The Role of Tissue Harmonic Ultrasonography and Computerized Tomography in the Diagnosis of Intraabdominal Cystic Lesions*

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Abstract

Aim: Abdominal Ultrasonography (US) and Computed Tomography (CT) examinations are imaging methods frequently used in Radiology Clinics. During these examinations, cystic lesions are frequently detected in the abdomen. It is an important problem to identify and characterize the clinical significance of these cysts.

Methods: The findings of 145 patients who underwent abdominal imaging in the US and CT units of the Istanbul Training and Research Hospital Radiology Clinic and were found to have cystic lesions were analyzed retrospectively. The CT findings of cystic lesions detected in the abdominal organs or the abdominal cavity were reviewed, and the contribution of the new US image acquisition method, Tissue Harmonic Imaging (THI), to the characterization of cysts was examined.

Results: A total of 145 patients, 56 men (39.3%) and 89 women (60.7%) with cystic lesions in the abdomen, were included. We detected cystic lesions most frequently in the kidneys (n:68, 46.89%) and second most frequently in the liver (n:65; 44.82%). In addition, we detected cystic lesions in the spleen in 5 cases (3.44%), in the pancreas in 7 cases (4.82%), and in the abdominal

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cavity in 5 cases (3.44%). In all our cases, cystic lesions could be visualized in both THI imaging and CT examination.

Conclusion: THI examination provides valuable information in characterizing cystic lesions, especially by showing the wall feature of the cyst, the internal septa and the presence of intra-cystic solid component, while CT examination especially shows the wall calcification and the presence of air in the abscess, as well as the intramural solid component.

Keywords: Intraabdominal cysts, tissue harmonic ultrasonography, computed tomography.

İntraabominal Kistik Lezyonların Tanısında Doku Harmonik Ultrasonografi ve Bilgisayarlı Tomografinin Rolü

Öz

Amaç: Batın Ultrasonografi (US) ve Bilgisayarlı Tomografi (BT) tetkikleri Radyoloji Kliniklerinde sıklıkla kullanılan görüntüleme yöntemleridir. Bu incelemeler sırasında batında sıklıkla kistik lezyonlar tespit edilmektedir. Bu kistlerin klinik önemini belirlemek ve karakterize etmek önemli bir sorundur.

Yöntem: İstanbul Eğitim ve Araştırma Hastanesi Radyoloji Kliniği US ve BT ünitelerinde abdominal görüntüleme yapılan ve kistik lezyon saptanan 145 hastanın bulguları retrospektif olarak incelendi. Abdominal organlarda veya batın boşluğunda saptanan, organlar ile ilişkisi olmayan kistik lezyonların BT bulguları gözden geçirildi ve ayrıca yeni US görüntü elde yöntemi olan Doku Harmonik Görütüleme (THI)'nin kistik lezyonların karakterizasyonuna katkısı incelenmiştir.

Bulgular: Batında kistik lezyon tespit edilen 56 erkek (%39,3) ve 89 kadın (%60,7) olmak üzere toplam 145 hasta dahil edildi. En sık böbreklerde (n:68, %46,89) ve ikinci sıklıkta karaciğerde (n:65; %44,82) kistik lezyonlar saptadık. Ayrıca 5 olguda (%3.44) dalakta, 7 olguda (%4,82) pankreasta, 5 olguda (%3,44) karın boşluğunda kistik lezyon tespit ettik. Tüm olgularımızda hem THI görüntülemede hem de BT incelemesinde kistik lezyonlar görüntülenebildi.

Sonuç: THI inceleme özellikle kistin duvarı özelliği, internal septa ve kist içi solid komponent varlığını göstermede, BT inceleme ise özellikle duvar kalsifikasyonu ve apsede hava varlığının yanı sıra intramural solid komponenti göstererek kistik lezyonları karakterize etmede değerli bilgiler sağlar.

Anahtar Kelimeler: İtraabdominal kistler, doku Harmonik ultrasonografi, bilgisayarlı tomografi.

Introduction

Doctors frequently request Ultrasonography (US) imaging from the Radiology clinic in the evaluation of patients who apply with the complaint of abdominal pain. In addition, US imaging is mostly used in the evaluation of patients in emergency surgery services, and non-contrast Computed Tomography (CT) examination may be the first choice in trauma patients. During these US or CT examinations, cystic lesions in solid organs or in the abdominal cavity that cannot be associated with organs are detected quite frequently.

Determining the radiological imaging features of intraabdominal cystic lesions, accurate diagnosis and patient management are very important. In the characterization of cystic lesions, the first goal should be correct localization, and secondly, good identification of the wall structure and its intracystic components. The quality of sonographic images is very important, as US imaging is often the first used, easily accessible, and inexpensive examination method.

Tissue Harmonic Imaging (THI) is a non-linear image processing technique designed to improve conventional grayscale ultrasonography image quality. Conventional grayscale US imaging is based on the principle of creating an image by sending high-frequency sounds to the body and recording the echoes reflected from the tissue. In the THI method, a new non-linear ultrasonographic image processing technique, developed by compiling the secondary harmonic echoes that occur endogenously in the body rather than the transmitted fundamental frequencies, is used[1,2]. This US imaging technique is a relatively new examination method that has been used in recent years, offered as an additional examination protocol in new ultrasonography devices [3-14].

In this study, we examined the effectiveness of conventional US examination in determining the clinical significance of cystic lesions detected in the abdomen, as well as in the characterization of lesions in the evaluation performed in THI sonography mode. We also reviewed the CT imaging features of abdominal cystic lesions detected on CT examination and compared the obtained findings with THI findings.

Methods

Study Population

145 patients with cystic lesions, localized in solid organs or unrelated to organs, during abdominal US or CT examination performed in our clinic for any reason were included in this study. Lesions located in the pelvis were not included in this study. CT or US imaging was not prioritized during the examination. Pelvic cystic lesions were not included in this study. CT or US imaging was not given priority during the examination.

Technique Selection and Patient Preparations

During the THI examination, patients were asked not to eat anything for eight hours before the examination to obtain optimal images for evaluation. The examination was performed while the patient was in the supine position and different positions were given to the patient for optimization if necessary. After the cystic lesion was visualized on the conventional US, the images were examined by adjusting the harmonic frequencies of the device to perform a THI examination. For this purpose, sonographic images were obtained in axial and longitudinal planes.

CT examination was performed by taking sections at 1 cm intervals starting from the diaphragm level and downwards to the iliac wing level. If necessary, the lesion was scanned with thinner sections, keeping the gaps narrower to reveal the lesion better. If a lesion protruding beyond the examination area was detected, the examination was continued until the end of the lesion. The examination was performed using oral and IV contrast. Patients were examined after 6-8 hours of fasting. One hour before the start of the examination, 1-2% contrast material was given orally to the patients. To opacify the abdominal organs and vessels, 100-150 ml (40-60gr iodine) contrast medication was administered intravenously as stated in the source. In all cases, nonionic contrast agents were preferred to reduce the risk of allergic reactions in drug selection. In pediatric patients, a contrast agent was used with a dose selection of 50-75 mg/kg from 300 mg iodine/ml preparations [15].

Evaluation Parameters

The following features were noted in the imaging performed with both methods in abdominal organs and cysts localized in the abdominal cavity not associated with solid

organs. Such as the wall structure of the cystic lesion, the presence of internal solid component, the appearance of the cyst content, the presence of septations, the presence of wall calcifications were investigated.

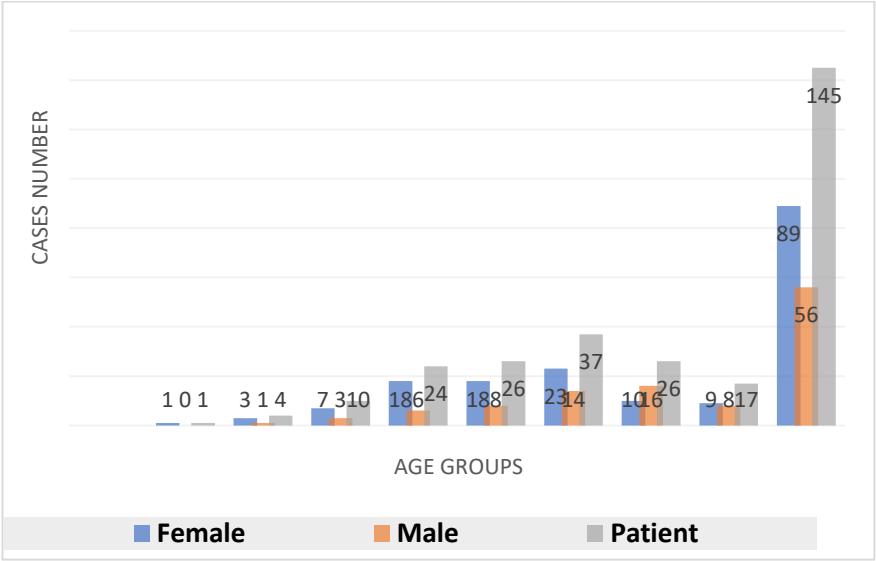
During the US examination of the patient, a cystic lesion was detected in the abdomen, images were taken at the harmonic mode settings of the device, and the THI appearance characteristics of the cyst were examined. Additional contributions to conventional gray scala US examination and its effectiveness in identifying lesions were investigated. The presence of additional findings such as better distinguishability of the internal structure of the cyst and showing the septa and solid part were investigated. In addition, features such as cyst wall thickness, contrast enhancement, homogeneity, presence of intralesional air, and wall calcification were examined in CT imaging.

While evaluating the findings obtained in the study, SPSS (Statistical Package for the Social Sciences) program (Version 11.0, SPSS Inc., Chicago, IL, USA) was used for statistical analysis. Descriptive statistical methods (mean, standard deviation, median, number, percentage, etc.) were used while evaluating the study.

Results

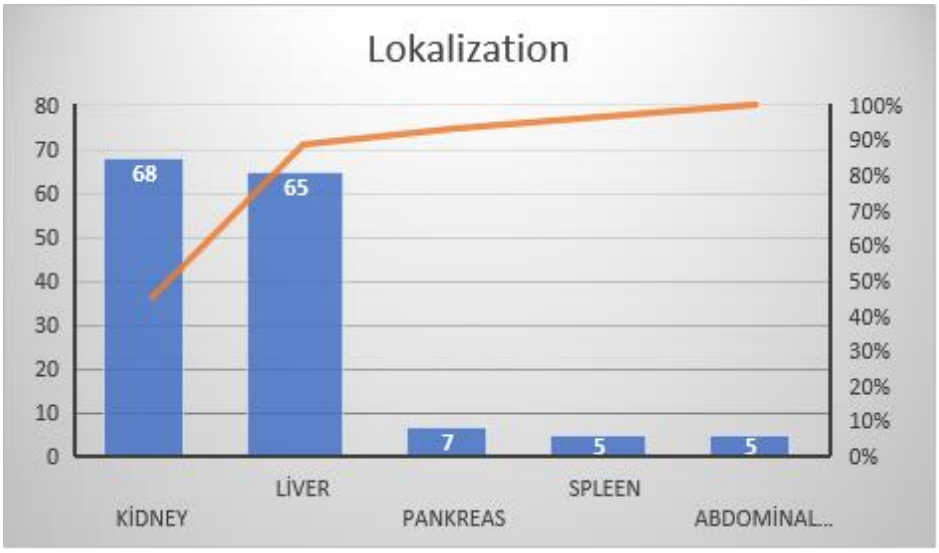
145 cases who applied to the US and CT units of Istanbul Training and Research Hospital for abdominal examination were included in this study. In our case group, which consisted of 56 males (38.7%) and 89 females (61.3%), the youngest was a 5-year-old girl and the oldest was an 80-year-old male (mean age 53.3). The distribution of the cases according to age groups is presented in Table 1.

Table 1: Distribution chart of the patients according to the age groups of ten



In our patient group included in our study, cysts and similar lesions in the abdomen were mostly detected in the liver and kidneys (91.71%). In addition, there were cystic lesions in the spleen, pancreas, and abdominal cavity, with no organ relation, to a lesser extent. The distribution of cystic lesions detected in all cases according to their localities is presented in Table 2.

Table 2: Distribution table of cystic lesions according to their localization in the abdomen



In this study, we found cystic lesions most frequently located in the kidneys in 68 cases (46,89%). These were cortical and parapelvic cysts and multiple cysts related to the polycystic kidney. In addition, we found calyx diverticulum in two cases and renal hydatid cyst in 5 cases. In our cases with renal localized cysts, the cysts most frequently showed cortical localization. Among these cases, we found a single cortical cyst or, in some cases, more than one uninoculated simple cyst. These were defined as thin, smooth-walled anechoic lesions with acoustic augmentation and no internal echogenicity during THI examination. On CT scans, hyperdense renal parenchyma was seen in the pyelogram phases as areas of water density with no contrast enhancement. In some of our cases, local lobulation of the cysts beyond the kidney contour was observed. These cysts were interpreted as exophytic cysts.

The polycystic kidney was detected in 7 of our cases (10.29%). Simple cysts were observed in the liver in 5 of them. In other words, 5 cases had polycystic kidney disease. These patients were in the middle age group and three of them were on dialysis due to kidney failure. In the THI examination, we detected multiple and varying sizes of thin-walled anechoic cysts in both kidneys. Both kidneys were greatly increased in size and lobulation was observed in the kidney contours due to cysts. In the CT examination, the sizes of both kidneys were greatly increased. Parenchymal sinus separation was not observed. Cysts were observed in water density in CT sections, and we did not detect complications such as hemorrhage or infection (Figure 1).

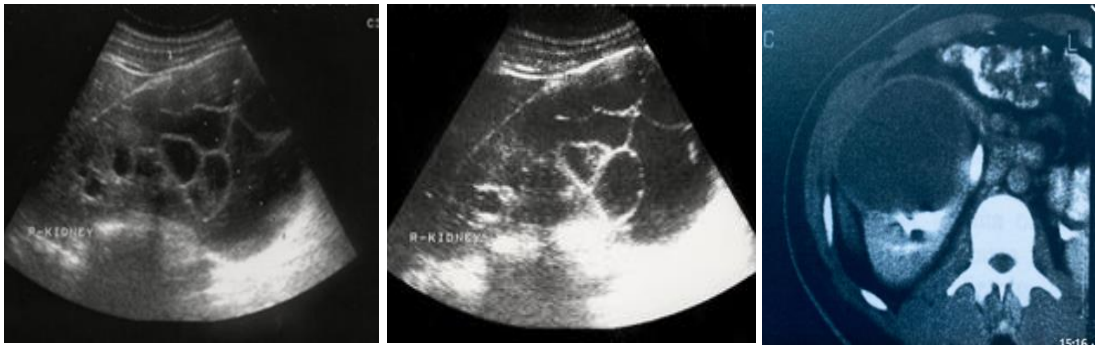
Figure 1: a) Multiple simple cysts in the kidney, Conventional and THI US image, b) Multiple hypodense cysts in polycystic kidney causing pushing in multiple calyceal structures in both kidneys on CT image.

a) Conventional US and THI image

b) CT image

Renal hydatid cyst was detected in 5 cases. In one case, THI imaging revealed a cystic lesion with a limited heterogeneous hypoechoic appearance in the middle pole of the right kidney cake. In contrast-enhanced series on CT, we detected a cortical hypodense non-enhancing lesion. In one case, a cortical cystic mass with a smooth and echogenic capsule was found in the left kidney, the solid component of which was not observed and protruding beyond the contour. In one case, opened germinative membranes in the cyst, and in another case, an appearance in the form of a cartwheel was detected (Figure 2). In one case, we found a hydatid cyst with a heterogeneous appearance and wall calcifications that caused external compression and springing on the calyceal structures.

Figure 2: Gharbi type 2 hydatid cyst in the kidney. a) Conventional, b) THI sonographic image, c) CT image. The wall of the cyst and the multiloculated septa it contains are seen more clearly on the left THI image than on the right conventional US. On CT imaging, the internal septa cannot be clearly distinguished and it is clearly seen that the cyst causes significant push on the calyx structures.



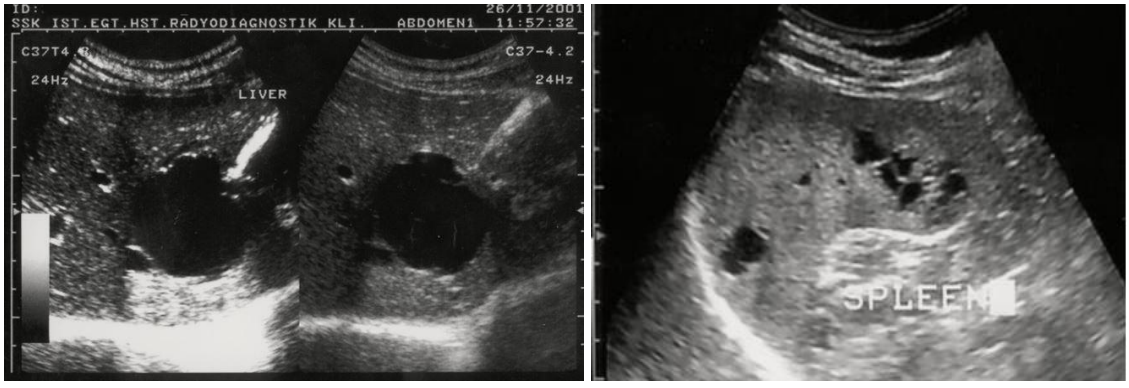
a) Conventional US image b) THI image c) CT image

In this study, we detected cystic lesions in the liver, which is the second most common in the abdomen and 65 (44.82%) patients. Among the cases included in the study, a hydatid cyst was seen in 42 cases. A simple cyst was detected in the liver in 21 cases, the second most common. In addition, lesions compatible with pyogenic abscess were observed in 2 patients. In one case, there was a loculated cystic appearance in the cholecystectomy site, giving the appearance of a pseudo gallbladder.

The features of 21 cysts located in the liver were evaluated as being compatible with simple liver cysts. In THI examination, the cysts had smooth echogenic walls and gave

acoustic enhancement. No internal echo or solid component was observed. 5 of our cases were also patients with Polycystic Kidney and kidneys filled with multiple cysts were observed. In total, three of our cases had simple cysts and thin echogenic septa. Simple cysts have a homogeneous hypodense appearance on CT, have a fluid density, and no septa have been identified, and no contrast enhancement was detected in contrast-enhanced CT scans. Figure 3, US images of simple cysts in the liver and spleen are given.

Figure 3: a) Liver simple cyst, THI and Conventional US image. In THI on the right, the cyst is clearly anechoic and thin echogenic wall is selected, and the interventional aspiration procedure needle is selected as an oblique echogenic line. b) Spleen simple cysts, THI US image. Multiple echogenic thin-walled anechoic simple cysts are seen.



a) THI and Conventional US image b) THI image

Among the lesions located in the liver in our cases, hydatid cyst was the first with 42 cases (28.9% of the total cases). We detected extrahepatic involvement in two cases. In one of these, widespread cysts were observed in the abdomen. In one of our cases, we found a hydatid cyst located in the right kidney. In our cases, the right lobe of the liver was frequently involved. In one of our cases, we found multiple cysts located in both lobes. There were only hepatic cysts in our 39 patients. According to the Gharbi classification (35), 14 of them had type 1, 6 had type 2, 11 had type 3 and 8 had type 5 hydatid cysts. In addition, type 1 and type 3 cysts were present in one patient, and type 2 and type 3 cysts were present simultaneously in one patient. In one of our cases, a type-2 hydatid cyst was found in the liver, and also a hydatid cyst located in the kidney. Again in one of our cases, we detected widespread cysts due to hydatid cyst rupture in the liver

parenchyma and the abdomen. In one of our cases, a cystoduodenostomy was performed due to a hydatid cyst and an appearance of an air-fluid level was observed in the cyst pouch. Figure 4, type 3 hydatid cyst located in the right lobe of the liver; THI, conventional US, and CT images are given.

Figure 4: Gharbi type 3 Hydatid cyst in the right lobe of the liver.

a) THI, b) conventional US image, b) CT image, the car wheel view

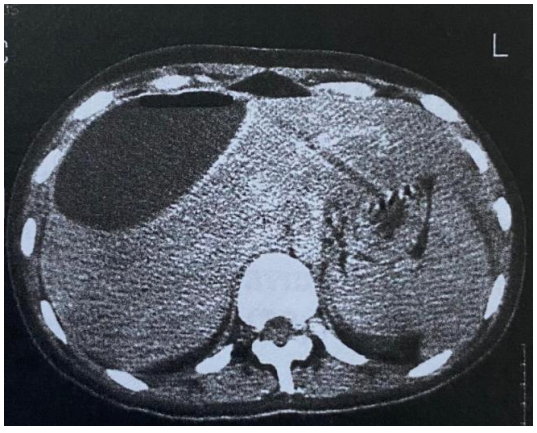
a) THI and Conventional US image

b) CT image

In our study, we detected pyogenic abscess in the liver in two patients. Both cases had an unexplained fever, chills, and right upper quadrant pain. In one of these cases, THI examination revealed a lesion with an echogenic wall located in the liver and containing intense internal echoes. In the other case, there was a smooth-walled cystic lesion with intense internal echoes. On CT scans, a hypodense appearance with a moderately thick wall with significant contrast was observed in cystic lesions in both cases. Figure 5, shows a case of hydatid disease with partial calcification of the wall in the right lobe of the liver and another case with abscess CT images.

Figure 5: On CT examination of the liver, a) Hydatid cyst with a partial calcified wall in the right lobe b) In another case, wall contrast and air-fluid leveling are observed in the abscess.

a) Contrast with CT image



b) Contrast with CT image

We detected an intraparenchymal cystic lesion in the spleen in 5 of the cases included in this study. Of these, 3 had simple cysts in the spleen. In one case, we detected a hydatid cyst with the appearance of a car wheel, which showed calcification on CT examination of the wall. In one case, a lesion with sharp and lobulated contours with intense internal echoes was detected in a subcapsular location in the THI examination. On CT, it was seen as a hypodense area with no contrast enhancement and no clear border. He had no additional clinical findings and was interpreted in favor of splenic infarction and followed up.

We examined 7 cystic lesions located in the pancreas (4.8 %). In 5 cases, they had an attack of acute pancreatitis, and changes were still observed in the parenchyma. On THI imaging located in the pancreas, it was observed as anechoic cystic spaces with no visible walls. On CT examination, pseudocysts were seen as hypodense areas with no wall structure and no contrast enhancement, located in the pancreatic parenchyma without a wall. In two cases, two small, thin-walled, anechoic cysts were detected in the pancreatic corpus part.

We detected cysts in the abdomen that were not associated with solid organs in 5 cases. Two patients had type 2 hydatid cysts accompanied by cysts in the liver. In these patients, there were smooth-walled cystic lesions with internal echogenic septations on

THI compatible with hydatid cyst between the aisles in one patient and near the stomach in the other patient with the liver. In three cases, an anechoic uninoculated cyst with the echogenic wall was observed in THI localized in the mesenteric plane between the ans in the abdominal cavity. In contrast-enhanced CT examination, no solid component, air content, or wall calcification was observed.

Discussion

The priority in abdominal cystic lesions is to determine the organ or structure from which the cyst originates. There may be differences between adult and pediatric age groups in the evaluation of abdominal cystic mass. In addition, parenchymal localization of the lesion in the organ or its location in omental or mesenteric areas in the abdominal cavity is important in the evaluation. Lesions such as simple and complicated cysts, cystic tumors, and abscesses can be seen frequently in abdominal solid organs, and primary mesenteric and omental cysts and collections can be detected in the abdominal cavity. Congenital cystic lesions and duplication cysts can be seen frequently in the abdominal cavity in the pediatric age group[16-19].

THI is one of the most important developments of US technology in recent years. In particular, the development of broadband transducers with high resolution and at the same time capable of generating and detecting sound waves at multiple frequencies significantly increased the quality of US images. In harmonic imaging, sound waves sent to the tissue interact nonlinearly with the tissue, resulting in new and different frequency sound waves that are not in the original frequency, and these frequencies are used to create harmonic images[2,4].

Compared with the conventional US, THI provides imaging opportunities by reducing artifacts that limit US examination, especially in an abdominal application. Since the harmonic wave is generated endogenously in the body, the anterior abdominal wall is less affected by reverberation artifacts originating from the fat and muscle surface. Thanks to this feature, factors that reduce contrast such as side lobe and reverberation artifacts that occur in hypoechoic and anechoic regions such as gallbladder, lumens of large blood vessels, acoustic shadows created by gallstones are eliminated. Especially in cases of abdominal wall thickness such as obesity or inflammation, harmonic examination technique significantly improves image quality in large tumors and complex

cystic masses. In particular, it reduces reverberation artifacts originating from superficial tissue and improves the image quality of fluid-filled structures. For these reasons, it has been reported in different studies that THI imaging is superior to gray scale conventional US examination in the evaluation of abdominal cystic lesions [4,5,8,11,12,15].

CT examination method is routinely used in the evaluation of abdominal cystic lesions. Bosniak et al., in their different studies, have classified renal cysts by CT examination and revealing the criteria for malignancy [20-22]. With CT imaging, it is possible to obtain findings that define the basic characteristics of the cystic mass, such as the internal structure of the cystic lesion, the wall structure, the presence of solid components, and the presence of calcifications. In addition, the enhancement feature can be demonstrated, and information about the content of the cystic lesion can be provided by density measurement. The cysts are in water density and the density measurement value is less than 20 HU, and intracystic hemorrhage or high protein content is considered in a cystic lesion with a higher density[23-27].

We examined a total of 145 cases with a cyst or cysts located in the abdomen during the study. In our cases, the lesions were located in the kidney in 68 (46.8%), the liver in 65 (44.8%), pancreas in 7 cases (4%), spleen in 5 cases (3%), and lesion in the abdominal cavity in 5 cases (3%) solid organ relationship was not found. Therefore, among the cases we examined during this study, the cysts were most frequently located in the kidney and the second in the liver. This was an expected result since our cases were generally older than middle age (mean age 53.3%). Because, as stated in many sources, simple renal cysts develop over 50% in the population over 50 years of age and increase with age [28-30].

A large number of cystic lesions can develop in the kidneys. These can be in a wide range of forms, such as simple cortical cysts, parapelvic cysts, calyx diverticula, kidney abscesses, cystic nephromes, hydatid cysts, and cysts developing in chronic dialysis cases. Simple cortical cysts develop at a rate of approximately 50% over the age of 50, and this rate increases with age [28,29]. In addition, it has been reported that acquired cysts develop in all end-stage chronic dialysis cases. Over 90% of renal cysts develop in 5 years. The incidence of renal cell cancer from these cysts is 5-20%[31]. In the study of Levine et al., it was reported that 7% of these cysts developed renal cell carcinoma [32].

In our study, we found the most common renal cystic lesions in 68 cases (46.89%). These were very high rates of cortical and parapelvic cysts and a large number of cysts related to the polycystic kidney. Two patients had diverticular enlargement of the calyx and 5 had renal hydatid cyst. In THI examination, cysts were defined as thin, echogenic-walled lesions that gave anechoic acoustic enhancement. CT scans showed hyperdense renal parenchyma in the contrast pyelogram phase or water-dense thin-walled cystic areas in the parapelvic area. 7 patients (10.29%) had polycystic kidneys and 5 had accompanying cysts in the liver. These patients were in the middle age group and three of them were on dialysis due to kidney failure.

We detected renal hydatid cyst in 5 of our cases. Hydatid cysts are most commonly found in the liver and lung, but may be secondary or primarily elsewhere in the body. In one of our patients, a hydatid cyst was present in the kidney at the same time as the liver. In hydatid cyst patients, there were germinative membranes opened within the cyst in one case, a circular appearance in the other case, and wall calcifications on CT in the other case. In renal hydatid cysts, the same characteristic appearances in liver localization are observed in THI imaging and CT examination. In addition, obstructive findings may develop due to the compression of the cystic lesion. As a result, hydronephrosis, colic-like pain, and sometimes hydraturia may develop as a result of the cyst opening into the urinary tract [32-37].

Since THI can identify kidney cysts much more clearly than conventional gray scala US examination, this rate can be increased even more [4]. However, in suspicious lesions, a needle biopsy can be performed under the guidance of US or CT and pathological evaluation can be performed. These lesions can be observed during THI and CT examination, and many diagnostic characteristics can be observed. They are sharply circumscribed, circular margins and well-contoured lesions that can be differentiated from the renal parenchyma. In the US, simple cysts are anechoic and acoustic enhancement is observed in the posterior wall, they have well-defined and smooth walls. On CT scans, they appear as well-circumscribed hypodense masses with a lower density than the renal parenchyma, the wall of which cannot be seen, and no contrast enhancement on contrast-enhanced sections. It is very important to differentiate complicated kidney cysts from benign to malignant. Septation of the cyst, thickening of the cyst wall, development of calcification, heterogeneous appearance, and presence of a

solid component in the cyst are signs of malignant change. They are smooth-contoured, round, homogeneous, water-dense lesions on CT examination. Density is below 20 HU in the CT examination. Simple cortical cysts can be complicated by bleeding or infection. In CT examination, increased density of the wall, thickening of the wall, and calcification in the septum can be detected. When there is bleeding into the cyst, it gives a hyperdense appearance on CT examination [28,32]. Bosniak classification is used for the evaluation of complicated kidney cysts. Accordingly, renal cysts were classified between type 1 and type 4 on CT examination. The type has no definitive malignant criteria, and type 4 defines cysts with definite malignancy findings [38-40]. Diagnosis of renal cystic masses can be determined with a rate of 93-97% by the US or CT [41].

The second most common localization of the lesions in the liver is due to the frequent localization of cystic lesions in this organ to be examined in the selection of cases. Hydatid cysts are most commonly located in the liver (75%), and less frequently in the lungs (15%), brain, spleen, kidneys, and bones [20,39]. Among the lesions located in the liver in our cases, hydatid cyst was the first with 42 cases (28.9% of the total cases). We detected extrahepatic involvement in two cases. In one of these, widespread cysts were observed in the abdomen. In one of our cases, we found a hydatid cyst located in the right kidney. In our cases, the right lobe of the liver was frequently involved. In one of our cases, we found multiple cysts located in both lobes. There were only hepatic cysts in our 39 patients. Especially in our THI examination, the presence of internal septa in Gharbi type 1, type 2, and type 3 cysts were found to be very successful in demonstrating opened germinative membranes. Type 5 cysts that we showed in 8 of our cases were inactive cysts with intense calcification and were observed as shadows on sonography. CT examination was particularly superior in characterizing calcified type 5 cysts. We did not have a case of Gharbi type 4 hydatid cysts. As it is known, these types of cysts are defined as heterogeneous solid lesions on sonography [34]. THI examination provides very useful contributions to the evaluation of separated germinative membranes and internal septations in type 1, type 2, and type 3 hydatid cysts. The difficulties experienced in differentiating the lesion content and presence of internal septations, especially in obese and gassy cases, were overcome with THI in parallel with the literature[8,22,25,27].

US and CT examination is the primary non-invasive imaging method used in the imaging of pancreatic pathologies and is easy to access [42]. In this study, we detected abdominal

cysts located in the pancreas in 7 cases (3.44%). These were simple cysts and pancreatic pseudocysts. The majority of our cases (n=5) consisted of pseudocysts, which were anechoic in THI developing after pancreatitis attack and displayed as loculated collections without a wall on CT. Pseudocysts are cystic lesions without a true wall surrounded by epithelium, which is formed as a result of the limitation of fluid collections with granulation tissue after acute or chronic pancreatitis. Acute fluid collections develop in approximately 30-50% of cases, but in half of them, the collections regress spontaneously, and pseudocyst formation is seen in the remainder within 4-6 weeks[43-47]. In our study, we had no case of a cyst with a solid component in the pancreas and a malignant feature. However, there are also cystic tumors of the pancreas and their appearance characteristics should be known[48].

Cystic lesions not associated with solid organs can be seen in the abdominal cavity in all age groups, and their differential diagnosis can sometimes be quite difficult. In this study, two of our cases had hydatid cysts and three of our cases, the largest of which was 21, had mesenteric cysts. Hydatid cysts were associated with the liver and exhibited similar radiological features. Mesenteric cysts there was an uncomplicated mesenteric cyst with anechoic cystic appearance, without septa, internal solid component, or wall calcification.

Mesenteric cysts are a heterogeneous group of common abdominal cystic lesions localized at or near the root of the mesentery and not associated with retroperitoneal structures. Omental or mesenteric cysts are frequently seen as anechoic cystic lesions without septation in the US. Rarely, exudation develops as a result of infection of the chylous contents and oil-fluid levels can be seen. Mesenteric cysts are a heterogeneous group of common abdominal cystic lesions localized at or near the root of the mesentery and not associated with retroperitoneal structures. Mesenteric cysts are defined as sharply circumscribed collections of water density on CT examination. Mesenteric cysts are benign lesions containing chylous or serous fluid, and fluid-fat leveling is detected pathognomonic in chylous cysts [49-51]. Our cases were young patients and did not show any complications.

Our limitations in this study are that it was scanned retrospectively from the records, CT and THI images were not taken simultaneously in all cases, and the radiological pathological correlation did not spread in all cases. In addition, the fact that the

relationship between cyst dimensions and morphological evaluation and characterization was not looked at, and statistical correlation tests were not examined in our study. However, it was not our primary aim to determine the location and frequency of the lesions in this study. In our study, we aimed to determine the contribution of THI imaging to conventional US examination in the diagnosis of abdominal cystic lesions, to review and discuss CT examination findings.

Conclusion

THI has now become a routine component of diagnostic US examinations for the accurate evaluation of cystic lesions in the abdominal, breast, and even thyroid examinations filled cavities such as heart, gallbladder, and bladder containing natural fluid in the body, as well as obstetric examination [2-12]. Supporting this in our study, we obtained clearer and more artifact-free images in terms of the characterization of cystic lesions, especially in our examinations performed in THI mode. As a result THI examination, which is now presented as a component of fundamental US imaging, provides clear images without artifacts, making a significant contribution to the evaluation of natural fluid-filled spaces in the body and the characterization of pathological cystic lesions. CT provides cross-sectional images and accurately guides the differential diagnosis of lesion localization and borders, especially the presence of cystic air in cyst wall calcification and abscess, and wall and solid component contrast involvement.

We think that large series of studies that will be planned prospectively, combining CT and THI findings, in which especially numerical quantitative measurements will be added and internal vascularization parameters, especially for complex cystic lesions, can provide important contributions to the literature. Abdominal MR imaging, which was not covered in this study, may contribute significantly to the evaluation and characterization of cystic lesions, especially the intracystic component, ineligible patients. All radiological imaging findings and clinical data should be correlated and, if necessary, histopathological verification should be performed for definitive diagnosis.

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