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	JIF = 1.500	SJIF (Morocco) = 7.184	OAJI (USA) = 0.350

SOI: 1.1/TAS DOI: 10.15863/TAS

International Scientific Journal

Theoretical & Applied Science

p-ISSN: 2308-4944 (print) **e-ISSN:** 2409-0085 (online)

Year: 2023 **Issue:** 03 **Volume:** 119

Published: 30.03.2023 **http://T-Science.org**

Issue Article

Malahat Jahangir Sultanova
Azerbaijan Medical University
Doctor of Medical Sciences, Professor

V.N. Najafova
Azerbaijan Medical University
Radiation diagnostics and therapy department
vafa.najafova@bk.ru

DETERMINATION OF THE PATHOLOGICAL CHANGES' DISTRIBUTION IN DIFFERENT PARTS OF THE LIVER BY RADIOLOGICAL METHODS IN PATIENTS WITH DIABETES MELLITUS

Abstract: *As a result of the development of the technical capabilities of various radiological methods, their application in a number of fields of medicine has been expanded. The purpose of the study was to study the sensitivity and specificity of various radiological methods in the diagnosis of metastases and cysts in certain parts of the liver in patients with diabetes. In order to quantitatively and qualitatively study the cysts in the liver of patients with and without fatty liver by MRI, MSKT and USM methods, a 3-stage research plan was prepared. We were able to identify 17 out of 18 patients with metastases who had changes in the contours of their liver during the MRI examinations. As a result of examinations with the appropriate method, out of 38 patients without liver contour changes, it was determined that 2 people had changes in the liver contours by mistake. Using the indices, TPR (sensitivity)= 0.9444, TNR (specificity)= 0.9473, ACC (accuracy)= 0.9464, PPV (positive predictive value)= 0.8947 and NPV (negative predictive value)= 0,9729 were also obtained.*

Key words: *diabetes, fatty liver, MRI, USM, MSCT, metastasis, cyst, sensitivity.*

Language: *English*

Citation: Sultanova, M. J., & Najafova, V. N. (2023). Determination of the pathological changes' distribution in different parts of the liver by radiological methods in patients with diabetes mellitus. *ISJ Theoretical & Applied Science, 03 (119)*, 251-254.

Soi: http://s-o-i.org/1.1/TAS-03-119-33 ***Doi***: crossref https://dx.doi.org/10.15863/TAS.2023.03.119.33

Scopus ASCC: *2700.*

Introduction

Relevance: Focal fatty infiltration of the liver and focal fatty liver dystrophy are the most common benign liver pathologies in clinical practice, and this problem occupies an important place in the technical research of liver pathologies in the world. [5,6,8]. Fatty dystrophy of the liver (fatty hepatosis) occurs as a result of metabolic disorders in the gland, including lipid metabolism. Fatty hepatosis is a widespread chronic pathology [2]. It is also observed that the disease develops at an early age. Diagnosis of liver hemangiomas is mainly carried out by radiological methods.

In the process of differentiation of focal malignant and benign liver lesions conditions such as focal fatty infiltration and dystrophy cannot be effectively diagnosed by methods such as ultrasound (US) and computed tomography (CT), which, therefore, leads to the need for such diagnostic methods, like magnetic resonance imaging (MRI) or biopsy. [1,9,11]. Contrast computed tomography (CT) is used to further clarify the diagnosis. Nevertheless, during this technique, the radiation is relatively high, and a number of undesirable effects may arise as a result of the injection of contrast material [3,7].

As a result of the development of technical capabilities in ultrasonography and contrast agents,

the application of the contrast ultrasonography (CUS) method has been expanded, and it shows high specificity in detecting liver hemangiomas, along with traditional US, contrast-enhanced ultrasound examination, contrast-enhanced computed tomography, magnetic resonance tomography, angiography, multispiral computed tomography (MSCT) [4,10,12].

The **purpose of the study** was to assess the sensitivity and specificity of various radiological methods in the diagnosis of metastases and cysts in certain parts of the liver in patients with diabetes mellitus.

Materials and methods of the study: A 3-stage plan of the study was prepared in order to quantitatively and qualitatively study the cysts in the liver of patients with and without obesity by MRI, MSCT and US methods. In the first stage, 22 people without symptoms of fatty dystrophy in the liver (conditionally control group) and 14 people with II grade fatty dystrophy in the liver (conditionally main group) were included in the study (in total 36 patients with cysts in the liver). The number and sizes of cysts in patients were determined by MRI.

In the second phase of the study, 16 people without liver fatty dystrophy and 12 patients with II degree fatty dystrophy of the liver, (in total of 28 people with liver cysts) were included in the study. Quantitative and qualitative analysis of cysts was performed by MSCT method.

14 people without liver fatty dystrophy and 12 people with grade II fatty dystrophy (in total 26 patients with liver cysts) were included in the 3rd stage of the study. Quantitative and qualitative analysis of cysts in relevant patients was performed by US method. For each stage of the study, the results we obtained are given by the absolute number of patients in the group and percentage.

Indicators such as sensitivity (true positive rate - TPR), specificity (true negative rate - TNR), accuracy (ACC), positive predictive value (PPV) and negative predictive value (NPV) were studied in determining various signs in the liver. It should be noted that the patients we involved in the process during the different stages of the research were not different, but in many cases the same patients.

The statistical processing of the results obtained during the research work was carried out with the Statistica 7.0 application computer program.

Results of the study. In the phase where we determined in which part of the liver the cysts were located in different research groups with and without fatty dystrophy in the liver using radiological methods such as MRI, CT and USM, in the group of patients without fatty dystrophy (n=30), in 60% of cases liver cysts were located in the left lobe of the liver (were determined by MRI). At this time, in the research group (n=21) who had grade II fatty dystrophy in the liver and used the MRI method for examination, the cases of cyst localization in the left lobe made up 57.1% of cases.

In the group of patients (n=20) who did not have any signs of steatosis in the liver, where we performed CT examinations, the percentage of cysts location in the left lobe of the liver was 40%. In the group (n=16) with grade II steatosis in the liver, the percentage of cases of cysts' localization in the left lobe were 43.8% of the total cases (found out by CT method) (table 1).

Table 1. Distribution of cysts in different parts of the liver as a result of examinations carried out by MRI, CT and US methods (%).

Localization of the cysts	Radiological methods					
	MRI		CT		US	
	Metastases (%)	Steatosis and metastases (%)	metastases (%)	Steatosis and metastases (%)	Metastases (%)	Steatosis and metastases (%)
Left lobe	60,0	57,1	40,0	43,8	33,3	43,8
Right lobe	30,0	23,8	20,0	12,5	38,1	37,5
Caudate lobe	6,7	14,3	15,0	6,3	19,0	12,5
Quadrate lobe	3,3	4,8	25,0	37,5	9,5	6,3
Total	30	21	20	16	21	16

During the detection of cysts in the left lobe of the liver by the US method, the percentage of cysts in the left lobe of the liver in the group without steatosis (n=21) made up 33.3% of the total cases in the group. Nevertheless, in the group with grade II fatty dystrophy in the liver, the incidence of cyst localization in the left lobe of the liver was 43.8%.

As a result of the study, in the group of patients who did not have fatty dystrophy in the liver(n=40), we found that in 22.5% of cases, the metastases were mainly located in the caudal lobe of the liver (Table

2). At the same time, in the group with fatty dystrophy in the liver (n=23) when we used the MRI method for examination, the cases of localization of metastasis foci in the corresponding lobe of the liver covered 26.1% of the total cases in the group.

Table 2. Distribution of metastases in different parts of the liver as a result of examinations carried out by MRI, CT and US methods (%).

Localization of the metastases	Radiological methods					
	MRI		CT		US	
	Metastases (%)	Steatosis and metastases (%)	metastases (%)	Steatosis and metastases (%)	Metastases (%)	Steatosis and metastases (%)
Left lobe	47,5	43,5	34,0	29,7	37,1	44,4
Right lobe	30,0	30,4	24,0	21,6	25,7	25,9
Caudate lobe	22,5	26,1	20,0	24,3	20,0	14,8
Quadrate lobe	0,0	0,0	22,0	24,3	17,1	14,8
Total	40	23	50	37	35	27

At the stage of determining the localization of metastases in the caudal lobe of the liver in the groups of patients with and without steatosis by CT examination, in the group of patients with grade II steatosis of the liver (n=37) it was recorded that metastases spread to the corresponding lobe of the organ in 24.3% of cases. But in the group without fatty dystrophy (n=50) CT method showed that the appearance percentage of metastasis foci in the caudal lobe was 20%.

Of the 161 patients with liver metastases (in 57 they were found out by US, in 48 - by MSCT, and in 56 – by MRI) at the 2nd stage we determined sensitivity (TPR), specificity (TNR), accuracy (ACC), positive predictive value (PPV) and negative prognostic value (NPV) according to the sign of liver contour changes. As a result, in the group in which we chose ultrasound as the examination method (n = 57), when using other examination methods, 23 people were confirmed that they really had changes in the contour of the liver, and 34 people did not have this symptom (P = 23, N=34). Nevertheless, after the research objects in the relevant group were involved in US examinations, 22 of the 23 patients with contour changes in the liver, but not all of them, had contour changes, but the relevant case of 1 person was not recorded (Table 3). In addition, 2 out of 34 patients without liver contour changes were shown to have false contour changes (false positive results). Considering these cases, it would be appropriate to note following indicators: TP (true positive)=22, FP (false positive)=2, FN (false negative)=1 and TN (true negative)=32 (table 3). By entering the relevant indicators into the necessary formulas, TPR (sensitivity)= 0.9565, TNR (specificity)= 0.9411, ACC (accuracy)= 0.9473, PPV (positive predictive value)= 0.9166 and NPV (negative predictive value)= 0.9696 was determined.

Table 3. Prognostic value indicators according to the sign of changes of liver contours in the application of radiological methods.

	P	N	TP	FP	FN	TN	TPR	TNR	ACC	PPV	NPV
US (n=57)	23	34	22	2	1	32	0,9565	0,9411	0,9473	0,9166	0,9696
MSCT (n=48)	17	31	16	2	1	29	0,9411	0,9354	0,9375	0,8888	0,9666
MRT (n=56)	18	38	17	2	1	36	0,9444	0,9473	0,9464	0,8947	0,9729

Among the 56 patients in the group of patients with metastases in the liver, in which we used the MRI method, when using other examination methods, 18 were confirmed that they really had changes in the contour of the liver, and 38 of them did not have this symptom (P=18, N=38). In the relevant group, we were able to identify 17 out of 18 patients with metastases who had changes in the contours of the liver during the MRI examinations. As a result of examinations with the appropriate method, out of 38

patients without liver contour changes, it was determined that 2 people had changes in the liver contours by mistake. Thus, it is determined that TP=17, FP=2, FN=1 and TN=36.

Using these indicators, TPR (sensitivity)= 0.9444, TNR (specificity)= 0.9473, ACC (accuracy)= 0.9464, PPV (positive predictive value)= 0.8947 and NPV (negative predictive value)= 0.9729 were obtained.

Thus, In patients with diabetes mellitus and fatty dystrophy with liver metastases, hemangiomas, cysts, and other pathological foci, along with the combination of several radiological methods, their specificity indicators should be taken into account.

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