Magnetic resonance imaging in assessment of liver lesions in patients with extrahepatic primary cancer

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Abstract:

Background: Liver imaging is commonly undertaken in patients with cancer history because, after lymph nodes, the liver is the most frequently involved organ by metastases

Objectives: The aim of the study was to evaluate the role of liver MRI (magnetic resonance imaging) in characterization and detection of liver lesion in patients with extrahepatic primary

Methods: this is a cross sectional study of 70 patients with extrahepatic liver primary cancer who had their treatment in oncology teaching hospital underwent routine abdominal ultrasound to detect liver lesion(s) and suspicious cases then referred to MRI which was done in Ghazi Alharri and oncology teaching hospital from the period from 1st of September 2015 to end of November 2016, the patients age range from 31 to 75 years

Results: hemangioma is the most common solitary liver lesion in patients with extrahepatic primary cancer which represent 27% of lesions detected followed by simple cyst which represent 13% of the lesions, in another hand solitary metastasis seen in 7% of solitary lesions while metastasis is the leading cause behind multiple hepatic lesions and represent about 38% of lesions seen ,unlike solitary lesions, hemangioma is a rare cause and seen in 7% of cases

Conclusion: MRI is a required adjuvant tool in evaluation of suspicious liver lesion ,its value was illustrated in characterization and diagnosis of liver lesions depending on their appearance in T1 ,T2 and fat suppression T2 sequences in addition to assess their enhancement pattern after dynamic IV(intravenous) contrast injection.

Keywords: liver metastasis, MRI, dynamic liver intravenous contrast.

Introduction

The liver is the largest abdominal organ that plays a main role in metabolism and has a numeral functions, including glycogen storage, breakdown of red blood cells, plasma protein production, hormone manufacture, and detoxification. It is one of very few organs that has the capability to regenerate [1]. Traditionally, the liver was divided into four anatomical lobes ,however, this has been outdated by the use of the Couinaud classification which divides the liver into eight functional units (known as segments), supplied by individual segmental hepatic arteries, portal veins and bile ducts, which can be individually resected[2]. Hepatic metastases are 18-40 times more common than primary liver tumors [3] Ultrasound, CT (computed tomography), and MRI (magnetic resonance Imaging) are all useful for detection of hepatic metastases and evaluation across multiple postcontrast CT series or MRI pulse sequences is necessary. The most common sites of primary malignancy that metastasizes to liver are breast, gastrointestinal malignancy, lung and kidney [4]. One of the main difficulties in liver imaging for metastatic disease is the high prevalence of benign liver lesions that can be misinterpreted as evidence of metastatic disease, thus dramatically changing a patient's stage, and thus Treatment options. Liver haemangiomas, and to a lesser degree Focal nodular hyperplasia (FNH), are the main sources of confusion [5] the appearance of liver metastases on MRI is also variable, but MRI is more sensitive than CT for the detection of liver metastases [6]. Most frequent appearances are :[7],T1: moderately hypointense,T2: mildly to moderately hyperintense, T1 contrast (Gadolinium): enhancement may be lesional or perilesional (enhancement outside the confines of the T1 delineated lesion),small lesions (<1.5 cm) tend to uniformly enhance, larger lesions (>1.5 cm) tend to show transient rim enhancement (i.e. with wash-out); helpful feature in distinguishing a metastasis from a liver haemangioma, perilesional enhancement is most commonly seen in colorectal and pancreatic adenocarcinoma metastases[8].

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Patients & methods:

This is a cross sectional study were 70 extrahepatic malignancy and attending our oncology outpatient clinic in oncology teaching hospital –medical city complex from March 2015 to December 2016 where they were subjected to abdominal sonography which was performed by Siemens X300 using a 2.5-6MHz convex transducer which reveals hepatic lesion(s) suspicious of metastasis for that they referred for abdominal MRI using Philips and Siemens 1.5 Tesla MRI machine ,the patient was examined in supine

position the coil is wrapped around the abdomen and the examination was done from liver to lower pole of kidneys using T1 ,T2 ,T2 fat suppression sequences , the sequences obtained in axial and coronal plain, then IV contrast is injected using gadolinium ,after that examination is performed at 30 seconds,70 seconds ,and after 5 minutes using T1 sequence in axial plain , the presence or absence of hepatic lesion , its signal intensity in different sequences is assessed ,then the pattern of enhancement is analyzed

Results

Seventy patients, their mean age was 53 years and their age was between 31and 75 years,80% of them are female and 20% are males ,all presenting with extrahepatic primary cancer and underwent liver MRI ,the age and sex distribution are shown in table 1 and 2.

Table 1: age distribution

Age group	No.	%
30-39	10	14
40-49	22	31*
50-59	18	26
60-69	16	23
>70	4	6
	70	

* Majority of patients are in 6th decade

Table 2: sex distribution

Sex	No.	%
Male	14	20
female	56	80 *

* Majority of examined patients are females

Most of the female patients had breast cancer, while in male the patients had no dominant tumor MRI of liver reveals solitary lesion in 48% while multiple lesions in 51%, figure 1

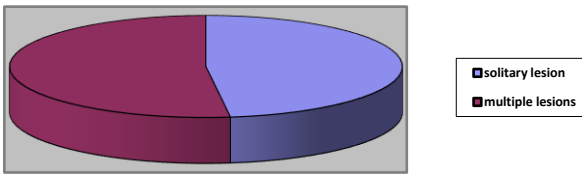

Figure 1

Of solitary lesions detected by MRI and depending on their signal characteristic on T1,T2 , T2 fat saturation and dynamic intravenous gadolinium contrast enhancement and on follow up of lesion size in most of patients after treatment ,hemangioma was the leading cause -27%-,while the mets contributes to 7% of solitary lesion ,while in case of multiple hepatic lesions metastasis is the leading cause and seen in 27 cases-38% of multiple hepatic lesions, the percentage of other lesions are shown in table 3 ,while the MRI signal and pattern of enhancement of each lesion type mentioned in the table below will be discussed briefly in next topic -the Discussion.

Table 3: types of hepatic lesions

	Heman-gioma		Focal nodular hyper-plasia		Cyst		Mets	
	No.	%	No.	%	No.	%	No.	%
Solitary	19	27	1	1	9	13	5	7
multiple	5	7	0	0	4	5	27	38

Discussion:

The objective of liver imaging in oncologic patients includes liver tumor recognition and categorization, patients with extra-hepatic malignancy underwent MRI examination to exclude the presence of hepatic and extrahepatic metastases and to clarify the presence or absence of lesions seen by other modality like computed tomography and ultrasound, and why MRI because it has high soft tissue resolution in addition to multi planar and multi sequence capability [9]. In our study patients with extrahepatic cancer who suspected to have liver metastasis sent for abdominal MRI either as check up or after doing abdominal ultrasound that showed liver lesion(s) ,in our study most patients are females and most of them had breast cancer which represent 44 out of 56 case –about 79%-,the explanation for this female predominance is mostly due to breast cancer is on the top of list of cancer in the world according to GLOBOCAN 2012 (IARC) ,similar condition seen in age as the Rates of breast cancer are low in women under 40. Fewer than 5 percent of women diagnosed with breast cancer in the U.S. are younger than 40, while the Rates begin to increase after age 40 and are highest in women over age 70 [10]. Depending on T1, T2, fat saturation T2 and dynamic IV contrast study and flow up of some of those patients after a month: Hemangioma is the leading cause represent 27% of solitary liver lesion and 7% of multiple liver lesions diagnosed by being hypointense in T1, hyperintense in T2 and fat saturation and shows peripheral nodular enhancement with centripetal filling in delayed 15 minutes scan and this according to literature [11, 12], additionally it doesn't changing in size on follow up scan. While simple hepatic cyst is 2nd solitary liver lesion detected by MRI being well defined smooth walled and followed fluid signal- i.e. identical to cerebrospinal fluid signal within adjacent lumber spinal canal, and thus being hypointense in T1 and hyperintense in T2 and fat saturation and persistent, low signal with no enhancement during dynamic intravenous contrast injection, also remains stable on follow up scan. Solitary metastasis is rare and seen in 7% of cases. Most of multiple hepatic lesions detected by MRI are metastasis and represent 38%, being variable in size ,irregular outline ,most are hypointense in T1,hyperintense in T2 and fat suppression sequences

and show peripheral enhancement after gadolinium injection ,single case of breast cancer shows hypervascular metastasis detected by dynamic enhancement by showing multiple lesions with arterial enhancement , isointensity to hepatic parenchyma in portal phase and lost the contrast in delayed phase[13,14,15],most of patients in whom lesions was diagnosed as metastasis received chemotherapy and on follow up they are either decreasing in size or show abnormal central necrosis. 2nd most common multiple hepatic lesions detected in our study is hemangiomas seen in 7% of cases.

Two cases show additional extrahepatic metastasis one to vertebrae and another one shows pulmonary metastasis, both of them had breast cancer. In one case ,male patient with transitional cell carcinoma of bladder shows solitary liver lesion its criteria meet the feature of focal nodular hyperplasia being hypointense in T1 ,hyperintense in T2 and fat saturation with avid enhancement in arterial phase ,being isointense in portal phase and shows enhancing central scar in delayed phase [16]

Conclusion:

MRI of liver is an excellent imaging modality in detection, characterization of liver lesion(s) in patients with extrahepatic malignancy, and follow up of patients when depending on signal characteristic of detected lesion and their appearance on variable sequences, the golden role of dynamic contrast injection is as vital adjuvant to reach the final diagnosis and being in line with what oncologist find on follow up of patients during and after completion of chemo or radiotherapy.

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