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How Much Attention Do We Pay to the Ultrasound Indications in Emergency Departments?

Hakan Onder[1], Cihad Hamidi[1], Faysal Ekici[1], Suzan Kuday[1], Muhammed Siddik Ozdemir[1], Ayhan Ozhasenekler[2], Guven Tekbas[1], Aslan Bilici[1]

[1]Dicle University Medical Faculty, Department of Radiology, Diyarbakır, Turkey

[2]Dicle University Medical Faculty, Department of Emergency Medicine, Diyarbakır, Turkey

Abstract

Purpose: The aim of this study is to compare the pre-diagnoses and the ultrasonography (USG) results in terms of the final diagnosis of the abdominal pathologies in patients who present to emergency departments with abdominal complaints.

Methods: Patients who presented to the emergency department with various abdominal complaints between January 2011 and October 2011 were retrospectively evaluated. Data from the clinical examinations, USG reports and computed tomography (CT) results were assessed and the intra-abdominal USG findings were recorded. The sensitivity, specificity, and the positive (+) and negative (-) predictive values were calculated. In patients with negative (-) USG results, additional abdominal CT examinations were also performed.

Results: Three hundred patients who underwent USG examinations - and additional CT examinations in case of negative (-) USG results - were included in the study. The sensitivity,

specificity; positive predictive values and negative predictive values of USG in detecting intra-abdominal lesions were found as 90.9%, 100%, 100% and 8%, respectively. The CT performed in patients with negative (-) USG results revealed 8-10% of additional lesions. Discrepancies between the pre-diagnoses and the USG and BT results were observed in 50% of the patients.

Conclusion: Although USG is a subjective method, it has high sensitivity and specificity in abdominal pathologies. If the USG is requested by the emergency physicians specifying the possible pre-diagnoses after the completion of the physical examination and laboratory tests, this will contribute to the task of the radiologist and reduce unnecessary USG examinations.

Keywords: Abdomen, pre-diagnosis, ultrasonography, computed tomography

Introduction

The aim of this study is to observe the compliance between the pre-diagnoses set out by the physicians who first see and examine the patient and the subsequent USG findings. For this purpose, 300 patients who presented to the Emergency Department of Dicle University Medical School Hospital were retrospectively evaluated and the correlation between the pre-diagnoses and the USG findings was observed. However, the majority of the physicians who requested the USGs were not specialists of emergency medicine.

Today, emergency medical services are provided in almost every hospital and the quality of the healthcare in the emergency departments is improving every day. Although the efforts to improve this quality are continued incessantly, there are many hindrances tethering this effort. The most important ones among these factors are physical limitations like inadequate physical conditions and the lack of qualified personnel, insufficient equipment or failure to use the existing equipment with maximum capacity, difficult working conditions,

large number of patients and limited time to devote to each patient. The focus of the present study is the compliance between the pre-diagnoses made by the physicians working in emergency departments incorporating one or more of these deficiencies and the results found by the radiologists performing USGs under these conditions.

Methods

For the purposes of this study, 300 patients who presented to the Emergency Department of the Dicle University Medical School Hospital with various abdominal complaints between January 2011 and October 2011 were retrospectively evaluated and the correlation between the pre-diagnoses made by the physicians in the emergency department, and the USG findings was observed. Patients whose USG results were negative (-) also underwent CT examinations. Patients who were referred without pre-diagnoses, those under the age of 18, pregnant patients, and those who were previously diagnosed were excluded from the study. Patients who had USG findings supporting the pre-diagnoses were evaluated as positive (+), while those without such findings were assessed as negative (-). Patients who were admitted due to motor vehicle accidents, gunshot wounds and stab wounds were included in the general body trauma group. The examinations were performed using the Toshiba Applio XG (Tokyo, Japan) USG device and a 3.5 MHz convex probe. CT imaging was carried out with the help of the Philips Brilliance 64 and 16 slice CT device (Eindhoven, the Netherlands). Patients were administered oral and IV contrast agents at a dose of 1ml/kg. The USG examinations were performed by radiology assistants with at least one year experience and radiology specialists with at least three years' experience. Patients were not necessarily in fasted state. The patients with normal or suspicious USG findings also underwent CT examinations. The CT results were assessed by radiology assistants with at

least two years' experience and radiology specialists with at least three years' experience. The approval of the ethics committee was obtained before the initiation of the study.

Results

The pre-diagnoses made by the physicians at the emergency department, the USG results and any additional CT results of the 300 patients, among which 189 were male (age range: 18-72 years; mean age = 44 years) and 111 were female (age range:18-68 years; mean age = 36 years), are summarised in Table 1 and Table 2.

Table1

	Pre-diagnosis	USG Result
Acute abdomen	+39	18
Abdominal pain	+12	-10
General body trauma	+19	-91
Pathologies of the urogenital system	+23	-13
Pathologies of the gastrointestinal system	+48	-27
	+141	-159

Table 2

Pre-diagnosis	CT result	(USG)
Acute abdomen	18	+1
Abdominal pain	10	+2
General body trauma	91	+9
Pathologies of the urogenital system	13	0
Pathologies of the gastrointestinal system	27	+2
	159	+14

In Table 1, the figures with positive (+) USG values indicate that there were findings supporting the pre-diagnosis, while the negative (-) USG values point out the lack of findings

in the USG supporting the pre-diagnosis. Among the 57 patients who were referred with a pre-diagnosis of acute abdomen, positive (+) results were obtained with the USG in 39 patients, while the results were negative (-) in18. Twenty-two patients had presented with the pre-diagnosis of abdominal pain and the USG findings were positive (+) in 12, while they were negative (-) in 10 patients. Among the 110 patients who presented with the pre-diagnosis of general body trauma, 19 had positive (+) findings and 91 had negative (-) findings. The findings were positive (+) in 23 out of the 36 patients with the pre-diagnosis of urogenital system pathology, while they were negative (-) in 13. Out of the 75 patients with the pre-diagnosis of gastrointestinal system pathology, the findings were positive (+) in 48, whereas they were negative (-) in 27. In conclusion, 141 patients had positive (+) USG findings, while 159 patients had negative (-) USG findings. These 159 patients who had negative (-) results underwent CT examinations, which led to further findings undetected in the USG in 14 patients. Out of these patients, 9 were classified under general body trauma, among which 4 had mild contusions in the liver, 3 had mild contusions in the spleen, and 2 had retroperitoneal haemorrhages. Two of these patients were classified in the group with abdominal pain and one of them had a mesenteric panniculitis, while the other had an epiploic appendagitis. In one patient classified as a case of acute abdomen, a retrocecal appendicitis was detected. Two patients were among the group with pathologies of the gastrointestinal system and one of these had an antral gastritis, while the other had colitis.

Discussion

The liver, gallbladder, biliary tract, spleen, kidneys, and pancreas are organs where USG is frequently used for diagnostic purposes. The technique makes it possible to observe both the size, parenchymal structure and congenital anomalies of the organs; and the presence and nature of cystic/solid masses. With the help of the contrast agents used in cases where

needed, results matching the CT or MRI in terms of quality may also be achieved (1). Endoscopic USG presents diagnostic opportunities in the pathologies of the oesophagus, stomach, duodenum and ampulla, as well as the pancreas. As a hollow organ, the bladder can only be examined in detail through USG if it is filled with urine or with sterile fluid administered through a catheter. In a distended bladder, changes in the wall thickness and trabeculations, local mural thickening or polyps, intraluminal stones and coagulum can be evaluated. Although less sensitive than cystoscopic methods, USG has become an integral part of the diagnostic algorithm in various urological disorders including the non-invasive assessment of small tumoral lesions, primarily in patients with hematuria. Besides, more detailed assessments can be made through transvesical, transrectal, transvaginal and intraoperative USG methods (2).

Following the first intervention to the patients who present to the emergency room for various reasons, laboratory tests and radiological evaluations are usually required in order to make the final diagnosis. USG is an imaging modality used for the diagnosis of abdominal pathologies since it is a non-invasive, mobile and easy to use method. The disadvantages of the method are the subjectivity of the ultrasonographic evaluation and the influence of the amount of the air in the bowels on the image. Presence of intra-abdominal fluid in a trauma patient is assumed as blood until proven otherwise (3). Diagnostic peritoneal lavage (DPL) used for the verification of abdominal bleeding is a valuable, but invasive method which carries a small risk of complication (4). Also, the specificity of TPL is low. Since 1991, a method called FAST is used as a USG imaging method in emergency departments to investigate solid organ injuries specific to trauma and the presence of intra-abdominal fluid. This method has considerably decreased the number of TPLs (5). Specialists of emergency medicine with USG training also perform the FAST USG. Although the method does not

replace a detailed abdominal USG, it is adequate to diagnose possible conditions in emergency patients. However, USG is usually carried out by radiologists in emergency departments. The pre-diagnoses specified for the emergency patients, for which USG examinations are requested, facilitate the task of the radiologist and reduce the duration of the USG performed under emergency conditions. Thus, they provide optimum benefit to the emergency physicians and the patients. A preliminary article reporting the results of a study comprising 353 consecutive blunt trauma patients at the Emergency Centre of the Leiden University Medical Centre reveal a 92.8% sensitivity, 100% specificity, and 99.4% accuracy (6). Our results have revealed a 90.9% sensitivity, 100% specificity, and 100% accuracy. However, the USG results obtained from the patients are around 50%. The pathological findings detected through CT in 14 patients with normal USG results may be attributed to the technical inadequacy of the USG in these patients and the variability of the USG according to the person who performs the procedure. However, the approximately 50% negative results obtained in contrast to the results of Leiden University can be explained with the inclusion of all the patients with abdominal problems - and not only the trauma patients - to the study and/or to an inadequate assessment of the patients before the referral for USG.

The sensitivity of USG in showing intra-abdominal fluid is 97-100%, while its specificity is 80-90%. Adequate training and skill is necessary in order to reach the optimum results. Clinical experiments have shown that USG plays an important role in the diagnosis and follow-up of polytrauma patients. However, USG cannot take the place of CT in patients with multiple trauma. CT enables additional diagnoses to those made through the USG (7,8). Also in our study, cases of epiploic appendagitis, mesenteric panniculitis, retrocecal appendicitis, antral gastritis, colitis, retroperitoneal haemorrhage and mild contusions in the liver and spleen we could not diagnose through USG were diagnosed with the help of CT.

If the USG and CT are performed under appropriate conditions and with optimum efficiency, solid organ injuries due to blunt trauma may be followed up without surgery. Thus, unnecessary surgical interventions may be avoided (9,10). The greatest part (36.6%) of our patients also consists of individuals with general body trauma and we are of the opinion that more care must be taken when specifying the pre-diagnoses in this patient group.

The limitations of this study include the fact that, besides trained emergency medicine specialists, physicians from various fields of medicine without adequate emergency medicine experience perform the initial examination of the patients in the emergency departments before referring them for the USG. The subjectivity of the ultrasonographic evaluation and intensive gas distension frequently observed in the patients under emergency conditions are further limitations of the study. Finally, the failure to hold the breath during the USG procedure in a group of patients including especially those with general body trauma is a factor that may affect the results.

Conclusion:

USG is an important diagnostic tool in the abdominal pathologies observed in the emergency departments. CT examinations in patients where the USG leads to negative (-) results may reveal 8-10% of additional results. If the physicians working in emergency departments reach a more accurate pre-diagnosis through the physical examination of the patients and the laboratory tests depending on the emergency of the patient's condition before requesting the USG, this may lead to a more efficient application of the USG preventing unnecessary and/or repeated USG examinations. In the patients where USG examinations are required, the probable pre-diagnoses must be specified and these pre-diagnoses must be clearly indicated on the referral and/or hospital computer system. This will increase the efficiency of both the USG and the radiologist. We are of the opinion that care must be taken

in requesting abdominal USG examinations especially in patients with general body trauma and that the data at hand must be shared with the radiologist. Studies with larger patient groups will provide more detailed information on this point. Periodic monitoring of the relationship between the pre-diagnosis and final diagnosis in terms of the USG in emergency departments will increase the service quality both in the emergency departments and the radiology units. We also believe that as greater numbers of trained specialists of emergency medicine replace rotational physicians in emergency departments, greater compliance will be observed between the pre-diagnoses and the final diagnoses.

Conflict of Interest

The authors declare that there is no conflict of interest whatsoever with this manuscript.

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