Validity of US in Comparison with CT SCAN in Blunt Abdominal Trauma

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Abstract

Aim of study: detection of the accuracy; sensitivityand specificity of sonography in detection of different intra abdominal injury in patient with blunt abdominal trauma in comparism with CT SCAN

Patients and method: we examined 326 patient with blunt trauma from June 2009 till July 2011 all underwent emergency ultra sound at al – Hilla teaching hospital to evaluate whole abdomen with blunt trauma all patient where identified and their result are compare with thir CT scan in correlation with clinical outcome]

Results: 326 patient where done for them ultra sonography with CT scan examination ; where 22 true positive from the 326 those are of different intra abdominal injuries from ;haemoperitonium ; solid organ injury ; till mesenteric injury ;292 true negative from the total 326 and two are false positive and10 false negative ; sensitivity of us are of 69%;andspecifity of 99%; and diagnostic accuracy is 96%

Conclusions: Although the sensitivity andspecifityand diagnostic accuracy is not as high as CT scan still is the 1st investigation bed side examination and recommended in emergency department

الخلاصة

أهداف البحث : معرفة الدقة والحساسية والنوعية للسونار في معرفة إصابات البطن بالمقارنة مع المفراس الحلزوني.

طريقة العمل: فحص٣٢٦مريض تم إدخالهم للطوارئ يعانون من مختلف إصابات البطن وتم إجراء فحص السونار ثم المفراس الحلزوني وتم مقارنة نتائج الفحص بالسونار و المفراس الحلزوني مع الأخذ بالاعتبار الحالة السريرية

النتائج: كانت الدقة في فحص السونار تصل الى ٩٦%و الحساسية ٦٩% و النوعية ٩٩% و كانت مطابقة بمجملها لعدة بحوث مقارنة.

الاستنتاجات: ان المعايير التي تم الحصول عليها من خلال البحث تشير الى دقة عالية و حساسية مع نوعية جيدة الى حد يمكن اعتمادها كفحص اولي بجانب السرير قبل فحص المفراس الحلزوني الذي يعتبر الفحص العالي الدقة و النهائي.

Introduction

Anatomy

The abdomen can be divided into 4 areas. The first is the intrathoracic abdomen, which is the portion of the upper abdomen that lies beneath the rib cage. Its contents include the diaphragm, liver, spleen, and stomach. The rib cage makes this area inaccessible to palpation and complete examination. The second is the pelvic abdomen, which is defined by the bony pelvis. Its contents include the urinary bladder, urethra, rectum, small intestine, and, in females, ovaries, fallopian tubes, and uterus. Injury to these structures may be extraperitoneal in nature and therefore difficult to diagnose. The third is the retroperitoneal abdomen, which contains the kidneys, ureters, pancreas, aorta, and vena cava. Injuries to these structures are very difficult to diagnose on the basis of physical examination

findings. The fourth is the true abdomen, which contains the small and large intestines, the uterus (if gravid), and the bladder (when distended)[1-3].

Mechanisms of injury:

Motor vehicle accidents are responsible for most of blunt trauma with abdominal injuries Blunt injuries causes solid organ trauma (spleen, liver and kidneys) more often than hollow viscera. Multi organ injury and multiple system injury are also more common in blunt injury than in other types. But there are other form of blunt abdominal injuries like crushing, shearing, bursting,penetration.

presentation varies widely from haemodynamic stability with minimal abdominal signs to complete cardiovascular collapse and may change from one to the other with alarming rapidity

Ultra sound examination

The sonographic examination that is performed for evaluation of the patient with blunt abdominal trauma has changed considerably since first described in the early 1990s. There has been a learning curve within the literature, and this examination has changed appropriately. The main focus of the examination has been on detection of free fluid within the abdomen of patients with acute trauma. One original description of the use of sonography in blunt abdominal traumae was to obtain a single view of the Morison pouch to detect free fluid which is either clear hypoechoic fluid or with internal echo inside (blood). However, that examination has been abandoned in favor of a more comprehensive examination, which has been well described in the literature. This examination has been named focused abdominal sonography for trauma (FAST). This usually includes sonography of the right upper quadrant, including the hepatorena-lfossa the left upper quadrant, including the perisplenic region; the right and left paracolic gutters; and the pelvis, performed to detect free fluid. Free fluid will gravitate to the most dependent portion of the pelvis and as such, free fluid in the pelvis may be missed if the patient has an empty bladder. In some instances, an examination of the epigastrium to check for free fluid, free air, or both is also performed[8]. Other components of the examination include an intercostal or subdiaphragmatic view of the heart. Examination of the chest is performed if, in fact, there has been chest as well as abdominal trauma; such an examination will be discussed below [5-7]. although in our study we do an completsonographic examination for the whole abdomen and not focus as the above mention type of sonography (FAST) as we done an perfect sonography to liver; spleen; mesentery; kidneys ;bladder

Computed tomography

The CT scan is a non invasive procedure. It has become the gold standard radiographic modality in evaluating blunt abdominal trauma patients;8 CT scan has a high accuracy reaching about 95%. It has a very high negative predictive value reaching almost 100%9 andCT was done as native andcontrast andaccording to the type of injury. Despite that, patients with suspected abdominal injury should be admitted for at least 24 hours in the hospital for observation even with a negative CT scan result. Follow up CT scan is useful to help making clinical decisions when adopting a conservative approach. It allows adequate assessment of retroperitoneal structures. This is a major advantage over the other modalities. Furthermore, it allows the assessment of blood perfusion of different organs Helical CT scan sagittal and coronal reconstruction images are useful for detecting ruptured diaphragm.

Moreover, it seems to improve the diagnosis of gastrointestinal injuries [11-13]

Material and Method

A three hundred twenty six with blunt abdominal trauma were studied from july 2009-2011 these included 214 male 112 female (patient age range 12-85 years old on admission to the emergency department all are seen by surgeon . most of the cases are due MVA ; falls from height ; football playing .

All sonography done for them by Phillips medical system HD3 model ; the radiologist interpreted the results in the emergency department with 30 mint to 2 hrs of calling the senior radiologist; each us examination is completed within 10min. Focused abdominal US is an examination of the abdomen for free fluid (blood) in the perihepatic area (which includes the Morrison pouch), perisplenic region (which includes the splenorenal recess), paracolic gutters, and cul-de-sac. The urinary bladder was filled with saline before or during scanning to allow visualization of the cul-de-sac. Solid organs (the liver and spleen) were not specifically evaluated for evidence of injury.

Abdominopelvic CT extended from the lower chest to the symphysis pubis. Spiral CT (CT/ High Speed multi detector ;phillips Medical Systems) was performed with 10-mm collimation and a table speed of 10 mm/sec (pitch of 1).

Patients who had positive US findings who were found to have true-positive CT findings of fluid were admitted for further treatment and theother are had follow up for at least 24-48 hrs then discharge and follow up on different time on hospital

Majority of patient which go to the CT scan after sonography are haemodynamicaly unstable and ultrasound finding positive

Results

The 326 patient underwent sonography in the emergency department andconfirm by CT scan examination; where 22 true positive from the 326 those are of different intra abdominal injuries like haemoperitonium; solid organ injury; mesenteric injury ..etc.

292 true negative from the total 326 and two are false positive and10 false negative **(table 1)**; we doubt that sonography will be limited or unable to show certain types of injuries. Of those who are provide positive finding; 15 patient had (46.8%) splenic injury ; 3 patient (9.4%) had hepatic injury ; 6 patient (18.8%)had hepatic and splenic injuries; 3 patient (9.4%) renal injuries; 3 patient (9.4%) had bowel and visceral injuries **(table 2)**.

Sensitivity of us are of 69%; specifity of 99%; diagnostic accuracy is 96%.

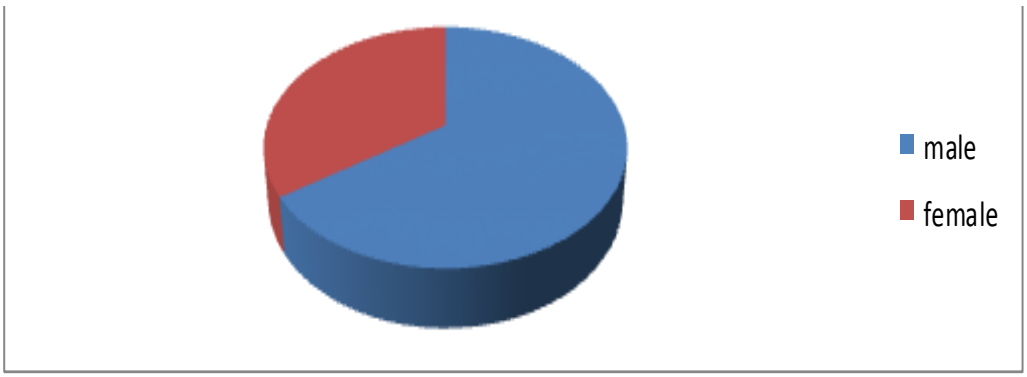

Figure 1 Sex distribution of patients

Table 1 Validity of ultrasonography in comparism with CT scan.

Number of patient (Total n= 326)	Validity of us in comparism with CT scan
292	True negative
22	True positive
2	False positive
10	False negative

We must know in every patient is positive by CT scan in proved by surgical theater or clinical follow up

Table 2: Type of injury.

Type of injury	Patient with true positive finding	percent from the total positive finding
Splenic injury	15	46.8%
Hepatic injury	3	9.4%
Hepaticandsplenic injury	6	18.8%
Renal injury	3	9.4%
Bowelsandmesenteric injury	5	15.6%

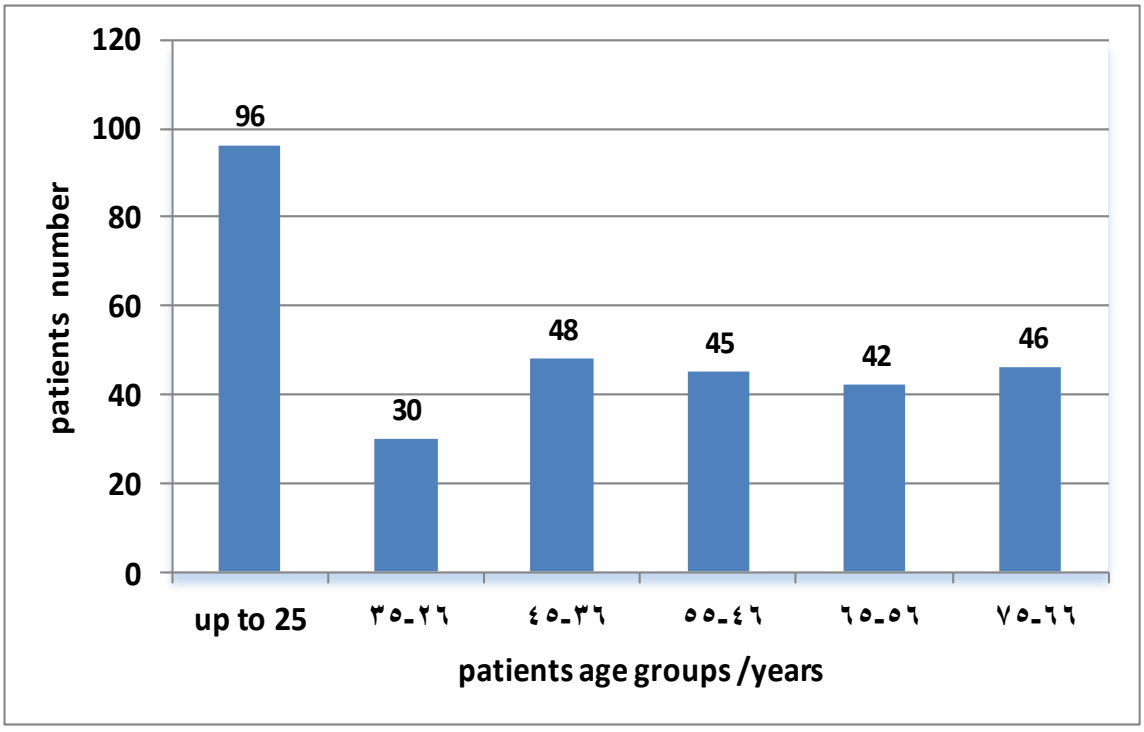

Figure 2 Age distribution of patients

Figure 3 haemoperitonium in pelvic region

Figure 4 Peri splenic haemoperitonium

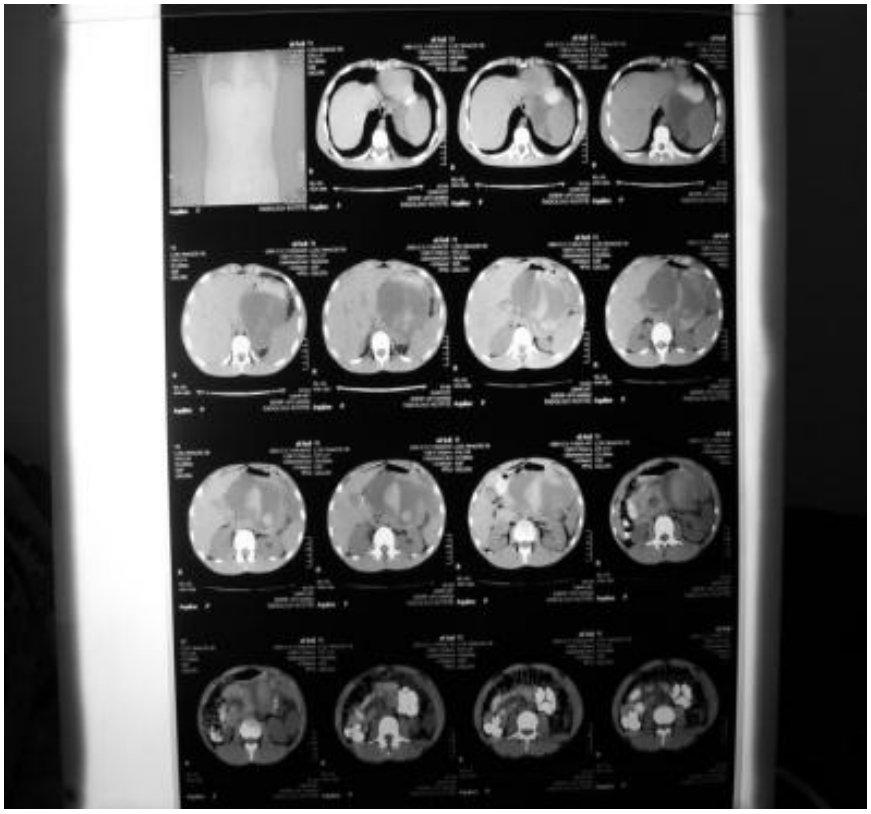

Fig 5 Lesser sac haematoma

Figure 6 Peri splenic hemoiperitonium with splenic injury

Figure 7 laceration of liver.

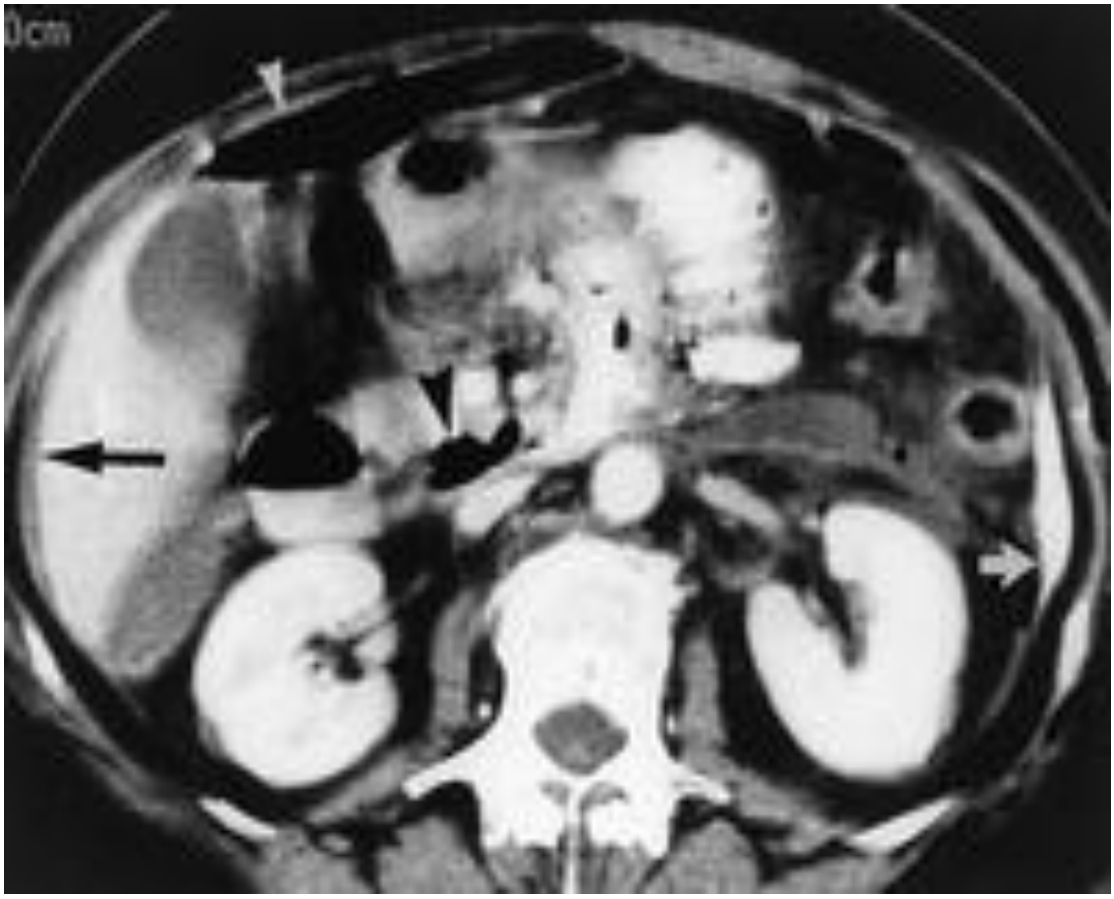

Figure 8 Haemoperitonium in Morrison pouch.

Discussion

The accuracy of the clinical diagnosis of blunt abdominal injury varies between 47% and 87% [14,15]. Physical findings may be unreliable because of decreased patient consciousness, neurologic deficits, medications, or other associated injuries [16].

Our research is compatible with several research showed that sensitivity of US range from 63%-100% [17,6,19,20]; examination of blunt abdominal trauma show sensitivity 84%, specificity of 88%, accuracy 86% by sonography [8].

The false negative that occure in our study related to pit falls that occur with sonography scan as our examination where done without fulled bladder ; as free fluid often be missed [21], examination before putting Foleys catheter decrease our false negative or beside refilled bladder before sonographic examination ;and another reasons are either to the type of equipment situation of sonography examination or hand depenedent or just related to sonographic ability in diagnosis [21, 22, 23, 7, 8, 12]. we doubt that sonography will be limited or unable to show certain types of injuries.andthe false negative cases that admits to emergency department are suffer of sever pain with major injury with their condition are more suspicious that is unstable and their colique suffer of magor abdominal injury and their condition very irritable and didn't cooperate with radiologidt beside empty bladder so decide after ultrasound to go to CT scan: These are not restricted but include spinal and pelvic fractures, diaphragmatic ruptures[25], vascular injuries [12], pancreatic injuries[26], adrenal injuries and some bowel and mesenteric injuries [27]

We advocate the use of sonography as the initial screening examination but think that CT should remain the definitive imaging modality, especially for hemodynamically stable patients [6,12] We have found sonography to be very useful for the triage of unstable patients with appreciable free fluid in the abdomen but would agree that CT still should be used for those stable patients who have undergone sonography and in whom there is suggestion of an intra-abdominal injury (IAI).

CT scan has the negative predictive value reaching 100% [9]; the sensitivity ; andaccuracy andspecifity of multi detector CT scan in identifyng patient with blunt abdominal trauma andintra abdominal injury and bleeding reaching 100% [28]; thats why used it as the definite diagnostic method in blunt abdominal trauma

In conclusion; the sonography is an efficient and accurate method for evaluation of blunt abdominal trauma;andit can be used to reduce the dependence on CT scan as the final diagnostic equipment and to some extent elevate the need of emergency CT scan as the definite examination to confirm any suspicious finding by ultrasound

Conclusions

1-sonography is of great helpand beneficial in intial assasment of patient with blunt abdominal trauma in another way US exhibited a satisfactory overall ability to distinguish negative from positive patients

2-CT scan isthe definite diagnostic method for patient with blunt abdominal trauma

3-for all resident in emergency department they must avoid any pit falls occur with US as examination with empty bladder

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