

Severity of Renal Injuries in Correlation with Mechanism of Trauma and Its Management: A Retrospective Cross Sectional Study

C. Arun Kumar¹, Varthe VenkataMahesh Naik², Srinivasa Reddy Pulusu³, G Raja sekhar⁴, P. Mutya Sri⁵, K. Sitharamaiah⁶

^{1,2,4}Assistant Professor, Department of Urology, Government General Hospital, Kurnool Medical College, Kurnool, Andhra Pradesh, India. ³Assistant Professor, Department of Community Medicine, ACSR Government Medical College, Nellore, Andhra Pradesh, India. ^{5,6}Professor, Department of Urology, Government General Hospital, Kurnool Medical College, Kurnool, Andhra Pradesh, India.

Abstract

Background: Renal trauma is the most common injury of the genitourinary tract and accounts for a significant proportion of abdominal solid organ injuries. Recent advances in imaging and critical care have resulted in a paradigm shift toward non-operative management (NOM) in hemodynamically stable patients. The objective is to evaluate the severity of renal injuries according to the mechanism of trauma, assess the role of diagnostic modalities in grading renal trauma, and analyze management strategies and clinical outcomes. **Material and Methods:** A retrospective cross-sectional study was conducted in the Department of Urology, Government General Hospital, Kurnool, from January 2022 to December 2025. 40 patients with documented renal trauma were included. Data regarding demographics, mechanism of injury, AAST renal injury grade, associated injuries, management modality and outcomes were collected from hospital records. All patients underwent contrast-enhanced computed tomography (CECT) of the abdomen and pelvis for grading of renal injuries. **Results:** The mean age was 30 years. There were 36 males (90%) and 4 females (10%). Blunt trauma accounted for 36 cases (90%) and penetrating trauma for 4 cases (10%). Hematuria was the most common presenting symptom and was observed in 36 (90%) patients. Associated injuries were present in 12 (30%) patients, while 28 (70%) had isolated renal trauma. Grade III renal injury was the most common injury pattern in 20(50%) patients. Conservative management was successful in 34 (85%) of patients, while nephrectomy was required in 4 (10%) patients. Mortality was observed in 1 patient (2.5%) due to associated injuries. **Conclusion:** Most renal trauma patients can be managed successfully with non-operative management. Accurate grading using CECT and careful hemodynamic assessment are essential for optimal treatment planning and renal preservation.

Keywords: Renal trauma; AAST grading; Blunt trauma; Non-operative management; Nephrectomy; Urological trauma.

Received: 21 May 2026

Revised: 01 June 2026

Accepted: 17 June 2026

Published: 04 July 2026

INTRODUCTION

Renal trauma is the most frequently injured organ of the genitourinary system following external trauma. It accounts for approximately 1–5% of all traumatic injuries and nearly 24% of solid organ injuries.^[1] Blunt trauma is responsible for 80–90% of renal injuries, while penetrating trauma contributes to the remaining cases.^[2]

The American Association for the Surgery of Trauma (AAST) classification system grades renal injuries from Grade I to Grade V and provides a standardized approach for management decisions.^[2,3] Historically, many renal injuries were managed surgically; however, advances in radiological imaging, intensive care monitoring, and minimally invasive techniques have shifted management toward conservative approaches.

Several studies have demonstrated that non-operative management is safe and effective in hemodynamically stable patients, including selected high-grade injuries(4). This strategy has resulted in improved renal preservation and reduced morbidity.

The present study evaluates the pattern of renal trauma, correlation between injury severity and mechanism of trauma and management outcomes in patients presenting to a tertiary care center.

MATERIALS AND METHODS

This retrospective cross-sectional study was conducted in the Department of Urology, Government General Hospital, Kurnool, Andhra Pradesh, India. The study included patients diagnosed with renal trauma between January 2022 and December 2025. Medical records were reviewed retrospectively, and a total of 40 patients with documented renal injuries were included in the analysis.

Inclusion criteria

- Patients aged 18 years and above.
- Patients with documented renal injury following blunt or penetrating trauma.
- Availability of complete clinical and radiological records.

Address for correspondence: Dr. C. Arun Kumar, Assistant Professor, Department of Urology, Government General Hospital, Kurnool Medical College, Kurnool, Andhra Pradesh, India. E-mail: run0702022@gmail.com

DOI:
10.21276/amt.2026.v13.i2.800

How to cite this article: Kumar CA, Naik VVM, Pulusu SR, Sri PM, Sitharamaiah K. Severity of Renal Injuries in Correlation with Mechanism of Trauma and Its Management: A Retrospective Cross Sectional Study. Acta Med Int. 2026;13(2):943-945.

Exclusion Criteria

- Patients below 18 years of age.
- Mixed abdominal trauma without documented renal injury.
- Incomplete medical records.

Data regarding patient demographics, mechanism of injury, clinical presentation, associated injuries, laboratory investigations, radiological findings, management modality and outcomes were collected from hospital records. All patients underwent initial clinical assessment and resuscitation according to Advanced Trauma Life Support (ATLS) principles. Laboratory investigations included complete blood count, blood urea, serum creatinine, bleeding time, and clotting time. Focused Assessment with Sonography for Trauma (E-FAST) was performed as an initial screening tool, followed by contrast-enhanced computed tomography (CECT) of the abdomen and pelvis in hemodynamically stable patients. Renal injuries were graded according to the American Association for the Surgery of Trauma (AAST) renal injury grading system.

The primary variables analyzed included age, sex, mechanism of injury, grade of renal trauma, presence of associated injuries, requirement for blood transfusion, management strategy and clinical outcome. Patients were managed either conservatively or surgically depending on hemodynamic status, severity of injury, and associated organ damage. Conservative management included observation, bed rest, serial clinical examinations, laboratory monitoring and follow-up imaging when indicated. Surgical intervention was performed in patients with hemodynamic instability or severe renal injury requiring operative management. Data were analyzed using descriptive statistics and expressed as frequencies, percentages, and mean values where appropriate

RESULTS

A total of 40 patients were included in the study. The mean age was 30 years. 36 patients (90%) were males and 4 patients (10%) were females.

Table 1: Distribution of cases according to Demographic characteristics

Variable	value
Mean Age	30 years
Male	36 (90%)
Female	4 (10%)

Blunt trauma was the predominant mechanism of injury accounting for 36 cases (90%), of which Road Traffic Accidents were 32 cases and 4 cases occurred because of

fall from height, whereas penetrating trauma 4 cases (10%) result from stab injury.

Table 2: Distribution of cases according to mechanism of trauma (n=40)

Mechanism of trauma	Number (%)
Blunt Trauma	36 (90%)
Penetrating Trauma	4(10%) 2g5,1g4,1g3

Gross hematuria was the most common presenting symptom, observed in 36 (90%) patients, followed by flank pain () and abdominal tenderness ().

Based on CECT findings AAST Grading was done, Grade III renal injury was the most common pattern observed.

Table 3: Distribution of cases according to AAST Grade (n=40)

Grade	Number of cases (%)
Grade I	4 (10%)
Grade II	6 (15%)
Grade III	20 (50%)
Grade IV	6 (15%)
Grade V	4 (10%)

28 patients (70%) had isolated renal trauma, while 12 patients (30%) had associated injuries involving other organ systems.

Table 4: Distribution of cases according to Injuries (n=40)

Category of injury	Number (%)
Isolated Renal Trauma	28 (70%)
Associated Injuries	12 (30%)

36 patients (90%) were managed conservatively. Conservative management consisted of bed rest, close hemodynamic monitoring, serial abdominal examinations, urine output monitoring, periodic assessment of hemoglobin levels, blood transfusion when required, analgesics, intravenous fluids, and follow-up imaging when indicated. Patients with low-grade renal injuries (AAST Grades I-III) and hemodynamically stable high-grade injuries were

treated with non-operative management. Blood transfusion was required in 6 patients (15%) due to significant hematuria and blood loss. These patients were managed with supportive care and close observation. Follow-up imaging demonstrated satisfactory healing in patients managed conservatively with preservation of renal function. 4 patients (10%) required surgical intervention. Nephrectomy was performed in patients with severe renal

injury associated with ongoing hemorrhage with hemodynamic instability despite adequate resuscitation. 1 patient (2.5%) who was initially managed conservatively subsequently required nephrectomy because of clinical deterioration and failure of non-operative management. One patient with autosomal dominant polycystic kidney

disease (ADPKD) and another with a Grade III injury involving an ectopic pelvic kidney were managed with conservative approach and close monitoring. One patient with Grade V renal injury with severe associated injuries, underwent surgical management died postoperatively resulting in an overall mortality rate of 2.5%.

Table 5: Distribution of cases according to Management method (n=40)

Management method	Number (%)
Conservative Management	36 (90%)
Nephrectomy	4 (10%) 3g5,1g4

DISCUSSION

Renal trauma remains the most common genitourinary injury and predominantly affects young males involved in high-risk activities and road traffic accidents. In the present study, the mean age was 30 years, and 90% of patients were male, findings consistent with previous reports in the literature.^[5,7]

Blunt trauma accounted for 90% of cases, while penetrating injuries represented 10%. This distribution is comparable to published studies and current guidelines, which report that 80–90% of renal injuries result from blunt mechanisms.^[2,5] Hematuria was the most common presenting symptom, occurring in 90% of patients. However, the severity of hematuria does not always correlate with the degree of renal injury, emphasizing the importance of radiological evaluation.^[3,5]

All patients underwent contrast-enhanced computed tomography (CECT), which remains the gold standard for diagnosis and grading of renal trauma.^[2,5] The AAST grading system was used for injury classification and has been shown to correlate well with injury severity, management requirements, and prognosis.^[4,6] Grade III injury was the most common injury pattern in our study, accounting for 50% of cases.

The most significant finding of the present study was the high success rate of non-operative management (NOM). Conservative treatment was successful in 90% of patients, supporting current recommendations that advocate NOM as the preferred approach in hemodynamically stable patients.^[5,9,10] Recent studies have demonstrated successful renal preservation even in selected high-grade injuries managed conservatively.^[6,9]

Nephrectomy was required in only four patients (10%), including one patient who failed initial conservative management. This highlights the importance of close monitoring and timely intervention when clinical deterioration occurs. Similar low nephrectomy rates have been reported in contemporary trauma series.^[7,8]

Associated injuries were present in 30% of patients and had a significant impact on outcomes. The single mortality observed in our study was attributable to severe associated injuries rather than renal trauma itself. This finding is consistent with previous studies demonstrating that prognosis is largely influenced by concomitant injuries and overall hemodynamic status.^[7]

Overall, our results reinforce contemporary guideline recommendations that emphasize accurate radiological

grading, hemodynamic assessment, and renal preservation through non-operative management whenever feasible.^[3,7,10]

CONCLUSION

Renal trauma predominantly affects young males and is usually secondary to blunt trauma. Grade III injury was the most common injury pattern observed. Contrast-enhanced CT is essential for accurate diagnosis and grading. Most hemodynamically stable patients can be successfully managed with non-operative treatment, resulting in excellent renal preservation. Associated injuries remain an important determinant of prognosis and clinical outcome.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Morey AF, Brandes S, Wang J, et al. Urotrauma Guideline 2020: AUA Guideline. *J Urol*. 2021;205(1):30–35.
2. European Association of Urology. EAU Guidelines on Urological Trauma. 2025.
3. Santucci RA, Wessells H, Bartsch G, et al. Evaluation and management of renal injuries: consensus statement of the renal trauma subcommittee. *BJU Int*. 2004;93:937–954.
4. Buckley JC, McAninch JW. Revision of current American Association for the Surgery of Trauma renal injury grading system. *J Trauma*. 2011;70(1):35–37.
5. Cocolini F, Moore EE, Kluger Y, Biffl W, Leppäniemi A, Matsumura Y, et al. Kidney and uro-trauma: WSES-AAST guidelines. *World J Emerg Surg*. 2019;14:54. doi:10.1186/s13017-019-0274
6. Moore EE, Shackford SR, Pachter HL, McAninch JW, Browner BD, Champion HR, et al. Organ injury scaling: spleen, liver, and kidney. *J Trauma*. 1989;29(12):1664–1666.
7. Santucci RA, Fisher MB. The literature increasingly supports expectant (conservative) management of renal trauma—a systematic review. *J Trauma*. 2005;59(2):493–503.
8. van der Wilden GM, Velmahos GC, Joseph DK, Jacobs L, Debusk MG, Adams CA, et al. Successful nonoperative management of the most severe blunt renal injuries. *JAMA Surg*. 2013;148(10):924–929.
9. Erlich T, Kitrey ND. Renal trauma: the current best practice. *Ther Adv Urol*. 2018;10(10):295–303.
10. Aziz HA, Healey A, Karam J, et al. Management of adult renal trauma: a practice management guideline from the Eastern Association for the Surgery of Trauma. *BMC Surg*. 2023;23:22.