

Incidence of Renal Injuries in Abdominal Trauma at Al-Kindi Teaching Hospital

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Abstract

Background : The kidneys may be injured in abdominal trauma, both blunt & penetrating. Renal trauma may manifest in a dramatic fashion for both the patient and the clinician.

Objectives: To evaluate the incidence, management, morbidity & mortality of renal injury in blunt & penetrating abdominal trauma.

Methods: A retrospective study includes 45 patients sustaining renal injury. These trauma patients were admitted to the casualty department in Al-Kindi Teaching Hospital during the period between 1st June 2006 – 31st May 2007. The patients were analyzed regarding their age, sex, mechanism of injury & grade of injury according to Organ Injury Scaling (OIS) classification of the American Association for the Surgery of Trauma (AAST). Management, morbidity & mortality were also noticed.

Results: The majority of patients were males (35= 77.8%), the rest were females (10= 22.2%). The average age was 37 years (range= 18-56 years). The

most common grades were grade1, grade2 and grade3 (40=88.9%), while 5 patients (11.1%) were grades 4 and 5. The most common associated injuries were liver, spleen, small & large bowels and diaphragm. The mortality was 20% (9 patients). The most common cause of death was multiple organ injuries in 2 patients (4.4%), kidney with injury of a second organ in 6 patients (13.3%), while delayed surgery was the cause in 1 patient (2.2%), while the most common cause of morbidity was wound infection in 5(11.1%) and wound dehiscence in 2 patients (4.4%), a total morbidity is of 7 patients (15.5%).

Conclusion: Renal injuries are not uncommon injuries, but they are less common than other intraabdominal organs e.g. liver, spleen and bowel. Injury grading using the OIS system (liver, spleen and kidney) of AAST is a useful tool for comparison and to evaluate management according to injury grade.

Keywords: Renal Injury, abdominal trauma, blunt trauma, penetrating trauma.

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Introduction

The incidence of renal trauma somewhat depends on the patient population being considered. Renal trauma accounts for approximately 3% of all trauma admissions and as many as 10% of patients who sustain abdominal trauma¹. Kidneys are retroperitoneal organs, although they are less prone to injury than other intra-abdominal organs, such as liver, spleen or bowel, they can be injured by penetrating or blunt trauma⁽²⁻³⁾. Also, renal trauma may occur in settings other than those thought of as a classic trauma setting. Renal injuries may be generally divided into 3 groups: renal laceration, renal contusion, and renal vascular injury^(1,4). The renal injury can be solitary or associated with other abdominal organ injury e.g., liver, spleen and /or bowel. All types of renal trauma require a high index of clinical awareness and prompt evaluation and management. The mechanism of injury should alert the clinician to the possibility of renal trauma. The most common clinical presentations of renal injury were loin pain with renal angle tenderness and ecchymoses, haematuria and abdominal pain/tenderness syndrome if there were associated organ injuries. Diagnosis was made by ultrasonography, computed tomography (CT)

Scanning. CT is the primary tool for staging all injuries to the abdomen^(5, 6). Renal injuries are graded by the American Association for the Surgery of Trauma (AAST) on the basis of the depth of injury and the involvement of vessels or the collecting system as follows⁽⁷⁾. (Table 1).

The diagnosis depends on clinical suspicion, then patients were subjected to examination by ultrasonography and / or CT scanning^(5,6). Patients were treated either conservatively or by explorative laparotomy.

Methods

A retrospective study of all patients who sustained renal injury. These trauma patients were admitted to casualty department in Al-Kindi teaching hospital during the period between 1st June 2006 – 31st May 2007. The patients were analyzed regarding their age, sex, mechanism of injury & grade of injury according to Organ Injury Scaling (OIS) classification of the American Association for the Surgery of Trauma (AAST)⁽⁷⁾. (Table1). Management, morbidity & mortality were also noticed.

Patients were resuscitated in the casualty department according to principles of Advanced Trauma Life Support (ATLS), following the

system of primary & secondary survey, since most, if not all, casualty staff were trained ATLS principles. Rapid lives saving measures with assessment of vital signs were done. Intravenous (I. V.) line(s) with empirical therapy were instituted. Blood was taken for cross-match. With high index of suspicion of renal injury, patients were subjected to diagnostic modalities. These were Ultrasonography (US) & Computed Tomography (CT) scanning. In seriously injured patients with continuous hypotension, patients were first resuscitated & then immediately sent to the theatre for exploration of the abdomen. Exploration was by upper midline incision which was extended up or low down if needed. Rapid survey of abdominal viscera was performed to discover the site of the injury & any associated injuries. Definitive management depended on the injured organ. All patients in our series had sustained renal injury with different degree of severity, with or without associated abdominal organ injuries. Surgical procedures performed depended on the severity of the renal injury. The most common procedures were renorrhaphy, partial nephrectomy & nephrectomy. Patients were followed up in the postoperative period using a follow-up chart which recorded vital signs, in & out fluid balance.

Results

In forty five patients who were admitted to the casualty department in Al-Kindi teaching hospital during the period between 1st June 2006 – 31st May 2007 and who proved to have renal injury by investigations (US and CT Scanning in stable patients) or at the time of abdominal exploration, there were 35 males (77.8%) and 10 females(22.2%). The average age was 37 years (range= 18-56 years). Most of the patients were in their fourth decades followed by the third decade (Table2). The most common grades were grade1, grade2 and grade3 (40=88.9%), while 5 patients (11.1%) were grades 4 and 5 (Table 3).

The most common associated injuries were liver in 2 patients (4.4%), spleen in 2 patients (4.4%), bowels in 1 patient (2.2%) and diaphragm in 1 patient (2.2%), and 2 (4.4%) patients sustained injury to multiple organs (kidney, liver and spleen). Table 4

The mortality rate was 20% (9 patients). The morbidity rate was 15.6%] (7 patients). The most common cause of death was multiple organ injuries in 2 patients (4.4%), kidney with injury of a second organ in 6 patients (13.3%), while

delayed surgery was the cause in 1 patient (2.2%), while the most common cause of morbidity was wound infection in 5(11.1%) and wound dehiscence in 2 patients (4.4%). The deaths according to grade of injury are shown in table 5.

Discussion

We have 45 patients out of a total of 540 patients sustain abdominal trauma. This accounts for a percentage of (8.3%). This result is similar to the reported percent of renal injury in abdominal trauma which is 3% - 10% as reported by Schwartz ⁽¹⁾. In some series the percentage of renal trauma is 1.2% ⁽⁷⁾. The most common mechanism of injury in our patients was penetrating injury. This may be due to the fact that most of the injured patients were the victims of terrorism. Most of the victims were young in the 3rd & 4th decades of life. These results match that of other studies (Schwartz ¹, van der Vlies et al ⁴ and AAST ⁷. Although (US & CT) are useful tools for diagnosis, laparotomy is the final way for evaluation of renal injury grade^{5, 6, 8-10}. The grading system of AAST was used for evaluation of trauma severity (AAST 2006)⁷. Most of the patients in our series are young males, since this group is most vulnerable to accidents, such as road traffic or explosions which are usual in most studies. As in other studies ^{1, 3-6}, most of the renal injuries are those in grades 1, 2 &3, while grades 4 &5 are less common (Schwartz ¹, Peterson & Stables ³, van der Vlies et al ⁴, Smith ⁵, Schwart⁶)(Table1 & Table3).

Although resuscitation of the injured patients was done in the casualty department following the principles of (ATLS) of primary and secondary survey, morbidity (15.6%) & mortality (20%) are higher than in other studies ^(1-3, 8-12). This is may be due to the fact that most renal injuries were finally managed by junior general surgeons with little experience in renal surgery. Delayed surgery in 1 patient was the cause of death, and this might be due to a decision making problem. Others died due to multiple organ injury, which needs a well experienced senior surgeon and an efficient preoperative resuscitation.

The surgical procedures performed depend on the injury grade & severity according to (AAST) grading of renal injuries⁷ (Table1). These procedures included the following ¹³⁻¹⁷.

1. Renorrhaphy
2. Partial nephrectomy
3. Nephrectomy

The information regarding mortality, morbidity, causes of death & surgical procedures performed were all taken from patient's records.

Conclusion

We conclude that renal injuries are not uncommon. They are more severe in our community because of the mode of injuries, i.e. terrorism & explosions. A high index of suspicion of renal injury aided by (US & CT SCAN) is the key for diagnosis. In many multicenter studies a trend for conservative treatment in mild grades injuries is recommended provided that close observations with good nursing care & good surgical experience are available. So radical surgical procedures will be avoided.

We advise junior surgeons to give more attention for their medical records since these records will be in future the only source for studies. Other important issue is to transfer the records to electronic form for rapid feedback.

The most important advice is to train all casualty medical & paramedical staff the principles of (ATLS), since these will increase the competence of patient's resuscitation.

Urosurgery specialists should be consulted especially in severe forms of renal injuries.

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18. Table 1 Renal injuries grading by the American Association for the Surgery of Trauma (AAST) on the basis of the depth of injury and the involvement of vessels or the collecting system⁽⁷⁾.

| | |
|--------|--|
| Grade1 | Hematuria with normal imaging studies, contusions, nonexpanding subcapsular hematoma |
| Grade2 | Nonexpanding perinephric hematomas confined to the retroperitoneum, superficial cortical lacerations less than 1 cm in depth without collecting system injury. |
| Grade3 | Renal lacerations greater than 1 cm in depth that do not involve the collecting system. |
| Grade4 | Renal lacerations extending through the kidney into the collecting system, injuries involving the main renal artery or vein with contained hemorrhage, segmental infarctions without associated lacerations, expanding subcapsular hematomas compressing the kidney. |
| Grade5 | Shattered or devascularized kidney, ureteropelvic avulsions, complete laceration or thrombus of the main renal artery or vein. |

Table 2 - Age distribution

| Age group (year) | No. of patients | Percentage |
|------------------|-----------------|------------|
| 0 – 9 | 0 | 0% |
| 10 – 19 | 4 | 8.9% |
| 20 – 29 | 10 | 22.2% |
| 30 – 39 | 20 | 44.4% |
| 40 – 49 | 8 | 17.8% |
| 50 – 59 | 3 | 6.7% |
| Total | 45 | 100% |

Table3- No. of patients correlated to grade of renal injury

| Grade of injury | No. of patients | Percentage |
|-----------------|-----------------|------------|
| Grade1 | 10 | 22.2% |
| Grade2 | 16 | 35.6% |
| Grade3 | 11 | 24.4% |
| Grade4 | 5 | 11.1% |
| Grade5 | 3 | 6.7% |
| Total | 45 | 100% |

Table 4- Mode of associated organ injuries.

| Organ Injured | No. of patients | Percentage |
|---|-----------------|------------|
| Kidneys | 37 | 82.222% |
| Liver | 2 | 4.444% |
| Spleen | 2 | 4.444% |
| Bowel | 1 | 2.222% |
| Diaphragm | 1 | 2.222% |
| Multiple organs (liver , Spleen , kidney) | 2 | 4.444% |
| Total | 45 | 99.998% |

Table 5- Deaths according to grade & cause

| Grade of injury | No. of patient | deaths Percentage | Cause of death |
|-----------------|----------------|-------------------|-------------------------------------|
| Grade 1 | 0 | 0% | |
| Grade 2 | 1 | 2.2% | Delayed surgery |
| Grade 3 | 2 | 4.4% | Associated liver & spleen injury |
| Grade 4 | 5 | 11.1% | Liver , spleen & bowel injury |
| Grade 5 | 1 | 2.2% | Severe renal, liver & spleen injury |

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