



CLINICAL EVALUATION OF EPIDEMIOLOGY AND MANAGEMENT OF RENAL TRAUMA IN A TERTIARY CARE CENTRE

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ABSTRACT

Introduction: Of all the genitourinary organs, the kidney is the most likely to be injured in cases of external trauma and injuries to at least one kidney occurs in as many as 10% of abdominal trauma cases. Up to 80% of renal injuries are caused by blunt trauma, mostly motor vehicle accident and most significant renal injuries are associated with other major organ injuries. **Aims and Objectives:** 1. To study the epidemiology of renal injuries occurring in trauma victims admitted in a tertiary care trauma centre, to analyse the mode of trauma and pattern of renal and associated organ injury, to evaluate the outcomes of various methods of management of traumatic renal injuries, to study the complications, early and late, associated with renal trauma and to study the morbidity and mortality pattern in renal trauma victims. **Materials and Methods:** The statistical details of all trauma patients who were admitted to the emergency trauma ward and managed in the Rajiv Gandhi Govt. General Hospital, Chennai, during the period between January 2021 to August 2023 were analysed and all the patients who sustained renal trauma confirmed by investigations were included in the study. The management protocols for all patients were analysed in this study. **Conclusions:** Urological injuries are present in up to 20% of patients admitted with abdominal trauma. CT scan is the most comprehensive imaging tool to identify and characterize the renal injuries. Non operative management has proven to be successful in majority of the patients sustaining renal trauma. The need for surgical intervention seems to increase with increasing grade of renal injuries. The nephrectomy rates are high when a patient with poly trauma is explored for other concomitant organ injuries.

KEYWORDS :

INTRODUCTION

The kidney is the most commonly injured urologic organ and may be the most challenging to treat. Although most renal injuries may be treated successfully without operative intervention, it is important and yet sometimes confusing to delineate which cases should be managed with intervention and which may be observed. Up to 80% of renal injuries are caused by blunt trauma, mostly motor vehicle accident and most significant renal injuries are associated with other major organ injuries. The common teaching that blunt renal injuries may be observed and penetrating injury must be explored may be true in most cases, but in select cases this dogma can be misleading and lead to poorer outcomes. This retrospective analysis attempts to decipher the epidemiological pattern of renal injury in trauma victims (both blunt and penetrating abdominal trauma) and also other variables like associated organ injuries, the method of presentation etc. The sensitivity and specificity of various investigatory modalities including biochemical and radiological are also evaluated. Finally, the outcome of the management pattern of renal injuries in Govt. General Hospital, Chennai and the mortality and morbidity data are critically analysed.

Aims and Objectives

1. To study the epidemiology of renal injuries occurring in trauma victims admitted in a tertiary care trauma centre.
2. To analyse the mode of trauma and pattern of renal and associated organ injuries.
3. To evaluate the outcomes of various methods of management of traumatic renal injuries
4. To study the complications, early and late, associated with renal trauma.
5. To study the morbidity and mortality pattern in renal trauma victims

BACKGROUND

Of all genitourinary organs, the kidney is the most likely to be injured in cases of external trauma and injuries to at least one kidney occurs in as many as 10% of abdominal trauma cases. In adult renal trauma, the two most important indicators for significant injury are haematuria and hypotension (systolic blood pressure less than 90 mm Hg at any time before resuscitation). Additional indicators for possible renal injury include the presence of haematuria, flank hematoma, rib fractures, and penetrating injuries to the low thorax or flank. Interestingly, haematuria is not seen in up to 36% of renal pedicle injuries and in 24% of renal artery occlusions.

The single best radiologic modality for diagnosing renal injury is CT

UROGRAM. CECT is rapid, is widely available in trauma centres, gives excellent three-dimensional data, and accurately can diagnose urinary extravasation, renal contusions, depth of renal lacerations, nonviable tissue, and renal pedicle injuries and is useful in staging renal injuries. Additionally, CT is useful in diagnosing concomitant abdominal injuries.

Grade*	Type of injury	Description of injury
I	Contusion	Microscopic or gross hematuria, urologic studies normal
	Hematoma	Subcapsular, nonexpanding without parenchymal laceration
II	Hematoma	Nonexpanding perirenal hematoma confirmed to renal retroperitoneum
	Laceration	<1.0 cm parenchymal depth of renal cortex without urinary extravasation
III	Laceration	>1.0 cm parenchymal depth of renal cortex without collecting system rupture or urinary extravasation
IV	Laceration	Parenchymal laceration extending through renal cortex, medulla, and collecting system
	Vascular	Main renal artery or vein injury with contained hemorrhage
V	Laceration	Completely shattered kidney
	Vascular	Avulsion of renal hilum which devascularizes kidney

In determining whether a renal injury needs to be explored, several factors must be considered including the presence of concomitant injuries. The absolute indications for surgical exploration in renal trauma are persistent, life-threatening haemorrhage believed to be from renal injury, renal pedicle avulsion, and expanding, pulsatile, or uncontained retroperitoneal hematoma. In times when hemodynamic instability is ongoing and the source of the blood loss is from the kidney or its pedicle, nephrectomy may be necessary. At the same time, Renal injuries with nonviable segments also may be managed conservatively, though the complication rate and need for delayed surgical intervention is higher. Even Grade V shattered but perfused kidneys in hemodynamically stable, bluntly injured patients also have been treated successfully without surgery. Postinjury, all patients who are managed conservatively are placed on bed rest until their gross haematuria resolves. They are imaged periodically to monitor for injury resolution. Follow-up imaging also is performed to document renal function 3 months following injury. The objective of managing patients with severe kidney injuries also conservatively is to retain enough functioning nephron mass to avoid end-stage kidney failure. A secondary goal is to avoid complications specifically attributable to the traumatized kidney.

MATERIALS AND METHODS

The statistical details of all trauma patients who were admitted to the emergency trauma ward in the Rajiv Gandhi Govt. General Hospital, Chennai during the period between January 2021 to August 2023 were analysed and all the patients who sustained renal trauma confirmed by investigations were included in the study. This included renal trauma

due to road traffic accidents, train traffic accidents, fall from height, assault, and stab injuries.

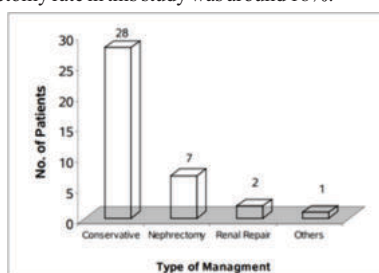
Exclusion Criteria

1. Critically injured patients who expired within 30 minutes of admission.
2. Patients with incomplete evaluation of their traumatic injuries due to any reason.
3. Patients who were lost even to the first follow up.
4. Iatrogenic renal trauma as in procedures like percutaneous Nephrolithotomy and unintentional injuries caused during surgical procedures.

A total of 38 patients who sustained renal injuries were finally available for the analysis. Demographic parameters of individual patients were assessed. History regarding the mode of trauma, presence of haematuria was noted. Examination findings including vitals at the time of receiving were noted. Presence of concomitant bony injuries or other system injuries were documented. Biochemical investigations done included Complete hemogram, Renal Function Test and Urinalysis for RBC. Radiological Investigations done included CXR – PA view, X – Ray KUB, USG Abdomen and pelvis, CT abdomen and pelvis with contrast.

RESULTS

- In the present study, out of a total 521 patients admitted with abdominal trauma, 99 had some form of urological injuries (19%).
- Kidney was the second most common genitourinary organ to sustain injury in abdominal trauma in our study (38%) (Most common was urethral injuries in our study)
- Of the total of 38 patients who sustained renal injuries, 84% (32 out of 38) were males. Only 6 females (16 %) sustained renal injuries in our series.
- Young adults in the age group of 16 to 30 years were the most frequent to sustain renal trauma.
- Road traffic accidents were responsible for the vast majority of renal trauma in our series.
- Haematuria, either microscopic or gross was present in 76% of all patients who sustained renal trauma. Of the two patients who had pedicle injury, only 1 had evidence of haematuria.
- 4 out of 6 patients with Grade V renal injuries and 2 out of 5 patients with Grade IV renal injuries presented with shock at admission.
- All trauma victims underwent Focussed Abdominal Sonography of trauma (FAST) as immediately as possible after admission if they are haemodynamically unstable or a detailed USG Abdomen and pelvis if stable. All blunt trauma patients with gross haematuria and patients with microscopic haematuria and shock (systolic blood pressure < 90 mm Hg any time during evaluation and resuscitation) underwent renal imaging with CT with intravenous contrast, as per protocol. No significant renal injury was missed after CT imaging and the sensitivity of CECT approached 100% in our series.
- Spleen was the organ which was most commonly injured concomitantly with renal injury in the present series. Among all concomitant injuries, Splenectomy was required in 3 patients and repair of liver lacerations was required in 2 patients, while the rest of the injuries were managed conservatively without intervention.
- 74% of cases were managed conservatively without any surgical intervention and all these patients recovered well.
- Two patients who had Grade IV renal injuries with urinary extravasation required percutaneous drain placement and DJ stent insertion.
- Two patients who had extensive grade IV renal injuries with hemodynamic instability required surgical explanation, debridement of devitalised renal tissue and repair. The nephrectomy rate in this study was around 18%.



- All the patients with renal trauma who were managed conservatively were imaged with repeat CECT – Abdomen 1 week later and with serial haematocrit measurements. After discharge, the patients were reviewed 1 month and 3 months later and appropriate imaging studies were done as necessary.
- We encountered the following complications in the in-hospital stay and follow up of the patients, which were all managed successfully.
 - o Urinary extravasation 4 patients.
 - o Urinoma requiring drainage 2 patient
 - o Perinephric abscess 1 patient
 - o Wound infection (surgical) 2 patients
 - o Secondary haemorrhage 2 patients
 - o Hypertension 4 patients
- Both the patients who presented with secondary haemorrhage had to undergo emergency nephrectomy because of hemodynamic instability. One patient who developed perinephric abscess required an open drainage.
- Of the total of 38 patients who sustained renal injuries, 2 patients expired. One of these patients, had associated duodenal injury and the patient's death was attributed to the complications of the bowel injury. Other patient who expired in the series had concomitant major vessel injury involving inferior vena cava, which was the likely cause of his death.

DISCUSSION

There was a male predominance in patients with renal injuries in the study. 84% of renal injuries were seen in male patients. Majority belonged to the age group of 16 to 30 years. Most of the renal injuries in the study were minor ones. Grade I injury was found in 10 patients and grade 2 injuries were found in another 10 patients. Only 28% of the injuries belonged to grade 4 to 5. The higher-grade injuries were more commonly associated with other intra-abdominal organ injuries, contributing to significant morbidity and mortality.

28 out of 38 patients were managed successfully with non-operative management. 10 out of 38 patients (26%) needed surgical intervention in the form of renorrhaphy, percutaneous drainage, DJ stent insertion or nephrectomy. The need for surgical intervention escalates with higher grades of renal injury.

Grade of injury	No. of interventions
I	0 / 10
II	0 / 9
III	0 / 7
IV	4 / 06
V	6 / 06

CONCLUSION

1. Urological injuries are present in up to 20% of patients admitted with abdominal trauma, hence urologist has a key role in the management of trauma victims.
2. Contrary to the findings of most other studies, posterior urethral disruption injuries seem to predominate among genitourinary trauma in our study.
3. Young adults in the age group of 16 to 30 years are the most vulnerable to sustain renal injuries. This is due to increasing number of this productive age group's preference for driving two wheelers.
4. CT scan is the most comprehensive imaging tool to identify and characterize the renal injuries.
5. Non operative management has proven to be successful in majority of the patients sustaining renal trauma
6. The need for surgical intervention seems to increase with increasing grade of renal injuries
7. Even penetrating renal trauma, when properly staged can be managed successfully with conservative approach. In this series 2 out of 3 patients with penetrating renal trauma were managed non operatively
8. The nephrectomy rate are high when a patient with poly trauma is explored for other concomitant organ injuries.

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