

Role of Computerized Tomography Scan in clinically suspected renal trauma

تقييم دور المفراس الحزوني في حالات اشتباه إصابات الكليتين عند الحوادث مقارنة بفحوصات السونار

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الخلاصة:

مقدمة: تعد حالات اصابات الكليتين من أكثر اصابات الجهاز البولي شيوعا وتحدث بنسبة ٨-١٠% من الإصابات المخترقة و العمياء.

الهدف من الدراسة: معرفة الدور الحقيقي الذي يلعبه جهاز المفراس الحزوني ابتداءا في تشخيص هكذا حالات مرضية.

طريقة العمل: دراسة استطلاعية أجريت في مستشفى مدينة الصدر الطبية/ دائرة صحة محافظة النجف الاشرف لمدة سنة كاملة بين شهري تشرين الأول ٢٠٠٩ و تشرين الأول ٢٠١٠ تناولت ٥٣ مريضا كانوا قد تعرضوا لحوادث إصابة عمياء للبطن وادخلوا وحدات الطوارئ واشتبه بوجود إصابات للكلى وعلى أثرها تمت إحالتهم إلى وحدة الأشعة التشخيصية و السونار لتقييم الضرر الذي تعرضت له الكليتين جراء الحادث. تم فحص المرضى بواسطة جهاز السونار ثم خضعوا لفحوصات المفراس الحزوني للبطن استنادا إلى مجموعة علامات سريرية وشعاعية توفرت في المرضى المحالين للفحص بجهاز المفراس الحزوني.

النتائج: أغلب المرضى كانوا من الرجال وذو إصابات للكلى طفيفة إلى متوسطة وكانت الكلى اليمنى أكثر عرضة للإصابة من الكلى اليسرى في نتائج الدراسة، كما تبين إن الفحص بجهاز المفراس الحزوني أكثر دقة (١٠٠%) مقارنة بالفحص بجهاز السونار الذي اقتصر تشخيصه على (٨٥%) فقط من الحالات الموجبة وجاءت نتائج السونار خاطئة في التشخيص بنسبة (١٤,٣%). كما وتبين من نتائج الدراسة أن نسبة حصول استسقاء الجوف البطني في حالات إصابات الكلى العمياء ضعيفة نسبيا (١٤,٣%) ولا تعتمد كمؤشر لشدة الإصابة.

Abstract

introduction: Renal trauma is the most common urologic trauma and occurs in 8-10% of patients with significant blunt or penetrating abdominal trauma

Aim of study: Is to evaluate role of CT scan as an initial investigation in clinically suspected blunt renal injuries.

patient and method: A prospective study was carried out in Al-Sadir medical city in Al-Najaf Al-Ashraf health directorate-Iraq over a period of one year from 1/10/2009 to 1/10/2010, on 53 patients with blunt abdominal trauma admitted to the casualty and referred for radiological assessment, all cases were examined by a specialized radiologist by US then underwent CT examination on basis of selection according to clinical criteria.

Results: It showed majority of blunt trauma cases were young adults male, all cases due to RTAs, most of renal injuries are minor injuries; Right kidney was more vulnerable to trauma than left kidney. No contrast reaction was noticed among the patients, normal CT scan effectively exclude renal injury, no cases were missed, in comparison to U/S which is positive in 85% of cases and falsely negative in 14.3%.

Blunt renal injuries were rarely associated with free fluid (only 14.3%).

Introduction

Renal trauma is the most common urologic trauma and occurs in 8-10% of patients with significant blunt or penetrating abdominal trauma. Most of the renal trauma is from blunt injuries (80-90%). Serious renal injuries are frequently associated with injuries to

other organs. Multiorgan involvement occurs in 80% of patients with serious penetrating trauma and in 75% of those with blunt trauma. A kidney with preexisting abnormality is at increased risk for injury. About 95% of isolated renal injuries are minor and are managed conservatively (1).

Kidney is the third most common organ involved in blunt trauma after spleen & liver, it is the most common injured organ in children (2).

Radiologists serve an integral role in the multidisciplinary approach to achieve the goal of renal injury assessment, playing a large part in the diagnosis and staging of injuries (3).

Trauma causes an estimated 10% of worldwide deaths and is the third commonest cause of death after malignancy and vascular disease. Trauma is the leading cause of death in the first four decades of life (1-44 years) (4).

Most significant renal injuries (95%) manifest with hematuria, with gross hematuria generally being associated with more severe renal trauma. Only 0.1%–0.5% of hemodynamically stable patients who present with microscopic hematuria has significant urinary tract injuries; therefore, microscopic hematuria is not itself an absolute indication for renal imaging. Moreover, it is now widely accepted that no significant urinary tract injury occurs in the absence of gross hematuria and shock in an adult patient. On the other hand, hematuria may be absent when ureteral tear, vascular pedicle injury, or ureteropelvic junction avulsion occurs (5).

Universally accepted indications for renal imaging in blunt trauma include: Gross hematuria, Microscopic hematuria and hypotension (systolic blood pressure <90 mm Hg) or other associated injuries requiring CT evaluation, beside a Blunt trauma with other injuries known to be associated with renal injury (6).

Computed tomography (CT) is the modality of choice in the evaluation of blunt renal injury (11).

Aim of study: Is to evaluate role of CT scan as an initial investigation in clinically suspected blunt renal injuries.

Patient and method

This prospective study performed about one year from first of October 2009 to first of October 2010, data collection depend on cases of blunt trauma admitted to the casualty of Al-Sadir medical city in Al-Najaf health directorate in Iraq.

All cases were examined by a specialized radiologist, the total number of cases collected with blunt trauma during this period 53 case, 12 cases (22.6%) out of 53 case with blunt trauma underwent CT examination depend on clinical criteria (Indication for CT imaging in patients with blunt trauma) and according to the results of CT scan about 7 cases out of 12 (58.3%) cases confirmed to had renal injury, i.e. 13.2% from the total number of blunt trauma patients.

Patients with positive results for renal injury classified according to age, gender, cause of blunt trauma, the side involved, then we classify renal injury according to Fedrle Classification and grading system AAST (American Association of Surgery for Trauma) for the reason that, the type of management depend on the grade of injury.

All patients (53) with blunt abdominal trauma were examined by u/s, then CT scan was done for selected patients according to the clinical indication, CT scan available in Radiology Department is somatofom 4 plus from Siemens, we did native scan then we administer (50 ml) of intravenous contrast agent (omnipaque) which is iodinated low osmolar contrast medium for an adult patient about 1 to 2 ml/kg we do two scans

immediately after injection and delayed scan after 5 to 10 minute , no contrast hypersensitivity observed in our patients.

Results:

Most of patients in this study were young age, followed by School age and young adults and no cases above 45 years old. Majority of patients (85.7%) were male and about 100% of cases with blunt renal injury the cause of trauma were Road Traffic Accidents (RTAs)as shown in (table 3.1).

Table 3.1: Distribution of patients with blunt renal trauma according to age, gender , cause of trauma, side of trauma.

Variable	No	%
1. Age		
5 – 14.9	2	28.6%
15- 24.9	4	57.1%
25-45	1	14.3%
2. Gender		
Male	6	85.7
Female	1	14.3
3.Cause of trauma		
RTA	7	100%
Others	0	
4.Side		
Right kidney	5	71.4
Left kidney	2	28.6
TOTAL	7	100%

In regard to the clinical presentation, it was found that 42% of cases with blunt renal injury were presented by flank contusion. Microscopic hematuria alone is not an absolute indication for renal imaging that is accompanied by hypotension which constitute 28.5% of cases, other indications include: hemodynamically unstable and any child with suspected renal injury regardless the blood pressure or degree of hematuria which constitute 14.3% of cases for each as shown in (table 3.2).

Table 3.2: Distribution of patients with blunt renal trauma according to clinical indication for renal imaging by CT.

Indication of referral for renal imaging	No.	%
1.microscopic hematuria with hypotension	2	28.57
2.Flank contusion	2	28.57
3.Flank contusion+ microscopic hematuria	1	14.3
3.hemodynamically unstable .systolic B.P below 90 mm Hg	1	14.3
4. stable child with microscopic hematuria	1	14.3
TOTAL	7	100

Patient with blunt renal injury in this study had been distributed according to the findings into: hypoechoic parenchymal lesion seen in 57% of cases, the main indication of US in blunt trauma is to detect free fluid (hemoperitoneum), free fluid seen in 14.3% of cases, US was negative in 14.3%, heterogeneous mass seen in 14.3% as shown in (table 3.3).

Table 3.3: Distribution of ultrasound findings among patients with blunt renal trauma

US Findings	No.	%
1.Hypoechoic lesion (parenchymal injury)	4	57.1
2.Free fluid + hypo echoic area	1	14.3
3.Heterogenous mass occupying the renal area	1	14.3
4.NO findings	1	14.3
TOTAL	7	100

While patient distribution of CT findings among patients with blunt renal trauma revealed; 28.5 % of cases to had laceration less than 1 cm not reaching the pelvicalyceal system, no urinary extravagation, contusion (small hypo dense area within the renal parenchyma) seen in 14.3% of cases and subcapsular hematoma seen in 14.3%, both contusion or subcapsular hematoma regarded as grade 1.

Laceration of 3 cm length reaching the pelvicalyceal system associated with urinary extravagation and perinephric hematoma seen in 14.3% of cases which is regarded as grade 4 renal injury , 2cm laceration either no urinary extravagation seen in 14.3% which regarded as grade 3 renal injury , multiple renal fragments (shattered kidney) no renal parenchymal enhancement which is grade 5 renal injury also seen in 14.3% of cases as shown in (table 3.4).

Table 3.4: Distribution of CT findings in patients with blunt renal trauma

CT Findings	Grade AAST	No.	%
.contusion	1	1	14.3
. subcapsular hematoma +free fluid	1	1	14.3
.Laceration less than 1cm not reaching the PCS	2	2	28.5
.Laceration 3cm with large perinephric hematoma, PUJ avulsion	3	1	14.3
.Laceration 2cm, no urinary extravagation	4	1	14.3
.Shattered kidney	5	1	14.3
TOTAL		7	100

In our series of cases, the radiological classification of blunt renal injuries according to Michael Fedrle was: 71% of cases were belonging to category (1): minor injury. Category (3) and (4) represent 14.3% for each this mean that majority of renal injury were minor (75-85%) as shown in (table 3.5).

Table 3.5: Radiological classification of blunt renal injuries according to Michael Fedrle

Category	No.	%
1	5	71.4
2	0	0
3	1	14.3
4	1	14.3
TOTAL	7	100

On comparing the result of US and CT in detection of renal injuries; In this study 100% of cases of blunt renal trauma was diagnosed by CT, while 85.7% of cases were positive by US, 14.3% of cases were negative by US (False negative) as shown in (table 3.6).

Table 3.6: Comparison between US and CT in detection of blunt renal injury among the positive cases.

Test	POSITIVE	%	Negative	%	TOTAL
US	6	85.7	1	14.3	7
CT	7	100	0	0	7

Discussion:

The prevalence of blunt renal injury seen in 13.2% of all blunt abdominal trauma cases attending the casualty of Alsadir medical city which is agreed with what is known that renal trauma occurs in 10-15 % of significant blunt abdominal trauma .(18)

Topographically speaking, most of our patients were young age, followed by school age and young adults and no cases above 45 years old. Majority of patients (85.7%) were male this reflect nature of our society in which the young male age group are usually work outdoor, consequently they are at increased risk of exposure to blunt trauma.

About 100% of cases with blunt renal injury the cause of trauma were Road Traffic Accidents (RTAs), this may explained by the overcrowding and increased number of cars, bad drivers and improper pavement of roads. This is compatible with what is known internationally in which RTAs was the most common cause of blunt renal trauma, In USA blunt trauma affect mainly young adults, no sex predilection.(3)

Right kidney was injured in 71.4% of cases while Left kidney was injured in 28.6%., this is due to the fact that right kidney is more vulnerable for trauma because in most cases, the right kidney is displaced somewhat more inferiorly than the left by the right lobe of the liver. This exposes more of the right kidney, making it additionally vulnerable to injury. (3)

Fortunately no contrast hypersensitivity occurs in all patients.

In regard to the distribution of CT findings among our patients with blunt renal trauma using renal injury scale according to American Association of Surgery of Trauma (AAST), the results of study were disagree with well known results in which grade 1 and grade 2 constitute 28.5% for each, i.e. both grades constitute 57% of cases, in comparison to the fact that grade 1 and 2 renal injuries are the most common type (90%) (11). Grade 1 alone constitute 75 -85% , grade 2 was 6% , grades 3 , 4 , and 5 seen in 14.3% of cases which is higher than what is known grade 3 seen in 3-7 %,(1,9).

both grade 4 and 5 form 5% of renal injury .this occurs probably because of small sample size , minor trauma may not send for assessment, CT scan is not available for emergency abdominal imaging, our surgeons were not familiar with CT , mostly they depend upon clinical features and US examination . In developed countries CT scanners available in the emergency department of hospitals while in our hospitals we lacks this facility.

In our case series, 100% of cases of blunt renal trauma diagnosed by CT, while 85.7% of cases were positive by US , 14.3% of cases were negative by US (False negative) ,several studies have reported the sensitivity of US for the detection of renal lesions to be as low as 22% (11).

Conclusion:

Contrast enhanced CT is the imaging modality of choice in the evaluation of blunt renal trauma.

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