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Original scientific paper

Profesional paper

Review

Case report

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Betimi i Hipokratit

Në çastin kur po hy në radhët e anëtarëve të profesionit mjekësor premtoj solemnisht se jetën time do ta vë në shërbim të humanitetit. Ndaj mësuesve do ta ruaj mirënjohjen dhe respektin e duhur. Profesionin tim do ta ushtroj me ndërgjegje e me dinjitet. Shëndeti i pacientit tim do të jetë brenga ime më e madhe. Do t'i respektoj e do t'i ruaj fshehtësitë e atij që do të më rrëfehet. Do ta ruaj me të gjitha forcat e mia nderin e traditës fisnike të profesionit të mjekësisë.

Kolegët e mi do t'i konsideroj si vëllezër të mi.

Në ushtrimin e profesionit ndaj të sëmurit tek unë nuk do të ndikojë përkatësia e besimit, e nacionalitetit, e racës, e politikës, apo përkatësia klasore. Që nga fillimi do ta ruaj jetën e njeriut në mënyrë apsolute. As në kushtet e kërcënimit nuk do të lejoj të keqpërdoren njohuritë e mia mjekësore që do të ishin në kundërshtim me ligjet e humanitetit. Këtë premtim po e jap në mënyrë solemne e të lirë, duke u mbështetur në nderin tim personal.

The Oath of Hippocrates

Upon having conferred on me the high calling of physician and entering medical practice, I do solemnly pledge myself to consecrate my life to the service of humanity. I will give my teachers the respect and gratitude which is their due. I will practice my profession with conscience and dignity. The health of my patient will be my first consideration. I will respect the secrets which are confided in me, even after the patient has died. I will maintain by all the means in my power, the honor and the noble traditions of the medical profession.

My colleagues will be my brothers.

I will not permit considerations of religion, nationality, race, party politics or social standing to intervene between my duty and my patient. I will maintain the utmost respect for human life from its beginning even under threat and I will not use my medical knowledge contrary to the laws of humanity. I make these promises solemnly, freely and upon my honor

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Profesional paper

DO WE REALLY NEED TRIPLE PHASE COMPUTED TOMOGRAPHY TO DETECT AND FOLLOW-UP LIVER METASTASES OF GIT(GASTROINTESTINAL TRACT) ORIGIN?

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ABSTRACT

Background/Aim: Gastrointestinal tract malignancies account for over 25% of all cancer incidence worldwide. Radiologic imaging's goal is to detect them in early stage. Multidetector CT is considered as the preferred imaging modality for colorectal cancer staging and follow-up, providing a global one-session staging method.

Methods: We conducted a prospective study at the Department of Radiology, Clinical Hospital in Shtip, Republic of North Macedonia from januar 2023 till december 2023, in which we included 43 patients aged between 30-80 years old with primary tumors originating from the gastrointestinal tract and synchronous metastases in the liver. During the study, two CT examinations were performed. The first examination was done at the beginning of the disease diagnosis, and the second one followed a year later. Both examinations were performed with post-contrast series, in arterial, venous and late phase.

Results: At the first CT scan, liver metastases from GIT origin in relation to the density of computed tomography in the venous phase all changes were shown as hypodense. At the second CT scan in the venous phase 33 changes were shown as hypodense.

Conclusion: On the first CT examination, we obtained a 100% representation of liver metastases in the venous phase, while on the second CT examination taking into account the seven deceased patients, the percentage decreased to 84.9%. When it comes to imaging the liver and extrahepatic illness (both abdominal and thoracic), MDCT offers a significant benefit of "one-stop-shopping." This guarantees that MDCT will keep playing a significant part in screening and staging.

Key words: gastrointestinal tumors liver metastases, computed tomography, portal phase

INTRODUCTION

Gastrointestinal (GI) tract malignancies account for over 25% of all cancer incidence worldwide and over 35% of all cancer-related fatalities in 2018, with an expected 4.8 million new cases and 3.4 million deaths worldwide. [1] The primary GI tract malignancies are stomach (with about 1.0 million new cases in 2018), liver (840,000 cases), esophageal (570,000 cases), pancreatic (460,000 cases), and colon (1.8 million cases). While these conditions have some common risk factors, their etiologies and descriptive epidemiologic profiles are largely different.

Globally, the number of new cases and deaths from GI

cancers are expected to increase by 58% and 73% to 5.5 million and 5.6 million, respectively, by 2040, based on changes in the world population's growth and age composition. [2] The magnitude of the impending burden emphasizes the need for clinical services planning for GI malignancies in the future as well as the importance of setting priorities and carrying out preventative measures that can avert a large number of future diagnosis and deaths.

Recent research indicates that modifiable risk factors, such as consumption of tobacco and alcohol, as well as infection, diet, and obesity, account for over half of all GI cancer cases. [3] Changes in the prevalence of these risk factors have been substantially attributed to the notable temporal differences in the incidence of the primary GI cancer types during the previous few decades. [4] With most diagnoses occurring at a late stage, the prognosis is typically poor. However, site-specific mortality trends mostly follow those of incidence, with the exception of colorectal cancer, where breakthroughs in early diagnosis and treatment have led to a generally positive prognosis.

About 25% of patients with colorectal cancer will have liver metastases at the time of initial presentation (also known as synchronous liver metastases), [5] and the presence or absence of liver metastases is the main factor influencing survival. The course of liver illness, rather than the initial colorectal cancer, defines the patient's overall prognosis, even in cases where the tumor is the only one in the liver. These patients' untreated survival is expressed in months. [5]

The liver has the unpleasant distinction of having two blood supplies—it is supplied by both the portal and the systemic circulations. Since the liver is the first capillary bed that metastasizing cells contact and the hepatic sinusoids are fenestrated, allowing tumor cells to establish themselves and develop, hepatic metastases from gastrointestinal tract malignancies are frequent.[6]

The lungs, distant lymph nodes, and peritoneum are the next most common sites of metastases, after the liver. [7] Based on population-based research, approximately 25% of patients initially show up with liver metastases, and 50% of patients eventually develop liver metastases over the course of their disease.[8] Compared to patients without liver metastases, who have a 5-year overall survival rate of 70%, this leads to a significantly lower life expectancy of 17%. [9] Chemotherapy regimens with or without targeted therapies are combined with curative-intent treatments, primarily tumor ablation and surgical excision, in modern treatment techniques.

In general, colorectal carcinoma (CRC) (20%), stomach (20%), pancreas (20%), lung (10%, and the breast cancer (10%) are the primary causes of liver metastases. [10] Other less prevalent primary malignancies include neuroendocrine tumors (NETs), gastrointestinal stromal tumors (GISTs), and renal cell carcinomas [10].

There is a wide range of presentations. Liver metastases can appear as solitary or, less commonly, as confluent masses. They often appear as multifocal and distinct lesions. [11]

Since arterial blood flow normally supplies solid liver metastases, they can be categorized as either hypovascular or hypervascular. [12]

Hypovascular liver metastases are most commonly caused by stomach, lung, colon, and breast malignancies. [13] They usually show a target appearance or perilesional enhancement, and they are best seen during the PVP. [14] Small hypodense metastases may be hard to distinguish from a variety of benign liver lesions if the lesions don't have that appearance. When compared to metastases, benign low-attenuation lesions are typically smaller, more often have a defined borders, and have noticeably lower attenuation. Compared to benign low-attenuation lesions, target enhancement is considerably more common in metastases. [15]

Hypervascular metastases are mainly noticeable during the hepatic arterial phase (HAP) and tend to enhance earlier. Furthermore, they show varying levels of washout on delayed images. The most prevalent causes of hypervascular hepatic metastases include neuroendocrine tumors, renal cell carcinoma, melanoma, and thyroid carcinoma. Given that both hypervascular metastases and flash-filling hepatic hemangiomas (HHs) can exhibit fast enhancement during the HAP, it might be challenging to differentiate between the two. However, they do show very differently on PVP or delayed-phase imaging. [16]

For cancer patients, early identification of liver metastases is crucial. With the exception of tumor palliation (i.e., to relieve obstruction of the gastrointestinal tract), the existence of liver metastases typically implies the non-resectability of the main tumor for oncologic reasons. Chemotherapy is the recommended treatment for these patients. One of the few malignant tumors that need surgical resection when limited synchronous liver

metastases or metachronous metastases are present is colorectal cancer. Exact understanding of the number, size, and spatial distribution of metastases is necessary to establish their resectability.

Radiologic imaging's goal is to examine the liver in surgical candidates to determine whether or not they have liver metastases, and in other cases, to determine whether chemotherapy was successful. Despite being a common tool for evaluating the liver, sonography has many drawbacks. For instance, it requires a high level of operator skill and frequently produces results that are unclear for patients whose livers have been infiltrated with fat as a result of chemotherapy. Following that, a computed tomography (CT) or magnetic resonance imaging (MR) examination is frequently recommended for these problematic instances. The use of CT in cancer patients to "screen" for liver, lung, and lymph node metastases in the body has significantly grown with the advent of multidetector CT (MDCT) imaging.

Computed tomography (MDCT) has become the primary imaging test for the staging and follow-up of most malignancies. Due to its exceptional coverage of the entire chest, abdomen, and pelvis, multidetector CT is considered as the preferred imaging modality for colorectal cancer staging and follow-up, providing a global one-session staging method.

MATERIALS AND METHODS

In order to protect and spare patients from unnecessary ionization, we conducted a prospective study at the Department of Radiology, Clinical Hospital in Shtip, Republic of North Macedonia from januar 2023 till december 2023, in which we included 43 patients aged between 30-80 years old with primary tumors originating from the gastrointestinal tract and synchronous metastases in the liver.

During the study, two CT examinations were performed. The first examination was done at the beginning of the disease diagnosis, and the second one followed a year later. Both examinations were performed with post-contrast series, in arterial, venous and late phase.

RESULTS

These are the results we came up with:

The gender structure of patients with cancer originating from the GIT consisted of 27 (65.85%) male patients and 14 (34.15%) female patients.

The patients were mostly aged 70-79 and 60-69 years – 16 (39.02%) and 16 (34.15%), respectively.

Table 1 . Patient characteristics

variable	n (%)
gender male female	 27 (65.85) 14 (34.15)
age 30 – 39 40 – 49 50 – 59 60 – 69 70 – 79	 1 (2.44) 1 (2.44) 9 (21.95) 14 (34.15) 16 (39.02)

In the group of primary GIT tumors with metastases in the liver, the most common were: rectal cancer - 15 (36.58%) and colon cancer - 14 (34.15%), followed by 7 (17.07%) pancreatic cancers, 4 (9.76%) stomach cancers and 1(2.44%) of GIST.

Regarding the degree of differentiation, moderately differentiated carcinomas dominated - 25 (60.98%).

In addition to hepatic metastases, lung metastases were detected in 16 (39.02%) patients with primary GIT cancer, and bone metastases in 2 (4.88%).

7 patients died, ie the mortality rate in this group of 41 patients with metastatic liver disease and primary GIT cancer was 17.07%.

Table 2 Tumor characteristics

variable	n (%)
primary carcinoma colon rectum stomach pancreas GIST	 14 (34.15) 15 (36.58) 4 (9.76) 7 (17.07) 1 (2.44)
Degree of differentiation Moderately differentiated Poorly differentiated	 25 (60.98) 16 (39.02)
Lung metastases	16 (39.02)
Bone metastases	2 (4.88)
deceased	7 (17.07)

At the first CT scan, changes in the liver originating from GIT cancer, in relation to the density of computed tomography in all three phases, had the following distribution: in the arterial phase 17 (41.46%) changes were shown by CT as hypodense, 15 (36.58%) as isodense, 6(14.63%) as annular and 3(7.32%) as hyperdense; in the venous phase all changes were shown as hypodense; and in the late phase 39(95.12%) were shown as hypodense

and 2(4.88%) as isodense (Figure 1,2)

Table 3 Liver metastases density – fisrst CT scan

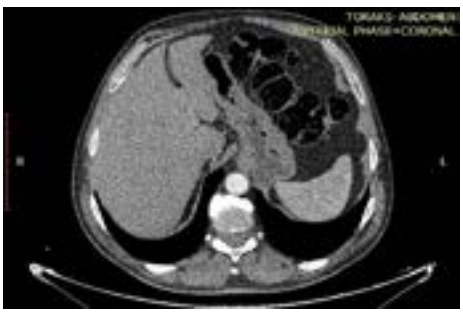
Primary GI tract carcinoma			
	Computed tomography 1		
	Arterial phase n (%)	Venous phase n (%)	Late phase n (%)
isodense	15 (36.58)		2 (4.88)
hypodense	17 (41.46)	41 (100)	39 (95.12)
hyperdense	3 (7.32)		
Ring shaped	6 (14.63)		

The Table 4 shows the CT finding of morphological changes in the liver in arterial, venous and late phase in patients with primary cancer of GIT, one year later.

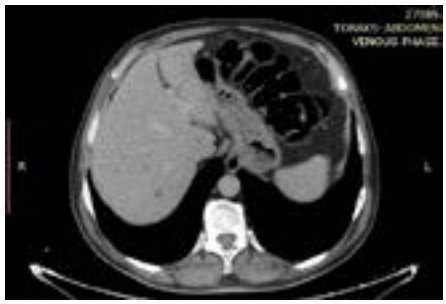
Table 4 – Liver metastases density - CT after one year

Primary GI tract carcinoma			
	Computed tomography 2		
	Arterial phase n (%)	Venous phase n (%)	Late phase n (%)
isodense	28 (68.29)		8 (19.51)
hypodense	4 (9.76)	33 (80.49)	26 (63.41)
hyperdense			
Ring shaped	2 (4.88)	1 (2.44)	
missing	7 (17.07)	7 (17.07)	7 (17.07)

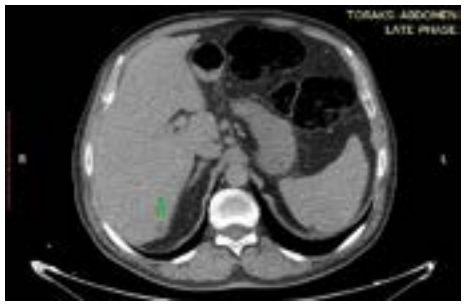
At the second CT scan, one year later in the arterial phase 4(9,76%) changes were shown by CT as hypodense, 28 (68,29%) as isodense, 2(4,88%) and as annular and 3(7.32%); in the venous phase 33 (80,49%) changes were shown as hypodense and only one was ring shaped; and in the late phase 26 (63,41%) were shown as hypodense and 8(19,51%) as isodense.



A



B



C

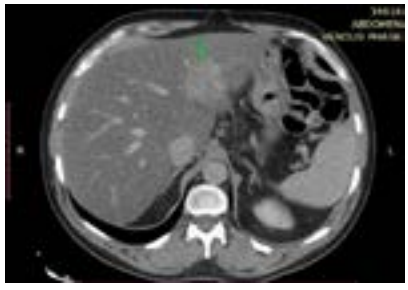
Figure 1

Comparing a multiphase CT scan of a patient with CRC:

(A) arterial phase - liver metastases are shown isodense with liver parenchyma,

(B) venous phase- the metastases are hypodense,

(C) late phase – liver metastases are shown hypodense



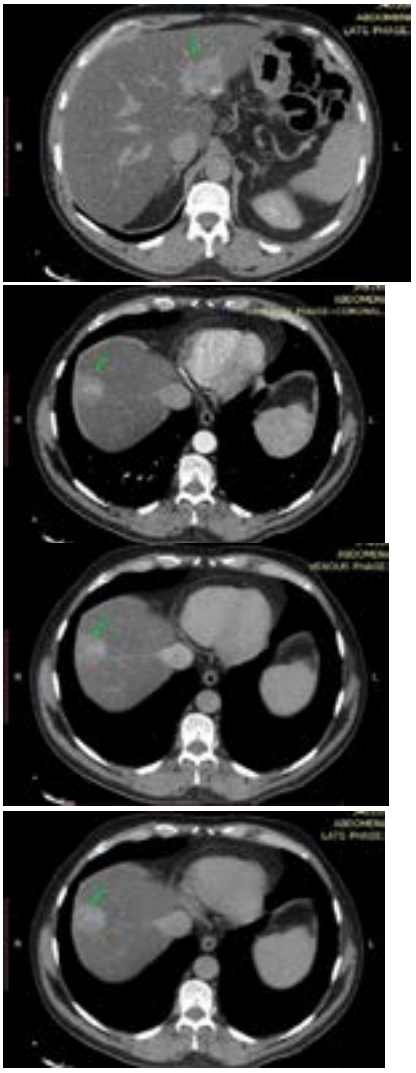


Figure 2

Mmultiphase CT scan of a 57-year-old patient with rectal carcinoma.

As it can be seen from the pictures, the metastases are shown hyperdense in arterial, venous and late phase.

DISCUSSION

The question of which imaging technique to apply still remains unresolved. The response most likely depends on operator experience, availability, and local equipment. Since MDCT scanning is well-established, many institutions frequently choose to use it as their first option for a "screening" liver check. While a shorter MDCT scan time allows for more precise multiphase scanning of the abdomen and chest and better lesion definition, it also results in an increased radiation exposure.

The number of scans required for a CT scan of the liver has been a topic of continuous discussion. The ability to classify tiny lesions as solid or cystic is the main use of an unenhanced scan. On the other hand, 11% of patients with colorectal cancer first present with calcified liver metastases. [17] These lesions are substantially better seen on unenhanced scans. The identification of hypervascular metastases and the distinction between these lesions and haemangiomas are greatly aided by arterial-phase scans, particularly when the haemangioma is early and fully enhancing.

Most colorectal liver metastases are hypovascular, however a tiny percentage of cases may show increased lesion conspicuity on arterial-phase scans. [18] The most dependable method for identifying colorectal liver metastases according to Valls and Sanchez is portal-venous phase scans, which have a CT sensitivity of 85.1% [19]

From the studies available for search, we found several studies emphasizing the portal venous phase in the detection of hepatic metastases.

.One of them is the study done at the University of Naples "Federico II", Italy by Mainenti et al. where a CT scan with only portal venous phase was performed on fifty-two consecutive patients who had a conventional colonoscopy-diagnosed colonorectal adenocarcinoma or highly suspected colon cancer. Two radiologists independently evaluated the depth of tumor invasion into the colo-rectal wall (T), regional lymph node involvement (N), and extracolonic metastases (M). Together with positive and negative predictive values, sensitivity, specificity, and accuracy were evaluated where it was concluded that for patients with colo-rectal cancer, the single portal venous phase CE CTC scanning technique allows for an acceptable preoperative assessment of T, N, and M staging.

According to a study made by Wicherts in Department of Surgery, University Medical Center Utrecht, The Netherlands in 2011 a total of 53 patients with liver metastases underwent CT scans in the hepatic artery, venous, and equilibrium phases between March 2003 and January 2007. Three different radiologists characterized the lesions that were found. Sensitivity rates for CLM were comparable between triphasic and hepatic venous phase CT ($P>0.05$). The conclusion was that arterial and

equilibrium phase CT had no incremental value compared to hepatic venous phase MDCT in the detection of CLM.

According to another study, made by Valls et al. in University Hospital Barcelona, Spain, the most dependable method for identifying colorectal liver metastases is portal-venous phase scans, which have a helical CT sensitivity of 85.1%. [19]

During our research we came up with similar results. On the first CT examination, we obtained a 100% representation of liver metastases in the venous phase, while on the second CT examination taking into account the seven deceased patients, the percentage decreased to 84.9%.

CONCLUSION

When it comes to imaging the liver and extrahepatic illness (both abdominal and thoracic), MDCT offers a significant benefit of "one-stop-shopping." This guarantees that MDCT will keep playing a significant part in screening and staging.

Supported by other studies, in our institution we have also confirmed the need for monophasic scanning when it comes to the detection and follow-up of liver metastases originating from GIT.

Conflicts of interest

The authors declare that there is no conflict of interest.

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