Role of Ultrasonography in Diagnosis of Cancers of the Gastrointestinal Tract

Gastrointestinal Kanal Kanserlerin Tanısında Ultrasonografinin Rolü

Gastrointestinal Kanal ve Ultrasonografi / Ultrasonography in the Gastrointestinal Tract

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Özet

Amaç: Günümüzde radyolojik görüntüleme yöntemlerindeki tüm gelişmelere rağmen gastrointestinal kanalın (GIK) incelemelerinde belirgin ilerleme sağlanamadığı gözlenmekte, geliştirilen modern BT yöntemlerinde de tetkikin pahalılığı, radyasyon riski ve hasta açısından uygulanabilirliğinin kolay olmaması, ultrasonografik (US) incelemelerin önemini arttırmakta ve US'yi GİK malignitelerinde tarama yöntemi olarak ön plana çıkarmaktadır. Bu çalışmada her ne kadar tanıda gold standartın üst gastrointestinal sistem endoskopisi veya kolonoskopi olduğu bilinsede ultrasonografinin gastrointestinal kanal kanserlerinde rolü araştırılmıştır. Gereç ve Yöntem: Bu çalışmaya anamnez ve fizik muayene bulgularıyla gastrointestinal kanal malignitesi ön tanısıyla ultrasonografi ve endoskopik tetkiklerin planlanan 40 hasta alınmıştır. Tüm hastalara ultrasonografi ve endoskopi uygulandı ve histopatolojik tanılarla sonuçlar karşılaştırılmıştır. Bulgular: Çalışmaya 25'i (%62,5) erkek, 15'i (%37,5) kadın toplam 40 hasta alınmıştır. Hastaların yaşı 63,1±11,5 olarak tespit edildi. Hastalardan 15'inde (%37,5) histopatolojik olarak malignite tespit edildi. Ultrasonun GI kanal kanserleri saptamada sensitivitesi %71,4, spesivitesi %75,7 pozitif prediktif değeri %65,2, negatif prediktif değeri %19,3 olarak saptandı. Endoskopik girişimlerin sensitivitesi %100, spesifitesi %96, pozitif prediktif değeri %93,7 olarak saptandı. Tartışma: Abdominal ultrasonografi gastrik-kolonik kanserlerin saptanmasında oldukça spesifik ve sensitif bir yöntemdir. Bu nedenle noninvaziv, kolay ulaşılabilir, radyasyon içermeyen, ucuz, risksiz olan bu yöntemin diğer tanı koydurucu yöntemlerden önce uygulanmasının faydalı olduğuna inanmaktayız .

Anahtar Kelimeler

Gastrointestinal Kanal; Kanser; Ultrasonografi; Endoskopi

Abstract

Aim: It is recently observed that there is not a remarkable advancement in gastrointestinal (GI) tract evaluations despite all developments in radiological imaging methods, and the high costs of examination, risk of radiation and difficult applicability in patients in modern CT methods emphasize the importance of ultrasonography (US) evaluations and stand US out as the scanning method in malignities of the GI tract. This study investigates the role of ultrasonography in cancers of the gastrointestinal tract, although the gold standard is known to be the endoscopy of the upper gastrointestinal tract or colonoscopy. Material and Method: The study included 40 patients whose ultrasonography and endoscopic examinations were planned with the preliminary diagnosis of tract malignity with findings of anamnesis and physical examination. All patients underwent ultrasonography and endoscopy, and results were compared with histopathologic diagnosis. Results: The study included a total of 40 patients, including 25 (62,5%) male and 15 (37,5%) female patients. Malignity was histopathologically identified in 15 (37,5%) patients. The sensitivity of ultrasound to identify cancers to the GI tract was 71,4%, its specificity was 75,7%, positive predictive value was 65,2%, and negative predictive value was 19,3%. The sensitivity of endoscopic intervention was 100%, its specificity was 96%, and positive predictive value was 93,7%. Discussion: Abdominal ultrasonography is a very specific and sensitive method in identification of gastric-colonic cancers. Therefore, we believe that the application of this non-invasive, easily accessible, cost-efficient method that does not involve radiation and entail risks before other diagnostic methods may be more helpful.

Keywords

Gastrointestinal Tract; Cancer; Ultrasonography; Endoscopy

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Introduction

Gastric and colorectal cancers comprise three-fourths of all cancers of the gastrointestinal (GI) tract. It is the second most important cancer cause of death for both genders (after lung cancer for men and breast cancer for women) and fourth in order of frequency after prostate cancer, breast cancer and lung cancer. [1]. In patients complaining of acute abdominal symptoms or nonspecific gastrointestinal symptoms and showing signs such as abdominal pain, diarrhea, hematochezia, change of bowel habit, or bowel obstruction, sonography may reveal the primary causes and may play a definitive role in making a diagnosis. On ultrasonography, abnormal lesions may appear as fungating mass with eccentrically located bowel lumen (pseudokidney sign) or symmetrical or asymmetrical, encircling thickening of the colonic wall (target sign). In patients with mass or wall thickening detected on ultrasonography, additional workup such as barium study, CT or endoscopy would be occasionally necessary for making a specific diagnosis, following clinical symptoms and laboratory findings, and endoscopic intervention methods and biopsy are applied as the gold standard [2]. It is recently observed that there is not a remarkable advancement in GI tract evaluations despite all developments in radiological imaging methods, and the high costs of examination, risk of radiation and difficult applicability in patients in modern CT methods emphasize the importance of US evaluations and stand US out as the scanning method in malignities of the GI tract [3].

The aim of our study is to emphasize the role of ultrasonography, which has a substantial sensitivity in diagnosis of gastrointestinal cancers, as well as the ultrasonographic findings with superiority in identifying malignity and to investigate the role of this method, which is commonly used before endoscopic interventions as it is non-invasive and easily-accessible.

Material and Method

Admission of Patients

The study included 40 patients whose ultrasonography and endoscopic examinations were planned with the preliminary diagnosis of tract malignity with findings of anamnesis and physical examination at gastroenterology polyclinic of Antalya Training and Research Hospital. Ultrasonography and endoscopic interventions by the same gastroenterologist and the same radiologist as well as biopsy results were evaluated in terms of presence of malignities in the GI tract.

All patients underwent ultrasonography and endoscopy, and results were compared with histopathologic diagnosis. The diagnosis of malignity in the GI tract was accepted after being histopathologically confirmed. The patients who underwent ultrasonography or endoscopy by other physicians were not included in the study. Through retrospective scanning the patient of files, the complaints of patients at admission and their laboratory findings were obtained.

Ultrasonography

Ultrasonographic evaluated was conducted by the same radiologist using TOSHIBA (Toshiba Medical Systems Europe, The Netherlands] with 3,5 convex probe and 7,5 linear probe. All patients were evaluated the night before following 12 hours of fasting. In US, certain findings such as wall thickening (circular, asymmetric, symmetric), presence of aperistaltic segments, hypoechoic lesions, appearance of pseudo-kidney, dirty fat plots and presence of acid, were considered as positive findings of US in terms of suspected malignity of the GI tract.

Endoscopy

Esophagogastroduodenoscopy of the patients was conducted with Pentax EPK 1000 video endoscopy system in left lateral lying position with local anesthesia following 8 hours of fasting. Colonoscopies were conducted with Pentax EPK 1000 video endoscopy system following appropriate cleansing of the intestines after a three-day pulpless diet. Written consent of all patients was obtained before the procedure. Biopsies were collected during endoscopic procedures where suspected lesions such as ulcer, erosion, polyp, veteran mass, etc., and appropriate polyps were excised with snare. Biopsies were sent to the pathology laboratory in 10% formol solution. Localization of identified lesions was completely reported.

Statistical Analysis

Statistical analysis was conducted with SPSS 13.0 software program. The relationship between presence of malignity and symptoms and US findings was investigated by chi-square test. The significant p value was accepted as <0,05. Sensitivity, Specificity, Positive predictive value and Negative predictive value for ultrasonography and endoscopic examinations were defined as follows.

Results

The study included a total of 40 patients, including 25 (62,5%) male and 15 (37,5) % female patients. The age of the patients was found as 63,1±11,5 (Table 1). The most common finding was anemia with 24 patients (60%), while the most common symptom was the stomach pain with 25 patients (62,5%).

Table 1. Laboratory results of cases included in the study

	Mean,Standard Deviation	Median
Age	63,5±11,7	64
AST (U/L)	18.5±5.8	18
ALT (U/L)	14.1±8.1	13
ALP (U/L)	79.2±16.7	77
LDH (U/L)	201.7±48.5	201
WBC (103/mm3)	8.1±3,64	7,38
HGB (g/dl)	11.4±1.9	11.2
PLT(103/mm3)	244.3±95.3	233

Malignity was histopathologically identified in 15 (37,5%) patients. Adenocarcinoma was found in ten patients, while stomach lymphoma, neuroendocrine carcinoma, squamous-cell carcinoma, fibrous tumor were identified in one patient each, and common intestinal metaplasia and severe dysplasia (early gastric carcinoma) were found in one patient.

Ultrasonography identified findings in favor of malignity in 17 out of 20 patients (42,5%), while no findings in favor of malignity were found in 23 (57,5%) cases. Among the patients where no findings in favor of malignity of the GI tract were found, pancreatic neoplasia was found in one, hepatosteatosis was found in two, kidney cyst in five, metastatic lesion in the liver in four

and lymphadenopathy was found in 1 patient. There was not a statistically significant relationship between malignities of the GI tract and ultrasonographic findings such as hepatosteatosis, lymphadenopathy or renal cyst. In US, the most common US finding with diagnosis of malignity was the dirty fat plots (33%). The subsequent most common findings of malignity were stomach wall thickening (26%), presence of metastatic lesion in the liver (26%), presence of hypoechoic solid lesions (20%), colon wall thickening (20%), and intestinal wall thickening by more than 10 mm (20%) (Figure 1, 2). Appearance of pseudo-kidney

Figure 1. Hypoechoic solid lesion in the descending colon

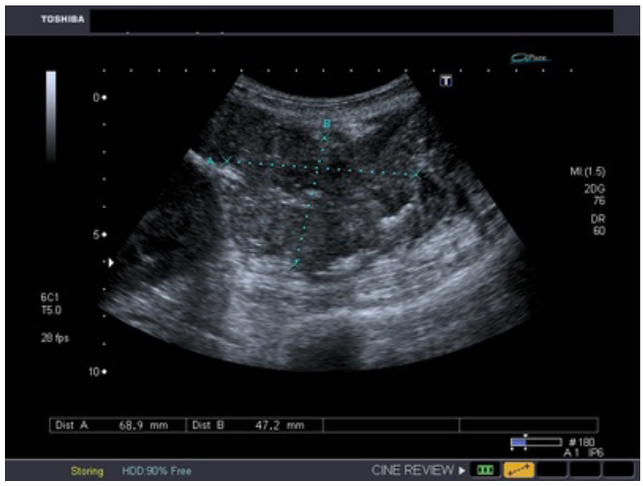


Figure 2. Intestinal wall thickening by more than 10 mm



(13,3%) and ascites (13%) were compatible findings with the malignities (Table 2). Wall thickening by more than 10 mm was identified in 8 patients (20%), 3 of whom were histopathologically diagnosed with malignity. According to this, US finding which is histopathologically most consistent with the malignities was wall thickening by more than 10 mm.

Table 2. Suspected GI malignity findings by US

the findings of malignancy in US	The number of patients	%
Dirty fat plots	5	33
Stomach wall thickening	4	26
Metastatic lesion in the liver	4	26
Hypoechoic solid lesions	3	20
Colon wall thickening	3	20
intestinal wall thickening by more than 10 mm	3	20
Pseudo-kidney	2	13.3
Ascites	2	13

A research of the relationship between US findings and the presence of histopathologically proven malignity revealed identification of hypoechoic solid lesions in US which was significant. (p:0,02). A comparison of ultrasonographic findings and the histopathologic results identified 8 (32%) cases as erroneously malign, and 6 (40%) cases as benign while erroneously malign. The sensitivity of ultrasound was 71,4%, its specificity was 75,7%, positive predictive value was 65,2%, and negative predictive value was 19,3%. Endoscopic interventions identified findings in favor of malignity in 17 out of 40 patients (42,5%). A comparison of histopathologic results revealed only 1 case which was erroneously considered as malign during endoscopic interventions. In this case, both colonoscopic findings and ultrasonographic findings supported malignity, but pathological diagnosis was consistent with inflammatory intestine disease. During endoscopy, no benign cases were erroneously diagnosed as malignity. The sensitivity of endoscopic intervention was 100%, its specificity was 96%, and positive predictive value was 93,7%.

Discussion

There has recently been a rapid change and advancement in diagnosis of cancers of the GI tract. However, almost all methods require a long period and are invasive and costly [4; 5]. Today, ultrasonography is the first preferred method in diagnosis of many diseases due to its advantages of accessibility, cost-efficiency and non-invasiveness as compared to the other imaging methods [5]. In the recent years, its reliability and preferability has been remarkably increased with the use of high frequency probes. However, there are restrictions on the use of US, particularly in the GI tract. The most important restrictions include excessive intestinal gas, obesity of patients and intestinal ans filled with stool. Nevertheless, when the intestinal wall is influenced by tumor or inflammation, the “target” or “pseudo-kidney” appearance can be easily detected with a good examination [6]. A recent study by Kingstone et al [7] has reported that acute abdominal sonography evaluation in adults should always include an evaluation of the colon, which should be a routine procedure and may reveal surprise multiple coincidental pathologies of the colon.

In their study, Rutgeerts et al [8] identified a high sensitivity rate of 95% for US in diagnosis of malignity of the GI tract. Similar results were reported by Richardson et al [9], who found the US sensitivity as 96%. Both studies found low specificities. The most important reasons for lower accuracy ratios with US examination as compared to endoscopy include localization of colon tumors in the rectosigmoid area and the failure of abdominal US to optimally examine this area as well as failure to demonstrate small polyps and early-phase lesions by US [10]. Our study also found a low specificity and sensitivity for US, which may be affected by the small number of patients.

In our study, most of the erroneous results were obtained by gastric neoplasia, all of which were localized in the stomach and very small in size. Liver metastasis was found in 4 cases, 3 of which also had suspected ultrasonographic findings for existing malignity of the GI tract but in one case, presence of

liver metastasis although no lesions were identified by US led to suspicion of malignity. In a study by Martinez et al [11] with 79 patients, 8,9% of the identified malignities were non-gastric originated malignities. In such cases, application of US may help to identify early-phase malignities by referring the patient to colonoscopy and endoscopy although no suspected lesions are present. [11;12]

Diagnostic accuracy of endoscopy in malignities of the GI tract vary from 71 to 98%, and our study is consistent with literature [13]. However, only in one case endoscopy was interpreted in favor of malignity while the pathologic diagnosis was inflammatory intestinal disease. In US, suspected diffuse intestinal wall thickening of about 12 mm in the descending colon and pseudo-kidney findings were revealed, which were considered to be significant for malignity; however, both ultrasonography and endoscopy misdiagnosed the case since the histopathologic results were consistent with inflammatory intestinal disease. The patient underwent colonoscopy twice and numerous biopsies were collected, and the diagnosis was confirmed. However, as is the case with many diseases, diffuse wall thickening can also be observed in inflammatory intestinal diseases, such as Crohn and ulcerative colitis, as well as in pseudo-membranous colitis and ischemic colitis [12; 14]. Although the study by Goetzs et al [15] found the sensitivity of ultrasonography in inflammatory intestinal diseases as 80-90%, they defined endoscopy as the gold standard in diagnosis.

A comparison of ultrasonographic findings and malignity finding ratios revealed that the finding which most commonly accompanied malignities was the hypoechoic solid lesion. In their studies, Truong et al. [16] reported that involvement of the small intestine and left colon as well as findings of diverticulitis, dirty fat plots and abscess formation usually accompanied the Crohn's disease; however, US findings such as asymmetric thickening of the wall, involvement of a short intestinal segment, immobile intestinal ans and hypoechoic solid lesions accompanied malignities. It has been reported in literature that an intestinal wall thickening from 4 to 10 mm was an important pathogonomic finding particularly for the colon; however, it was emphasized that findings such as a thickening by more than 10 mm, asymmetric thickening, involvement of a short segment and effects on accompanying fat plots further supported malignity [15]. In our study, 8 (20%) cases had a wall thickening by more than 10 mm, 3 of which were histopathologically diagnosed with malignity. In these 3 malign cases, the wall thickening involved a short segment and was asymmetric, which led us to consider that not only the wall thickening but also the nature of thickening is important.

In conclusion, abdominal ultrasonography is a very specific and sensitive method in identification of gastric-colonic cancers. The examination is an accessible, well-tolerated, non-invasive method which does not require a lot of time, does not entail risks and prevents excessive exposure of patients to radiation [17]. It may make remarkable contributions to detect malignities by identifying a notable mass at times, or a suspected, thickened intestinal segment at others, though not in the early phase, in cases particularly with symptomatic and intestinal findings. Due to its high levels of accuracy in cases other than tumors of the rectosigmoid area and polypoid lesions, we believe that its application before directly resorting to invasive methods, despite all advancements in imaging, may be very helpful for the patient and may be a guide for endoscopy and colonoscopy by identifying the location of suspected lesions.

Therefore, we believe that the application of this method before all radiological examinations and interventional diagnostic methods may be more helpful.

Competing interests

The authors declare that they have no competing interests

Authors' contributions

EP, MY, AHÇ, MY and AND conceived and designed the study. MY and UDD carried out the data collection and the wrote the main parts of the manuscript. MY conducted the statistical analysis. All authors read and approved the final version of the manuscript.

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