



Research Article

ISOLATED RENAL TRAUMA: OUR EXPERIENCE IN A TERTIARY HEALTH CARE CENTRE

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ABSTRACT

**Introduction:** Out of all trauma cases, renal trauma comprises around 5% and the same accounts for 24% of all abdominal solid organ injuries. Management of renal trauma has evolved over the past decades, and the current management is advocated more towards conservative approaches for the majority of hemodynamically stable patients. Analysis of the mechanism of injury, management and outcomes in isolated renal trauma cases is the main objective of this study.

**Methods:** Patients diagnosed with isolated renal injury in Government Rajaji Hospital from January 2021 to January 2023 were analyzed retrospectively. Data were collected from the medical records. Analysis of variables includes sex, age, degree of renal trauma, mechanism of injury, management and outcomes.

**Results:** Out of the 37 patients identified, the average age was 24.3 ± 0.5 years and most were male-30 (81%). Blunt trauma accounted for 81% (30) of all cases. The most common renal injuries were grade I-III (84%) and 32.4% (12) of the cases had hematuria. Most patients (89.2% - 33) were treated with non-operative management (NOM). Nephrectomy was performed in 8.1% (3) of cases and 2.7% (1) of cases underwent renorrhaphy. It was found that the overall mortality rate was 2.7% (1).

**Conclusions:** Non-Operative Management has a good outcome in majority of blunt and penetrating types of renal trauma in hemodynamically stable cases.

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INTRODUCTION

Anatomically, the strong lumbar muscles, ribs, vertebrae and abdominal viscera protects the kidney. However, among the genitourinary organs, kidneys are the ones that are most often traumatized [1]. Out of all trauma cases renal injury comprises around 5% and the same accounts for 24% of all abdominal solid organ injuries [2]. It is the third most commonly injured organ due to abdominal trauma after spleen and liver[3].

Blunt trauma to the abdomen is the most common mechanism of injury accounting for 80–95% of all renal trauma and mostly occurs due to road traffic accidents[4].

However the prevalence of penetrating renal trauma can reach upto 20% or more. Many blunt renal traumas are low-grade and 80–85% of these cases can be treated with non-operative management [5]. Renal trauma along with injury to other major organs is often found.

Evaluation of renal trauma is based on the patient’s hemodynamic status, mechanism of injury, physical examination, urinalysis and imaging [6].

Abdominal / Pelvic Computed Tomography (CT) with intravenous (IV) contrast with immediate and delayed images is the imaging technique of choice [7] for defining the location

and severity of renal injury and also provides a view of associated other abdominal and pelvic organ injuries.

The most common grading system for renal trauma is American Association for the Surgery of Trauma (AAST), as shown below [8];

Grade	Type of injury	Description of injury
I	Contusion	Microscopic or gross hematuria, urologic studies normal
	Hematoma	Subcapsular, non-expanding without parenchymal laceration
II	Hematoma	Non-expanding 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 the kidney

The need for operative management and the risk for nephrectomy has a statistically significant correlation with the AAST grading (grade I to grade V). The management options consists of: Conservative treatment, Minimally invasive approach (including angioembolization & placement of an ureteral stent) and Open surgical interventions (renorrhaphy and nephrectomy).

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**METHODS**

**Objective:** To analyze the demographics and characteristics of isolated renal injury & to review the management & outcomes of isolated renal trauma in our institution.

**Study Population:** It is an observational retrospective study and we analyzed data of all patients who presented in Government Rajaji Hospital, Madurai, after suspected renal trauma from January 2021 to January 2023 (Total-37).

**Inclusion Criteria:** All patients (>12years) who were admitted for suspected renal injury and who underwent both conservative and surgical treatment in the Urology department during the study period.

**Exclusion Criteria:** Paediatric patients (less than or equal to 12years).

Patients with associated other organ injuries.

All suspected renal injury patients underwent contrast enhanced CT scan and were graded according to AAST organ injury severity scale which was divided into five categories based on radiological findings. The AAST grade of renal injury, hemodynamic status and the requirement of blood transfusion were the primary factors in determining the patient's need for operative intervention and overall outcome. Patient's age, sex, injury mechanism, degree of hematuria, hemodynamic status, treatment options and outcomes were recorded. Majority of renal trauma were classified as minor 84% (Grade I to III) & treated conservatively. The remaining 16 % of cases represent major injuries (Grades IV to V). Surgery was limited to patients with penetrating renal injuries and in patients who were hemodynamically unstable despite aggressive resuscitation. Conservative management consisted of continuous hemodynamic monitoring, parenteral fluid therapy, blood transfusion, prophylactic antibiotics and bed rest.

**Characteristics of Renal Trauma**

Characteristics	Number of Cases	Percentage %
<b>1) Age Group (Years) ;</b>		
13-20	07	19
21-30	14	37.8
31-40	10	27
41-50	04	10.8
51-60	02	5.4
<b>2) Gender ;</b>		
Male	30	81
Female	07	19
<b>3) Renal Side ;</b>		
Right	16	43.2
Left	21	56.8
<b>4) Trauma Type ;</b>		
Blunt	30	81
Penetrant	07	19

Characteristics	Number of Cases	Percentage %
<b>5) Mechanism of Injury ;</b>		
Road Traffic Accident	27	73
Fall from Height	03	8.1
Stab Injury	05	13.5
Bull gore Injury	02	5.4
<b>6) Hematuria ;</b>		
Gross	09	24.3
Microscopic	03	8.1

Absent	25	67.6
<b>7) Hemodynamics ;</b>		
Stable	32	86.5
Shock	05	13.5

Characteristics	Number Of Cases		Percentage %	
<b>8) AAST Grade ;</b>	<b>Blunt</b>	<b>/Penetrant</b>	<b>Blunt</b>	<b>/Penetrant</b>
I	08	/ 01	21.6	/ 2.7
II	13	/ 02	35.1	/ 5.4
III	06	/ 01	16.2	/ 2.7
IV	03	/ 02	8.1	/ 5.4
V	00	/ 01	0	/ 2.7
<b>TOTAL :</b>	<b>30</b>	<b>/ 07</b>	<b>81</b>	<b>/ 19</b>
<b>9) Management ;</b>				
Non-Operative	33		89.2	
Operative :	04		10.8	
-Nephrectomy	03		8.1	
-Renorrhaphy	01		2.7	
<b>10) Outcome;</b>				
Good	36		97.3	
Poor	01		2.7	

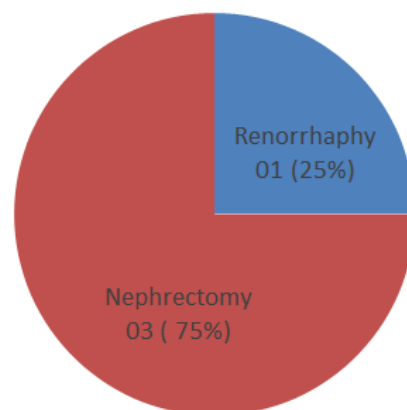


Fig 1 Type of Operative Management in Renal Trauma

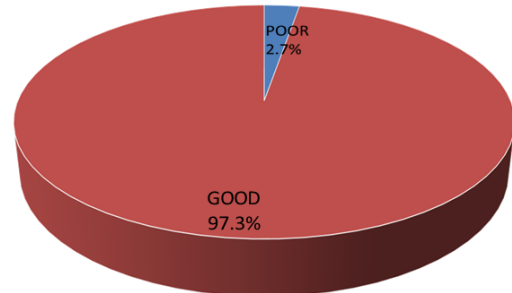


Fig 2 Overall Outcomes

**RESULTS**

In this hospital-based observational retrospective study, 37 cases of trauma involving isolated renal injury were studied, and the patients characteristics were analyzed. We found that 81% (30 of 37) of the patients were male, and 19% were female (7). The age at admission was 24.3±0.5 years (range=13–60 years) and adults with an age range of 21–30 years were the largest age group. The most common type of renal trauma was the blunt injury – 30 cases (81%), with road traffic accidents - 27 cases(73%) being responsible for the majority of mechanisms of injury. The majority of cases – 21 (56.8%) in this study involves the left kidney. Hematuria (both microscopic and gross) was found in 32.4% (12) of all renal trauma. AAST recommendations were referred for assessment of renal trauma severity.

Most cases -30 (84%) had grade I-III renal trauma, and 89.2% (33) were treated non-operatively. Isolated renal trauma was less common and majority of them were low grade injuries. Surgical interventions i.e. nephrectomy and renorrhaphy were performed in 03 and 01 of the high-grade renal trauma cases, respectively. The mortality rate was 2.7% (01).

## DISCUSSION

The majority of patients in our study -30 (81%) were male. The age at admission was  $24.3 \pm 0.5$  years (range=13–60 years), and adults (age range 21–30 years) were the largest age group (14 cases). High rate of road traffic accidents was the main cause of renal trauma in our study. Collisions of high-speed motor vehicles can cause severe renal trauma because of the rapid deceleration & direct transmission of kinetic energy. So in addition to renal parenchymal lacerations, they can also cause vascular injury [9].

Isolated renal trauma was usually less common and majority of them were low grade injuries. In our study we found that the most cases of renal trauma were grade II 15 cases (40.5%), followed by 9 cases (24.3%) of grade I, 7 cases (18.9%) of grade III, 5 cases (13.5 %) of grade IV and 1 case (2.7%) of grade V. The presence of microscopic hematuria (> 3 RBCs/hpf) or gross hematuria is an indicator of suspected urinary tract trauma, especially when associated with deceleration injury, penetrating trauma or hypotension (SBP < 90mmHg).

However, there is no consistent correlation between the severity of hematuria and the grade of renal trauma [10]. We found 9 (24.3%) cases of gross hematuria, 3(8.1%) cases of microscopic hematuria, and 25(67.6%) cases without hematuria. There were 1 patient with grade III renal trauma, 3 with grade IV and 1 patient with grade V who entered a state of hypovolemic shock. Emergency surgery was done in 4 cases (10.8%) of high-grade renal trauma. Renorrhaphy was performed on 1 case of grade III renal trauma. The nephrectomy was performed in 2 cases of grade IV and 1 case of grade V renal trauma, respectively.

The majority of blunt and penetrating renal trauma cases can be treated non-operatively [11,12]. Non operative management is the widely accepted approach in cases of low grade of renal trauma [13]. However, there are still debates about the management of high-grade renal trauma. There are a large number of studies about the success of Non-operative management in blunt and penetrating renal trauma in certain selective cases [3,14], and there has been a gradual shift in management approach [11,12]. Usually, exploration of high-grade renal trauma inevitably leads to nephrectomy, and many experts recommend Non-operative management with many reports of satisfactory results [15]. Surgical intervention is indicated in patients with hemodynamic instability, expanding or pulsatile hematoma found during laparotomy performed for associated injury, or those suspected of having a vascular injury [1,16]. In our study, only one patient expired (2.7%).

## CONCLUSION

Non-operative management has a good outcome in majority of blunt and penetrating types of renal trauma in

hemodynamically stable cases. The presence of isolated high grade renal injury, associated with hemodynamic instability aggravates the patient's condition and affects the prognosis.

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