

Renal Trauma: A 2-Year Retrospective Review of Injury Severity, Treatment Approaches, and Outcomes from a Tertiary Centre

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Abstract: ***Background:** Renal trauma represents a clinically important component of abdominal and genitourinary trauma. Contemporary management increasingly favors renal preservation and non-operative treatment in appropriately selected patients. This study evaluated the injury profile, management strategies, and short-term in-hospital outcomes of renal trauma at a tertiary-care centre. **Methods:** A retrospective review was performed of 20 patients with renal trauma managed at MGM Hospital, Kamothe, Navi Mumbai, between January 2024 and November 2025. Demographic characteristics, mechanism and side of injury, AAST injury grade, hemodynamic status, treatment, hospital stay, complications, and mortality were reviewed. Data were analyzed descriptively using SPSS version 26. **Results:** Twenty patients were included; 15 (75%) were male and 5 (25%) were female, with a mean age of 29.1 years and median age of 30 years. Road traffic accidents accounted for 18 (90%) cases and assault for 2 (10%). Left-sided injury occurred in 12 (60%) and right-sided injury in 8 (40%). Seventeen patients (85%) were hemodynamically stable. AAST Grade I, Grade II–III, Grade IV, and Grade V injuries occurred in 5 (25%), 8 (40%), 4 (20%), and 3 (15%) patients, respectively. Conservative management was used in 13 (65%), DJ stenting in 6 (30%), and nephrectomy in 1 (5%). No mortality or documented in-hospital complications occurred, and mean hospital stay was 7 days. **Conclusion:** Most renal trauma in this cohort was successfully managed without open surgery. Even selected high-grade injuries were managed conservatively in stable patients. Early contrast-enhanced imaging, AAST grading, close monitoring, and selective minimally invasive intervention are central to renal preservation.*

Keywords: renal trauma, blunt renal injury, AAST grading, conservative management, DJ stenting, nephrectomy, renal preservation

1. Introduction

Renal trauma is encountered in a significant proportion of patients with abdominal and genitourinary trauma and is most commonly caused by blunt mechanisms such as road traffic accidents. The kidney is relatively protected by its retroperitoneal location; however, high-energy deceleration and direct flank trauma may result in parenchymal, collecting-system, or vascular injury.

The management of renal trauma has changed substantially with the widespread availability of contrast-enhanced computed tomography (CT), improved resuscitation, intensive monitoring, and minimally invasive interventions. Hemodynamic status is the principal determinant of initial management, while anatomic severity is commonly described using the American Association for the Surgery of Trauma (AAST) renal injury scale. Contemporary guidelines support non-operative management for most hemodynamically stable renal injuries, with ureteral stenting, drainage, selective angioembolization, or surgery reserved for selected indications.

This retrospective study was undertaken to describe the demographic and clinical profile of renal trauma patients presenting to a tertiary-care urology service, characterize the severity of injury, evaluate the treatment approaches used, and describe short-term hospital outcomes. The study also examines the extent to which management in this centre reflects the contemporary preference for renal-preserving strategies.

2. Aim and Objectives

Aim: To evaluate the severity, management strategies, and short-term outcomes of renal trauma cases presenting to a tertiary-care centre over a two-year study period.

- To describe the demographic and clinical characteristics of patients with renal trauma.
- To classify renal injuries according to AAST injury severity.
- To describe the mechanisms and laterality of renal trauma.
- To evaluate non-operative, endourological, and surgical management strategies.
- To assess in-hospital complications, mortality, and duration of hospital stay.

3. Materials and Methods

Study design and setting

This was a retrospective observational study conducted in the Department of Urology, MGM Hospital, Kamothe, Navi Mumbai, Maharashtra, India. The study included patients with renal trauma managed between January 2024 and November 2025.

Study population

Twenty consecutive patients with renal trauma were included. The available clinical records were reviewed for age, sex, mechanism of trauma, side of renal involvement, hemodynamic status, AAST injury grade, treatment received, hospital stay, complications, and mortality.

Injury assessment and grading

Renal injuries were classified according to the AAST renal injury grading system based on the radiological and clinical information documented in the patient records. Contrast-enhanced CT was used for evaluation and staging when clinically indicated. The study dataset grouped injuries as Grade I, Grade II–III, Grade IV, and Grade V.

Management Protocol

Management was individualized according to hemodynamic status, injury grade, imaging findings, urinary extravasation, hematuria, and clinical course. Patients who remained stable were managed conservatively with close observation and supportive treatment. DJ ureteral stenting was performed when urinary drainage was considered necessary, including cases with urinary extravasation or persistent hematuria. Nephrectomy was reserved for the severe injury requiring operative management.

Outcomes and Statistical Analysis

The primary descriptive outcomes were treatment modality and renal preservation. Secondary outcomes included complications, mortality, and duration of hospital stay. Data were analyzed using SPSS version 26. Continuous variables were summarized using mean and median values, while categorical variables were summarized as frequencies and percentages. No long-term follow-up data were available for this retrospective analysis.

Ethics

The authors report that formal Institutional Ethics Committee approval was not required for this retrospective review of anonymized clinical records according to the institutional policy applicable to the study. No patient-identifying information is included in this manuscript.

4. Results

4.1 Demographic and Injury Characteristics

A total of 20 patients were included. There were 15 males (75%) and 5 females (25%). The mean age was 29.1 years and the median age was 30 years. Road traffic accidents were the predominant mechanism, accounting for 18 patients (90%), while 2 patients (10%) sustained renal trauma following assault. The left kidney was involved in 12 patients (60%) and the right kidney in 8 (40%). Seventeen patients (85%) were hemodynamically stable at presentation, as presented in Table 1.

Table 1: Demographic and clinical characteristics of the study population

Characteristic	Number	Percentage
Total patients	20	100
Male	15	75
Female	5	25
Road traffic accident	18	90
Assault	2	10
Left renal injury	12	60
Right renal injury	8	40
Hemodynamically stable	17	85

4.2 Distribution according to Injury Grade

Table 2: Distribution of renal injuries according to AAST grade

AAST grade	Patients (n)	Percentage
Grade I	5	25
Grade II–III	8	40
Grade IV	4	20
Grade V	3	15

Grade I injuries accounted for 5 patients (25%), Grade II–III injuries for 8 (40%), Grade IV injuries for 4 (20%), and Grade V injuries for 3 (15%). Thus, 13 patients (65%) had Grade I–III injuries, while 7 patients (35%) had high-grade Grade IV–V injuries.

4.3 Treatment modalities

Table 3: Management according to renal injury grade.

Injury grade	Patients	Conservative	DJ stenting	Nephrectomy
Grade I	5	5	0	0
Grade II–III	8	4	4	0
Grade IV	4	2	2	0
Grade V	3	2	0	1
Total	20	13	6	1

Overall, 13 patients (65%) were treated conservatively, 6 patients (30%) underwent DJ ureteral stenting, and 1 patient (5%) underwent nephrectomy. All Grade I injuries were managed conservatively. Among Grade II–III injuries, four were managed conservatively and four underwent DJ stenting. Among Grade IV injuries, two were treated conservatively and two underwent DJ stenting. Of the three Grade V injuries, two were managed conservatively and one required nephrectomy.

The mean duration of hospital stay was 7 days. No in-hospital mortality or documented complications were reported in the study cohort. No long-term follow-up outcomes were available.

5. Discussion

The present study demonstrates the feasibility of renal-preserving management in a tertiary-care setting. The cohort was predominantly young and male, with a mean age of 29.1 years and 75% male representation. Road traffic accidents accounted for 90% of injuries, emphasizing the contribution of high-energy blunt trauma to renal injury in this population.

The predominance of lower-grade injuries in this cohort is consistent with the clinical experience that many renal injuries are minor and can be treated without surgery. In the present series, 65% of patients had Grade I–III injuries, and all Grade I injuries were successfully managed conservatively.

An important observation was the management of selected high-grade injuries without nephrectomy. Two of three Grade V injuries were managed conservatively, while two of four Grade IV injuries were managed without surgery. This supports the contemporary principle that injury grade alone should not dictate operative treatment. Hemodynamic stability, ongoing bleeding, associated injuries, urinary

leakage, and the overall clinical trajectory are important determinants of management.

The overall nephrectomy rate was 5%, with nephrectomy required in only one Grade V injury. The low rate of renal extirpation reflects the renal-preserving approach used in this cohort. Contemporary EAU guidance similarly emphasizes hemodynamic stability as the principal criterion for non-operative management and supports non-operative treatment for most Grade I–IV injuries, with selected Grade V injuries also potentially managed non-operatively when appropriately selected.

DJ stenting was performed in six patients, representing 30% of the cohort. In the study records, stenting was used particularly in the setting of urinary extravasation and persistent hematuria. Contemporary guidance supports urinary drainage for persistent or symptomatic urinary leakage, while routine stenting is not required for stable asymptomatic Grade IV injuries. Therefore, the decision to stent should be individualized rather than based solely on the AAST grade.

The study also demonstrates the importance of contrast-enhanced CT in defining injury severity and identifying collecting-system or vascular abnormalities. Standardized AAST grading facilitates communication, comparison between studies, and treatment planning. The 2018 AAST revision incorporated additional CT-based vascular findings, reflecting the increasing importance of modern imaging in renal trauma assessment.

6. Comparison with Contemporary Evidence

The findings of this series are directionally consistent with contemporary literature supporting non-operative management of hemodynamically stable renal trauma. A systematic review and meta-analysis comparing operative and non-operative management reported lower mortality and morbidity with non-operative management across renal trauma grades, although the included evidence was predominantly observational. Current EAU guidance continues to recommend non-operative management for stable blunt renal trauma, with escalation to minimally invasive or operative treatment when clinically indicated.

7. Clinical Implications

- Hemodynamic stability should remain the primary determinant of initial management.
- Contrast-enhanced CT and standardized AAST grading facilitate appropriate risk stratification.
- Stable patients with low- and moderate-grade injuries can generally be managed without surgery.
- Selected high-grade injuries may also be preserved when there is no persistent hemodynamic instability or other indication for exploration.
- DJ stenting should be reserved for clinically significant or persistent urinary leakage and other selected indications rather than used routinely solely because of injury grade.
- A multidisciplinary trauma-urology approach is important when deciding on escalation to endourological, interventional radiological, or surgical treatment.

8. Limitations

- The study was retrospective and included a relatively small sample of 20 patients from a single tertiary-care centre.
- The analysis was primarily descriptive and was not powered for comparative statistical testing or prediction of treatment failure.
- Long-term renal functional outcomes, renovascular hypertension, delayed complications, and long-term imaging findings were not available because follow-up was not included in the study dataset.
- Details of individual associated injuries and transfusion requirements were not available in the source dataset used for this manuscript.
- The study period and cohort may limit generalizability to other trauma systems.

9. Conclusion

This two-year retrospective review of 20 renal trauma patients demonstrates that most renal injuries can be managed successfully with conservative or minimally invasive strategies. In this cohort, 65% of patients were managed conservatively, 30% underwent DJ stenting, and only 5% required nephrectomy. Selected Grade IV and Grade V injuries were successfully treated without nephrectomy, emphasizing that hemodynamic stability and clinical assessment are more important than injury grade alone in determining the need for surgery. Early contrast-enhanced imaging, accurate AAST grading, close monitoring, and timely escalation to endourological, interventional, or surgical treatment are essential for maximizing renal preservation.

Declarations

Ethics approval: Formal ethics committee approval was reported as not required for this retrospective review of anonymized records according to institutional policy.

Consent: Individual patient consent was not required for this retrospective analysis of anonymized records, according to the institutional policy reported by the authors.

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Authors' contributions: Dr. Swapnil Nikam contributed to study conception, data collection, analysis, and manuscript preparation. Dr. Piyush Singhania provided supervision, clinical guidance, and critical review of the manuscript. Dr. Preet Jain and Dr. Dhaval Desai contributed to the study and manuscript as co-authors. All authors reviewed and approved the final manuscript.

Data availability: The underlying patient-level data are not publicly available because they are derived from institutional clinical records.

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