital and Dr Osman Alwahab private clinic included 260 patients(156 males 104 females) aged from 4years to 90 years,with 260liver lesions diagnosed by ultrasound .ethical approval would be granted from the hospital and private clinic as well as informed consent from the patients would be taken that nopatients identifications would be disclosed. requested abdominal ultrasound was done using Toshiba Xario ,Diagnostic ultrasound system Model SSA-666A,with 35 curve-linear transducer probe and Sony printer and also using general Electric Ultrasound ,Machine,Model 2104587 with curvelinear transducer probe and Sony printer. Liver was scanned in various planes ,varios ultrasonographic features of liver lesions were observed which include:number of lesions-single or multiple location within the liver- lobar distributions(right lobe, left lobe, both lobes) Echogenicity (by comparing with that of normal liver parenchyma) ,hyper echoic ,hypo echoic, an echoic,or mixed echo genic. size and shape like round ,oval or errigullar also were observed. the data would be collected in questionnaire which were coded before entering data into computer using Statistical Package for Social Science (SPSS) for analysis

III.   RESULT

This study aimed to characterized the liver lesions using ultrasound and texture analysis, comprises of 260 patients with different types of liver lesions underwent successful abdominal ultrasound for a period of three years conducted in the department of radiology at Ibn Sina teaching hospital and f Dr Osman Alwahab private clinic .These patients were subjected for ultrasound evaluation , The followed observation were made:

Out of the total 260 cases the most common liver lesions discovered by ultrasound were 112 (43%) cases as metastases, appear more in male 50 cases than female 26 cases. followed by 49(18.85%) cases as HCC more in male 40 cases than male 9 cases, 43(16.5%) cases as haemangioma more in male 22 cases than female 21 cases, 22(8.5%) as cyst,16(6.2%) cases as abscessesmore in male 12 cases than female 4 cases, 12(4.6) cases as hydated cyst while the other as lymphoma all of three in male, adenoma all of two female, and intrahepatic choliangi carcinoma in one patients, with 3 (1.2%), 2(.8%). and1 (.4%) respectively. so liver metastases have higher incidence followed by HCC. According to Hapanietal 2014 whom reported that out of 50 cases t he most

lesions were 18(36%) liver abscesses , 8(16%) haemangioma, , 7(14%) metastases, 6(12%) cyst ,4(8%) primary liver tumors, and3(6%) hydrated cyst in population of 50 patients table1&2

Table(1) distribution of hepatic lesion diagnosed by ultrasound

Lesion type	Frequency	Percent
Mets	112	43.0
Hemangioma	43	16.5
Abscess	16	6.2
hydatid cyst	12	4.6
HCC	49	18.8
Cyst	22	8.5
Lymphoma	3	1.2
Adenoma	2	0.8
intrahepatic Cholangiocarcinoma	1	0.4
Total	260	100.0

Table 2 sex distribution of liver lesions

		Lesiontype									
		mets	Hemiangioma	Abscess	H. cyst	HCC	Cyst	lympho ma	aden oma	Intrahe patic col ca	Total
Gender	female	50	21	4	6	9	11	0	2	1	104
	male	62	22	12	6	40	11	3	0	0	156
Total		112	43	16	12	49	22	3	2	1	260

In relationship between the lesions type and its echogenicity out of 260 lesions discovered there were 99 cases, the appear hypoechopic more of them 62 cases in metastases(METS) due to vascularity ,replication of cells anf fat or fluidcontaining of original cancer. out of 88 lesions appear hyper echoic , most of them were 43 hyperechoc appear in haemangioma. which thought to be due to multiple interface between walls of cavernous sinuses and blood contained within .the total of 25 lesions appear heterogenous echopattern ,all of them appear heteroginous in hepatocllelular carcinoma (HCC)as a result of necrosis and fibrosis. Out of 34 appear an echoic morein 22cyst and 12 hydatet cyst and few were appear as mixed 6 cases in mets as cystic and 3 isoechoic also in mets .. ((Table3&4)

Table3 Distribution of cases based on echgenicity of lesions

Echogenicity	Frequency	Percent
Hypoechoic	99	38.1
Hyperechoic	88	33.8
Mixed	5	1.9
Heterogeneous	25	9.6
Cystic	6	2.3
Anechoic	34	13.1
Isoechoic	3	1.2
Total	260	100.0

Table 4Relationship between the lesion type and echogenicity

	ECHOGINICITY							Total
	Hypo	Hyper	Mixed	Heterogeneous	Cystic	Anechoic	Isoechoic	
Mets	62	36	5	0	6	0	3	112
Hemangioma	0	43	0	0	0	0	0	43
Abscess	16	0	0	0	0	0	0	16
Hydate Cyst	0	0	0	0	0	12	0	12
HCC	17	7	0	25	0	0	0	49
Cyst	0	0	0	0	0	22	0	22
Lumphoma	3	0	0	0	0	0	0	3
Adenoma	0	2	0	0	0	0	0	2
Intrahepatic Chole	1	0	0	0	0	0	0	1
	99	88	5	25	6	34	3	260

According to lobar involvement of liver lesions, there was 178 cases (68.5%) had right lobe involvement 23 cases (8.8%) had left lobe involvement , and 59 cases (22.7%)involved both lobes . the highly affected of right lobe involvement due to streaming of portal venous blood from more frequently and more heavily infected right side of colon specially in liver abscesses, and much greater volume of right lobe. This finding semi like study done by thiamiah et al 2013 whom they found that 64%had right lobe involvement,11% had lt lobe involvement and 23% involved both lobes. Table5

Table 5 Lobar involvement of liver lesions

Site	Frequency	Percent
right lobe	178	68.5
left lobe	23	8.8
both lobe	59	22.7
Total	260	100.0

In relationship between liver size and type outof 260 lesions the study showed that 159(61.2%) lesions with normal liver size. Malignant lesions with normal liver size included were 55 (49%) of 112 mets 14(28.5%)of 49 HCC ,one (100%)of ,one choleangiocarcinoma,one(100%)ofone lymphoma and the remaining 85(93%)of 95 were benign lesions. 91(3.5%) lesions with enlarged liver size ,the malignant lesions included were 57(50.8%)of 112 mets ,26(53%) 0f 49 HCC,one(100%) of one choleangiocarcinoma two(66.7%) of three lymphoma while the other 6(6.3%) of 95 benign lesions .and 10(3.8%) lesion with small liver size which included 9(64%) of 14 HCC and one(2.4%) of 41 haemangioma. Most of enlargement of liver size according to multiple liver metastases due to strenghtend of the liver . the small size according to HCC due to shrunken cirrhotic liver. Metastases was most common detectable affected liver size followed by HCC asignificant correlation at(p=0.000)between lesion type and liver size table 6

Table 6 Relation between lesion type and liver size

		Liver Size			Total
		Normal	Enlarged	Small	
Lesiontype	Mets	55	57	0	112
	Hemangioma	41	1	1	43
	Abscess	14	2	0	16
	hydatid cyst	10	2	0	12
	HCC	14	26	9	49
	Cyst	21	1	0	22
	Lymphoma	1	2	0	3
	Adenoma	2	0	0	2
	intrahepatic cholangiocarcinoma	1	0	0	1
Total		159	91	10	260

Regardless to lesion type and liver texture among 260 patients , there were 111 of 204 patients (78.4%) with malignant liver lesions had normal liver texture while the remaining 93 patients with benign liver lesions .out of 56 patients(21.5%) ,there were 54 patients with malignant liver lesions had coarse liver texture and two had coarse liver texture in patients with haemangiomas table 7&8

Table 8 Distribution of cases based on liver texture

	Frequency	Percent
Normal	204	78.4
Coarse	56	21.5
Total	260	100.0

Table 8 liver texture vs. lesion type

Liver Texture vs. Lesiontype		LiverTexture		Total
		Normal	Coarse	
Lesiontype	Mets	83	29	112
	Hemangioma	41	2	43
	Abscess	16	0	16
	hydatid cyst	12	0	12
	HCC	24	25	49
	Cyst	22	0	22
	Lymphoma	3	0	3
	Adenoma	2	0	2
	intrahepatic cholangiocarcinoma	1	0	1
Total		204	56	260

IV.   DISCUSSION

Liver lesions are common on pathologic or imaging evaluation of liver and include a variety of benign and malignant lesions, aswell as congenital and acquired masses of inflammatory and traumatic nature. evaluation of liverlesionsia a comlex issue which is often the major focus of cross sectional imaging study7 Ultrasonography has been an accepted methods for the diagnosis of liver lesions because of its rapidity of diagnosis and its highsensitivity ultrasound features of liver lesions were studied, and various types of liver lesions encountered in the study were liver metastases, haemangiomas, hepatocllelular carcinomas, liver cysts , liver abscesses, Hydated cysts, adenoma ,lymphoma and choleangiocarcinoma.

V.   CONCLUSION

Ultrasound is a safe and effective methods to characterize and detect liver lesions due ton its flexibility, availability and reduce the cost and time to arrive at a diagnosis. It allow to scan the liver in multiple planes enabling to know the location of lesions and study their echopattern, the study concluded that the most common liver lesions were metastases followed by hepatocellular carcinoma, haemangioma , liver cysts , Hydated cysts were frequently involved the liver in the present study while the remaining liver lesions discovered in the study were rare as lymphoma, adenoma,and intrahepatic choliangiocarcinoma.

It is evident that Ultrasonography hasawide applicability in the diagnosis of liver lesions being a safe,simple,repeatable,and without radiation exposure to the patients,it is worthly of being included in a routine diagnostic work. .

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