

Research Article

Evaluation of Renal Trauma and its Treatment Options Using Multislice Ct: Prospective Study

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Abstract

Background: Renal injury occurs in approximately 1% to 2% of all traumas and can be classified as blunt or penetrating according to the mechanism. Blunt injuries are usually secondary to high-energy collisions such as motor vehicle accidents (MVA), falls from a height, and contact sports, although significant injuries have been reported following trivial trauma in structurally abnormal kidneys. Penetrating injuries are less common such as stabbings and gunshot wounds. In the management of renal trauma, surgical exploration inevitably leads to nephrectomy in all but a few specialized centers. With current management options, the majority of hemodynamically stable patients with renal injuries can be successfully managed nonoperatively. Improved radiographic techniques such as Multislice CT and the development of a validated renal injury scoring system have led to improved staging of injury severity that is relatively easy to monitor. The aim of this study is to evaluate the role of multislice CT in early diagnosis and selection of best treatment option for each type and grade of renal trauma. **Methods:** prospective study at El-Minia University Hospital included 20 haemodynamically stable patients with suspected renal trauma subjected to full history, clinical examination, necessary laboratory investigations and radiological assessment with focused assessment with sonography for trauma (FAST) and mainly Multislice CT (MSCT). Patients were classified according to the results of MSCT in respect to American Association for the Surgery of Trauma (AAST) organ injury grading scale and treated accordingly. **Results:** Blunt trauma (80) cases were more common than penetrating trauma (20) cases, with MVA being the most common mode of blunt renal trauma followed in order of frequency by paedestrian struck, assault, fall from height, work and sports injury. Stab and gunshot wounds were of same frequency 2 cases each (10%). Ct findings in blunt trauma cases (80), were: 11 cases were grade I, 14 cases were grade II, 14 cases were grade III, 14 cases were grade IV and 7 cases were grade V. In penetrating trauma cases (20), 13 cases were grade I, 4 cases were grade II and 3 cases were grade III. From a total of 80 cases of blunt renal trauma 14 cases were treated conservatively, 4 cases underwent total nephrectomy, 14 cases underwent partial nephrectomy and 14 cases underwent renal repair. From a total of 20 cases of penetrating renal trauma, 13 cases were treated conservatively, 13 cases underwent total nephrectomy, 1 case underwent partial nephrectomy, and 14 cases underwent renal repair. **Conclusion:** Evaluation and management of renal trauma have undergone significant changes during the past decade. The liberal use of computed tomographic evaluation in blunt and penetrating trauma has improved the diagnosis and grading of the severity of kidney injuries. MSCT is a useful tool for the evaluation of renal trauma especially in the detection of grades of injuries and retroperitoneal haematoma. However, final decision should be based on clinical assessment rather than radiological findings

Key words: Renal Trauma, Multislice Ct

Introduction

Trauma is a leading cause of morbidity and mortality all over the world. Blunt abdo-

minal trauma accounts for more abdominal injuries than the less frequent penetrating injuries, Urinary tract injuries occur in 3%–

10% of all abdominal trauma patients, the kidney being the most commonly injured organ. The vast majority (80%-90%) of cases are secondary to blunt abdominal trauma. The most significant renal trauma is associated with injury to other major organs. On the other hand, up to 90%-98% of isolated renal injuries are considered minor injuries and are managed non-surgically because they usually heal spontaneously without complications.

The use of computed tomography (CT) in evaluation of abdominal trauma has influenced the current trends in the management of solid organ injuries towards non-operative managements. Even though the decision for operative intervention is usually based on clinical criteria rather than on imaging findings, CT information frequently increases the diagnostic confidence of the surgeons and influences clinical management decision and plays an important role in decreasing the rates of unnecessary exploratory laparotomy.

Patients and Methods

Study Design: Prospective study.

Source of Data: All patients clinically suspect edofhav ingren altrama (RT) and advised toundergo CT scan abdomenat Minia University Hospital **Sample Size:** The study comprised a total of 20 patients (10 males and 10 females) that were clinically suspected of having renal trauma (RT).

Duration: Two years, from May 2011 to May 2013

Inclusion Criteria: Our inclusion criteria were patients clinically suspected of having renal trauma and advised to undergo CT scan abdomen with I.V. contrast, and all were hemo dynamically stable.

Exclusion Criteria: Our exclusion criteria were, severely shocked patients who couldn't be transported to CT unit, patients with serum creatinine levels greater than 1.0mg/dl, patients with well known allergies to iodinated contrast agents, and patients not giving consent.

Primary assessment in emergency room involved: Full history taking- All patients underwent completes physical examination General assessment, Emergency laboratory investigations.

Urological assessment included:

A- Rapid revision of emergency room data: Personal history and clinical presentation

B- Detailed history of trauma: including type of trauma and exact mode of injury

C- Clinical findings: Conscious state, Hemodynamic stability, Indwelling Foleys urethral catheterization were applied for all patients Associated abdominal injuries and associated external genital injuries

D- Radiological assessment: focused assessment with sonography (fast) multi-detector ct (mdct) with grading of renal injury according to the American association for the surgery of trauma, organ injury score (AAST) Treatment Options

A- Conservative Treatment:

Conservative treatment was performed in 32 patients,

B- Operative Treatment (Renal Exploration): was performed in remaining 11 cases with trans abdominal, trans peritoneal approach, with exploration of all intra-abdominal organs.

We covert patients from conservative ttt. to renal exploration in case of: Persistent renal bleeding, expanding perirenal haematoma, pulsatile perirenal haema-toma and sometimes in other cases like: urine extra vasation, nonviable renal tissue, delayed diagnosis of arterial injuries, segmental arterial injuries and incomplete staging

1- Renal Reconstruction: was performed in 11 cases. Principles: Complete renal exposure, debridement of non-viable tissue, complete haemostasis by individual suture ligation of bleeding vessel, water tight closure of pelvicaliceal system coverage or approximation of the parenchymal defect

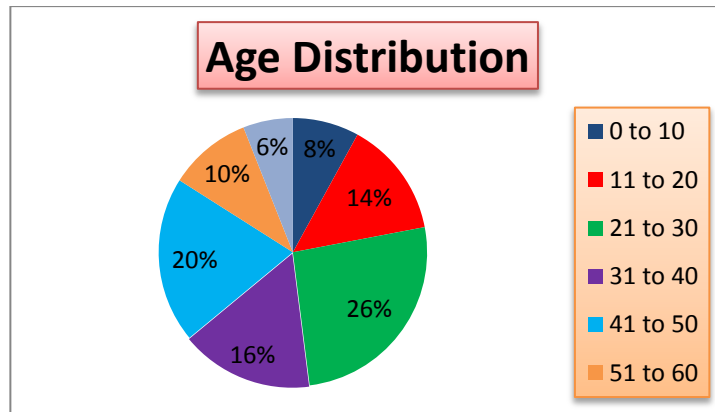
2- Partial Nephrectomy was performed in 3 Cases When a polar injury cannot be reconstructed all non-viable tissue must be removed complete haemostasis, closure of pelvicaliceal system (PCS), covering of injured part by omental flap, retro peritoneal fat or peritoneal graft

3- Nephrectomy was performed in 5 cases we did total nephrectomy in cases of: Extensive parenchymal and/or vascular injury and in intraoperative haemodynamic instability, when the life of the patient was threatened by attempting renal repair.

Results

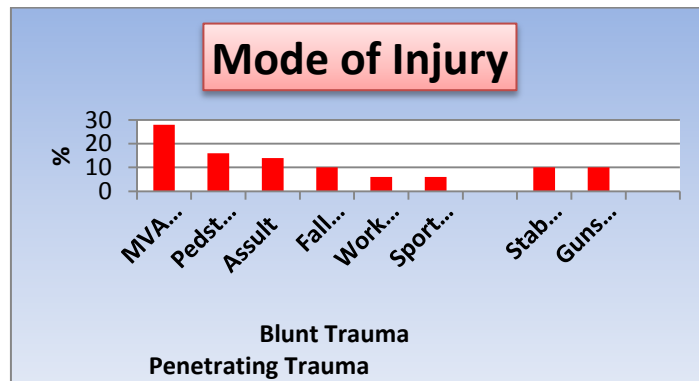
A total of fifty patients who were clinically suspected of having renal injury and

referred to Minia University Hospital included in the study.



The age range was from 6 to 60 years with an average of 40 years in male patients and 30 years in females. The maximum percentage of patients, 26% (26%) was in the age range of 21 to 30 years. This was

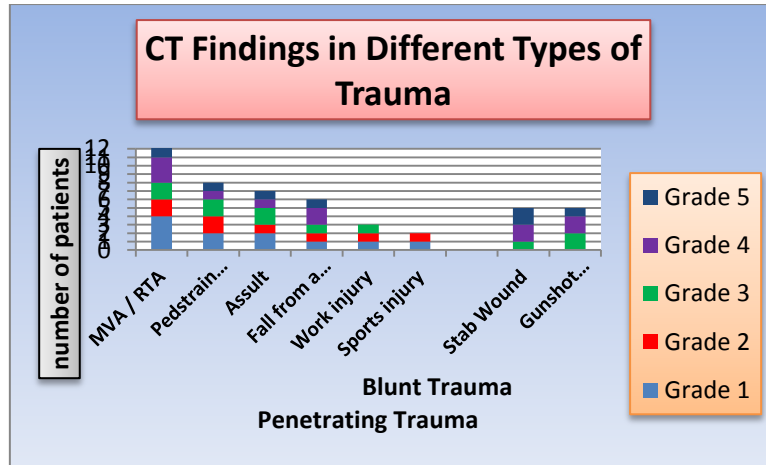
followed by 20% of patients, 16 cases in the age ranges of 41 to 50, 16% of patients, 8 cases in the age range of 31-40 and 14% of patients, 7 cases in the age range of 11-20 years.



M V A: motor vehicle accident
RTA: road trauma accident

Blunt trauma (40) cases were more common than penetrating trauma (10) cases, with M V A being the most common mode of blunt renal trauma followed in

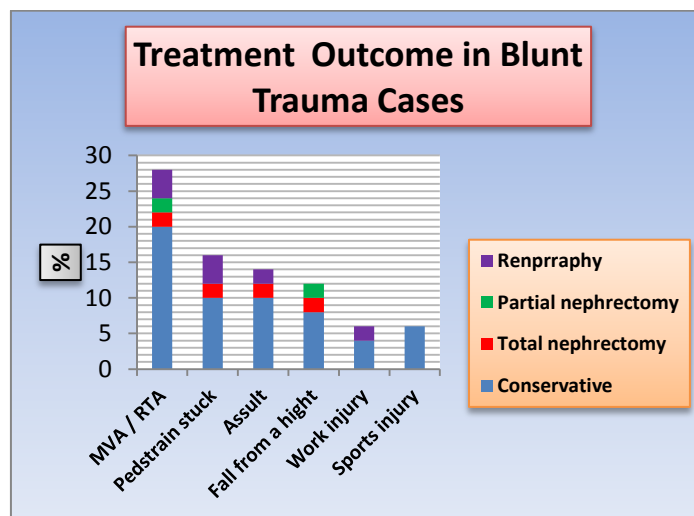
order of frequency by paedistrian struck, assault, fall from height, work and sports injury with stab and gunshot wounds were of same frequency



Ct findings in different types of trauma:
In blunt trauma cases (40), 11 cases were grade 1, 4 cases were grade 2, 4 cases were grade 3, 5 cases were grade 4 and 6 cases

were grade 5.
In penetrating trauma cases (10), 3 cases were grade 3, 4 cases were grade 4 and 3 cases were grade 5

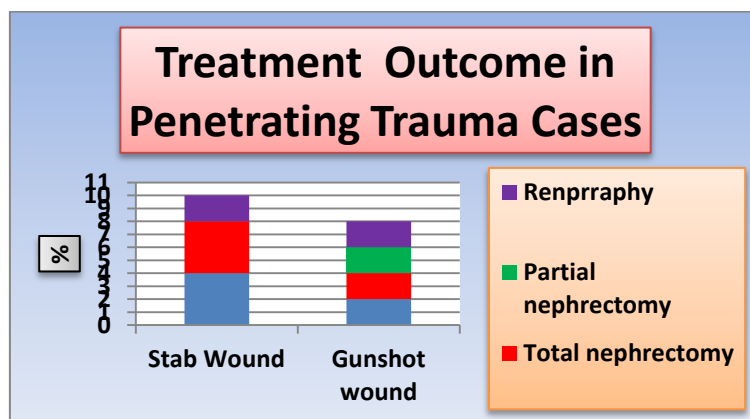
Treatment outcome in blunt trauma cases.



From a total of 40 cases of blunt renal trauma 24 cases were treated conservatively, 4 cases underwent total neph-

rectomy, 2 cases underwent partial nephrectomy and 3 cases underwent renal repair

Treatment outcome in cases of Penetrating trauma



From a total of 10 cases of penetrating renal trauma, 3 cases were treated conservatively, 3 cases underwent to alnephrectomy, 1 case underwent partial nephrectomy, and 3 cases underwent renal repair

Discussion

Renal injury from different types of trauma posed a challenge to clinicians in giving accurate diagnosis. Many of these patients were the victims of multiple injuries and the clinical signs and symptoms of the intra abdominal injury may be masked by more obvious or compelling injuries elsewhere. However, MSCT can provide a rapid and accurate appraisal of the status of the abdominal viscera, retroperitoneum and abdominal wall. The use of MSCT has influenced the current trends in the management of blunt intraabdominal injuries towards nonoperative managements.

As regard incidence of trauma in our study, forty patients (80%) in this study were suffered from closed blunt trauma distributed as follows, fourteen patients (35%) were involved in motor vehicle accidents, 4 patients (10%) in pedistrean accidents, 5 patients (12.5%) in assault trauma, 6 patients (15%) falls from heights, 3 patients (7.5%) sports injury and 3 patients (7.5%) in work injury. The other ten patients (25%) presented open trauma caused by cutting weapons in 6 patients (15%) and firing guns in other 4 patients (10%).

Blunt abdominal trauma is responsible for most closed injuries of the genitourinary organs and accounts for up to 80%-90% of all cases, with motor vehicle crashes being the most common cause while penetrating trauma accounts for approximately 10% of all renal injuries however its incidence is increasing.

Contrast Enhanced Computerized Tomography (CECT) examination was performed for all patients and they were classified according to the AAST grading system as follows: **Grade I** injury was diagnosed in 12 patients (30%), this is matched with (4) who mentioned that Grade I injuries are the most common type of renal injury (30%-40% of cases), **Grade II**: was seen in 9 patients (22.5%), **Grade III**: was seen in 9 patients (22.5%), **Grade IV**: injury included 11 patients (27.5%) **Grade V**: Grade V injury was diagnosed in nine patients (22.5%).

In a large series reported by, 82% of injuries were classified as grade 1, grade 2 accounted for 12%, grades 3 and 4 accounted for 4%, and vascular injuries (grades 4 and 5) for only 2% of cases. In a retrospective review includes 110 patients (111 renal units) who underwent routine early follow-up imaging during non-operative management of a blunt renal injury. The majority of these renal units (101/80%) suffered a grade I, II, or III injury. It is noteworthy that the proportion of grade I injuries was significantly smaller than other published

blunt renal trauma series (16% vs. 64% and 86%). It is probable that a significant proportion of patients with grade I renal injuries were deemed appropriate for out-patient management by the trauma surgery service, and were therefore not captured in their database.

All cases (32) 64% who were managed conservatively had uneventful recovery during subsequent clinical observation or follow up period.

Cornelis H. van der Vlies et al.,⁵; even though Non Operative Management (NOM) has proven to be of tremendous benefit, a couple of controversies regarding the current management of trauma patients should be discussed., advances in CT technology have improved the practitioner's ability to determine the degree of injury and to identify patients who are more likely to fail NOM. However, until now, CT scanning has not been able to differentiate, in a precise manner, between which patients should be treated conservatively, which would benefit from angioembolization and which would respond best to a surgical response.

Out of our 50 patients with positive intra-abdominal injury, 36% (18 patients) were taken for surgery of them, 9 patient's undergoe total nephrectomy, 3 patient's undergoe partial nephrectomy and the last 8 patients under go enorrhaphy. All the CT findings of hemoperitoneum and/or solid organ injury were confirmed in these cases, an additional one case of bowel injury was diagnosed. CT was 100% sensitive in detecting renal injury grade and hemoperitoneum.

Sclafanietal.,⁶ also consider CT the method of choice for renal injuries and confirm at ory angio graphy unnecessary. Lupetin et al.,⁷, using CT, diagnosed renal artery occlusion in all seven patients in their series. Lang et al.,⁸, on the other hand, found CT less reliable in the detection of trauma to the renal artery, as the diagnosis was missed on CT in five of seven patients in their series.

Of importance in our study to state that the high rate of surgical interference is the result of lake of angioembolization (AE) in our hospital, the difference will be clear when comparing our study to a study done in Level-1 trauma center of the Academic Medical Center (AMC), the Netherlands, between January 2000 and December 2009 done by Cornelis H. van der Vlies et al.,⁵ as they said: in our opinion AE is a good alternative for renal exploration in specialised centers with appropriate equipment and expertise.

Summary and conclusion

A total of 50 patients, 40 males and 10 females had MSCT abdomen for abdominal trauma 40 cases of blunt trauma and 10 cases of open trauma, with high suspicion of renal injury within this study period. Positive scan for renal injury were seen in all patients (100%). More than half of the cases, 30 cases had minor renal lesions and the remaining 20 cases had major lesions, 22 cases were treated conservatively with reasonable outcome, the remaining cases were treated surgical, in 8 cases renorrhaphy was done, total nephrectomy was done in 9 cases and partial nephrectomy was done in 3 cases with little incidence of accepted post-operative complications. Multislice computed tomography (MSCT) is the imaging modality of choice in assessing clinically stable patients with renal trauma, especially in the detection of grades of injuries and retroperitoneal haematoma. However, final decision should be based on clinical assessment rather than radiological findings. Selective nonoperative management is safe for blunt and penetrating kidney injuries. More than 90% of blunt trauma renal injuries can safely be managed nonoperatively. The safety of nonoperative management, even in severe grade IV injuries, is well documented in the literature. The introduction of nonoperative management in penetrating solid organ injuries has added a new method to our armamentarium in the treatment of kidney injuries.

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