Original Article

Management of renal injuries in blunt abdominal trauma

Parth Patel*, Dipesh Duttaroy**, Samir Kacheriwala***

*Third year Resident, **Professor, *** Associate Professor
Department of General Surgery, Medical College, Baroda, Gujarat

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ABSTRACT

Background: Renal trauma occurs in 8% to 10% of all patients with abdominal trauma & the most common organ injured in pediatrics blunt abdominal trauma. Blunt force is responsible for 70 to 80% of renal trauma.

Objectives: To identify & determine the common mode & types of injury, investigation of choice, conservative & surgical management & outcome.

Methods: An Observational Cross Sectional Combined Retrospective and Prospective study of 25 patients of blunt renal injuries was conducted during a period of 5 years from December 2008 to November 2013.

Results: Blunt renal injury is more common in young male of 11-20 years (40% patients). Road traffic accident was responsible for 64% cases. Minor & major renal injuries were found in 68% & 32% cases respectively. CT scan & USG had detected renal injuries in 88 % & 64% patients respectively. Only 2 (8%) patients of blunt renal trauma were managed surgically, both the patient had AAST Grade IV injury. All 17 (68%) patients with AAST Grade I, II & III were successfully managed conservatively with one mortality.

Conclusion: Contrast enhanced computerized tomography abdomen is the choice of investigation. Majority of patients had minor renal injuries (Grade I, II or III) with Grade V injury being the most rare and most severe renal injury.

Keywords: Blunt renal injury, USG, CECT, conservative & operative management.

INTRODUCTION

The technological advancement in automobile industry has greatly contributed to the development of the world, but it is a field where sometimes priority is given to speed over safety. Thus, motor vehicle accidents now rank fourth in order among the leading cause of death. In person less than 30 years, trauma is responsible for more deaths than all other illnesses put together. They are the commonest cause of non-penetrating abdominal trauma [1].

Renal trauma occurs in 3% of patients hospitalized for trauma and in 8 to 10% of all patients with abdominal trauma. Blunt force is responsible for 70 to 80% of renal trauma[2]. The kidneys are the most commonly injured organs following pediatric blunt abdominal trauma [3].

The Committee on Organ Injury Scaling (OIS) of AAST, in 1989, has developed a widely accepted grading scale in which renal injuries are divided in to five grades as shown in table 1 which also ensures a common consensus between surgeons and radiologists for proper management of renal injuries [4]. As for other injured organs, the AAST classification system is now the standard adopted method for radiological reporting and the classification system used in renal trauma.

Despite increasing experience in the last 20 years with the management of major renal trauma, there remains a considerable divergence of opinion, with strong proponents both of conservative and of aggressive surgical management. With improvements in radiological imaging and the ready availability of CT scan, most patients with major renal trauma can be managed expectantly. Most avoidable deaths result from failure to resuscitate and operate on surgically correctable associated injuries especially to head, thorax and extremities. New

techniques and diagnostic tools available are important in the management of blunt renal trauma.

Table 1: AAST Renal Injury Grading

Grade*	Description Of Injury
1	Contusion- Microscopic or gross hematuria, urological studies normal Hematoma- Sub capsular, nonexpanding without parenchymal Laceration
2	Hematoma -Nonexpanding perirenal hematoma confined to renal retroperitoneum Laceration -<1.0 cm parenchymal depth of renal cortex without urinary extravasation
3	Laceration ->1.0 cm parenchymal depth of renal cortex, without collecting system rupture or urinary extravasation
4	Laceration- Parenchymal laceration extending through the renal cortex, medulla, and collecting system Vascular -Main renal artery or vein injury with contained haemorrhage
5	Laceration- Completely shattered kidney Vascular- Avulsion of renal hilum which devascularizes kidney

*Advance one grade for multiple injuries to same organ

MATERIAL & METHODS

Sample size: An Observational Cross Sectional Combined Retrospective and Prospective study of 25 patients of blunt renal injuries was conducted during a period of 5 years from December 2008 to November 2013.

Data collection: Prospective data were collected from the patients by entering in a specially prepared proforma. This included the demographic data including age, sex and mode and time of accident leading to the injury, detailed clinical history, clinical examination and investigations –laboratory and radiological of all patients of blunt renal trauma who were admitted. Post-operative follow up was done to note for complications. Retrospective data was obtained from the medical records section.

Inclusion Criteria

All patients with renal injury in blunt abdominal trauma diagnosed by Ultrasonography or CT scan irrespective of age and sex are included in study.

Exclusion Criteria

Patients with renal injury due to penetrating injuries of abdomen are excluded from study.

Management: Management was divided into two types:

- Conservative management: Which includes:
  - Monitoring temperature, pulse, blood pressure
  - Monitoring abdominal girth
  - Intravenous Fluids infusion
  - Blood transfusion if necessary
  - Intravenous antibiotics
  - Serial hematocrit
  - Review sonography or CT scan
- Surgical management: Criteria For Switching Therapy From Conservative To Surgical Management:
  - Persistent increase in abdominal girth
  - Increase rigidity and guarding on per abdominal examination
  - Hemodynamic unstable patient (hypotension, tachycardia)
  - Increase requirement blood transfusion >4
  - Indications for Initial Operative Management*
  - Massive extravasation of dye on CT scan
  - Haemodynamically unstable patient
  - Hilar vascular injury
  - Shattered kidney
  - Management of associated injury was done simultaneously.

(*it includes the conditions in which patients are directly shifted to operation theatre and managed surgically without offering any initial conservative management.)

RESULTS

Blunt renal trauma occurs in all age groups. In the present study the maximum incidence of blunt renal trauma was seen in the age group of 11-20 years of age as shown in Table 2. (Mean age of occurrence being 22.76 years). A majority (92 %) were males as shown in Table 2.

Road traffic accident was the commonest mode of injury in blunt trauma 16(64%) patients and followed by fall from height in 4(16%) as shown in Table 2.

Majority of the patients presented with abdominal pain (96%) and abdominal tenderness (96%). Hematuria was present in (64%) of the patients. Flank bruise was present in (12%) of patients as shown in Table 3.

This study demonstrates lesions associated with other organs in over 70% of patients. Majority of the extra abdominal injuries include chest injuries (fractured ribs, hemopneumothorax and lung contusions) and traumatic brain injuries as shown in

Table 2: Distribution of cases according to age, sex, mode of injury, grade of injury, associated injuries, treatment & hospital stay of patients

Variables	No. of patients (%) n=25
Age (years)	
1-10	4(16)
11-20	10(40)
21-30	6(24)
31-40	3(12)
41-50	1(4)
More Than 50	1(4)
Sex	
Male	23(92)
Female	2(8)
Mode of injury	
Road traffic accident	16(64)
Fall from height	4(16)
Assault with blunt object	2(8)
Bull gore	1(4)
Sports injury	2(8)
Grade of renal injury	
Minor(Grade I,II,III)	17(68)
Major(Grade IV & V)	8(32)
Associated injuries	
Head & Neck injury	7(28)
Spine injury	1(4)
Chest injury	11(44)
Extremities&/or pelvic fracture	5(20)
No associated injury	6(24)
Treatment	
Operative	2(8)
Conservative	23(92)
No. of days of hospital stay	
1-10	11(44)
11-20	12(48)
>20	2(8)

table-2. The spleen (48%) is the commonly affected solid organ followed by liver (20%). USG did not detect any case of bowel or urinary bladder injury in association with renal injury. Out of 25 patients of blunt renal injury all underwent CECT abdomen, of them splenic injury was detected in (32%) patients and liver injury was also detected in (32%) patients. Chest injury was associated in (56%) of the patients, of them most common was rib fractures. Same as USG, CECT abdomen did not detect any case of bowel or urinary bladder injury in association with renal injury.

Minor & major renal injuries were found in 68% & 32% cases respectively as shown in Table 2.

Table 3: Comparison of Clinical Features in Different Studies

Clinical Features	In present study No. of cases (%)	Herschorn S et al[9] (1991) (%)	Garcia Ha et al[7] (2009) (%)
Abdominal Pain	24(96)	75	68
Flank/Abdominal Tenderness	24(96)	75	68
Hematuria	16(64)	68	90
Hypotension	10(40)	20	10
Flank Bruise/Contusion	3(12)	17	3

In present study, CT scan & USG had detected renal injuries in 88 % & 64% patients respectively. In 3(12%) patients, USG diagnosis of renal injury was confirmed, but CT scan shows normal kidney while in 9 patients (36%) there was no renal injury on USG findings which was positive on CT scan as shown in Table-4.

Table 4: Evaluation of Diagnostic methods

Injuries	Diagnosed on CT scan (%) n=25	Diagnosed on USG (%) n=25
Renal injuries	22	16
No renal injuries	3	9
Total	25(%)	25(%)

After a detailed clinical evaluation and suitable investigations, 23 patients (92%) were selected for non-operative management because they had no signs of peritonitis & they had hemoperitoneum without hemodynamic instability. However, 2(8%) patients required operative management as shown in Table-2.one patient with hemoperitoneum with hemodynamic instability having Grade IV injury with associated splenic injury and chest injury was operated for exploratory laparotomy with splenectomy and left side nephrectomy with intercostal chest tube insertion 7 hours after admission. Another patient having grade IV right side renal injury was operated on 20th day of admission for non-functional right lower pole of kidney and associated urinoma formation.

Mean duration of hospital stay for major & minor renal injury was 13.37 & 10.52 days respectively. Mean hospital stay for the conservative group patients was 11.34 days. Mean hospital stay for the operative group patients was 22 days. One patient

with Grade V injury was admitted and observed for 22 days as shown in table-2.

Of the 23 patients who were managed conservatively, one patient with associated splenic injury and head injury (subarachnoid hemorrhage) with Glasgow coma scale (7/10) and tracheostomy with associated left lung contusion was expired after 6 days of conservative management in intensive care unit. The death was probably because of severe associated injuries and not due to the renal injury alone.

DISCUSSION

Blunt renal trauma occurs in all age groups. In the present study the maximum incidence of blunt renal trauma was seen in the age group of 11-20 years of age (Mean age-22.76 years) & nearly 80 % of patients were from age group 10-39 years. This is probably because patient in this age group lead more active life and have more outdoor activities. Similar demographic data have been reported in other studies [5,6,7,8].

A majority of patients were males in our study which matches with other studies [5,6,8,9,10]. The incidence of abdominal trauma in male population is higher because in our country males are the bread earners of the family. However Garcia HA et al have reported a higher incidence of renal injuries in females (95.6%) [7].

Road traffic accident was the commonest mode of injury in case of blunt trauma followed by fall from height. Similar results have been published in other studies with most injuries due to road traffic accidents [2,5,7,8]. Assault due to hit or by animal also is significant mode of trauma in rural parts of the country.

Table-3 shows the comparison of clinical features of the present study with other studies and the data are comparable to similar studies in the past [7, 9]. Usually, renal injury forms part of the complex management of multi-organ trauma. Most common associated extra abdominal injury is chest injuries (fractured ribs, hemopneumothorax and lung contusions) followed by traumatic brain injuries. Liver and splenic injuries were the commonest intra-abdominal organs which were injured in association with renal trauma. Similar findings have been reported in other studies [7,11,12].

In this study minor renal injury (Grade I, II and III) accounts for 68% of all patients while major renal injury (Grade IV & V) accounts for 32%.This is comparable with other studies. [6, 8,9]

Focused Assessment with *Sonography* in Trauma (FAST) has become an initial screening tool and extension of physical examination in all patients with intra-abdominal trauma with sensitivity of 80- 90% for detecting intra-abdominal fluid but relatively insensitive for parenchymal injuries and retroperitoneal haemorrhage. CECT abdomen is the modality of choice and gold standard for evaluating renal injuries. It provides images those are easy to interpret and demonstrate findings which correlate with surgical observations. CECT forms the basis of AAST classification of renal injury. McGahan JP et al [13] have also confirmed that most other data on ultrasonographic detection of parenchymal organ injury are fairly disappointing, with sensitivities approximating 40%. This confirms the findings of other studies that CECT is a far superior diagnostic modality in the diagnosis of blunt renal trauma [5,7,14,15]. The other radiological modalities such as intravenous pyelography (IVP), MRI and angiography have limited usefulness in renal injuries. MRI may be an alternative in patients with contraindication for administration of contrast and pregnant patients.

The present study shows that conservative management is feasible even for higher Grade blunt renal injuries. At our institution the decision to treat a renal injury is primarily based on hemodynamic instability whilst considering the Grade of renal injury and the presence of concomitant injuries. In present study, conservative management was successful in all Grade I, II and III renal injuries. The management of Grade IV and V renal injuries remains controversial. In present study two patients with major renal injury were managed operatively, remaining six cases which were haemodynamically stable were managed conservatively successfully including one patient with Grade V injury. Santucci RA et al [12] reported that in 57 patients had Grade IV renal injuries, 84.2% were managed conservatively, while the remaining 15.8% of them underwent renal exploration. Similar findings have been reported in other studies [5,7,9,10].

Garcia HA et al [7] in their study have shown that the average stay in hospital for Grade IV-V trauma was 8 days while in the study by Moudouni SM et al[11] the mean hospital stay was 16.3 days for patients with Grade IV-V renal injury. The period of hospital stay may not be comparable as social customs, free medicare, literacy of the population, financial capability and availability of transport may determine the mean hospital stay over and above the actual clinical condition.

Mortality in blunt renal injury would depend on the Grade of injury, the associated injuries to the

patients, the accident-management interval time and availability of ideal investigative and management setup. Delay in management of the patient may lead to a poor outcome. Other studies have reported mortality ranging from 0% to 15% depending on the grade of injuries and other associated injuries [5,6,9,10].

CONCLUSION

In conclusion, our results shows that majority of patients belongs to young age group between 11-20 years of age with male preponderance. Road traffic accidents are the most common mode of blunt renal trauma. Patients who were initially haemodynamically stable & ultra sonographic evidence of renal injury underwent for CT scan for accurate staging of injury. Ultrasonography of the abdomen has important role in blunt renal injury in screening, triage and diagnosis of associated injuries. CT scan proves to be more effective than ultrasonography in proper staging of renal injury provided patient is vitally stable.

Multiple organs were involved in most of the cases rather than an isolated organ injury. Majority of patients had minor renal injuries (Grade I, II or III) with Grade V injury being the most rare and most severe renal injury. Conservative management is successful in all Grade I, II and III patients and majority of the patients with Grade IV and V. Patients having Grade IV or V renal injury with associated intra and/or extra abdominal injuries and those who were vitally unstable after initial period of resuscitation required exploration.

Operated patients require longer duration of hospital stay comparatively. Mortality in case of isolated renal injuries even in case of major injury seldom occurs. It depends on the haemodynamic status and status of associated injuries.

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Corresponding Author:

Dr. Parth Patel,
Street 11 Qtr 2, G.N.F.C. Township,
Narmada Nagar, Bharuch, Gujarat.
E-mail: parthpatel7@yahoo.in

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