

Case Series

High-grade renal trauma: conservative management experiences in Morocco

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Received: 21 April 2026

Revised: 17 May 2026

Accepted: 08 June 2026

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ABSTRACT

Renal trauma accounts for 1-5% of abdominal injuries and is mostly caused by blunt mechanisms such as road traffic accidents. Non-operative management (NOM) is now the standard of care for hemodynamically stable patients, even with high-grade injuries. This retrospective case series included twelve patients with CT-confirmed renal trauma managed in Casablanca between March 2024 and March 2025. The median age was 35 years, and all patients were male. High-grade injuries predominated (AAST IV: 7; V: 5). Conservative management was performed in 91.7% of cases; five patients required double-J stenting for urinoma, and one unstable gunshot case underwent nephrectomy. Early complications occurred in five patients, mainly urinomas. At six-month follow-up, renal function was preserved in all cases. Conservative management proved safe and effective for high-grade renal trauma, even without embolization access, with excellent short- and mid-term outcomes.

Keywords: Renal trauma, Kidney injury, Non-operative management, AAST classification, Urinoma, Resource-limited setting

INTRODUCTION

Renal trauma accounts for 1-5% of abdominal injuries, most commonly resulting from blunt mechanisms such as road traffic accidents in young adults.¹ Contrast-enhanced computed tomography (CT) is the gold-standard investigation for diagnosis, AAST grading, and therapeutic decision-making.²

Over the past two decades, management has shifted toward NOM, even for many high-grade (IV-V) injuries in hemodynamically stable patients.³ Large retrospective series have demonstrated high renal salvage rates and reduced morbidity with NOM, reserving surgery for hemodynamic instability, pedicular injuries, severe penetrating trauma, or failed conservative management.⁴ However, data from North African or resource-limited

contexts remain scarce, where access to embolization and standardized imaging follow-up is often limited. In this context, we report 12 months experience from a Moroccan tertiary center involving 12 patients (mostly AAST IV-V), focusing on clinical and radiologic profiles, predominance of conservative management, selective use of double-J stenting for urinomas, and short- to mid-term outcomes. This series provides a contextual contribution from a resource-limited setting, where arterial embolization was not routinely available.⁵

CASE SERIES

Study design and setting

This was a retrospective descriptive and analytical study conducted in department of urology, over 12 months (March 2024 to March 2025).

The study included all patients admitted for renal trauma, either directly to the urology department or referred from the surgical emergency unit.

All patients with post-traumatic renal injury, whether blunt or penetrating, were eligible for inclusion, provided that the diagnosis was confirmed by abdominopelvic CECT or intraoperative findings.

Exclusion criteria were age under 15 years, iatrogenic renal injuries (e.g., biopsy, surgery, endourological procedures) and incomplete medical records or unavailable imaging.

Diagnostic and therapeutic approach

Abdominopelvic CECT was the reference diagnostic tool, used to grade the injury (AAST) and guide management.

Hemodynamically stable patients were treated conservatively, including bed rest, close clinical and laboratory monitoring, and follow-up imaging.

A double-J ureteral stent was inserted in cases of documented urinoma or persistent urinary leakage.

Surgical exploration (partial or total nephrectomy) was reserved for hemodynamically unstable patients or those with complex renal or vascular injuries, especially penetrating trauma.

All patients underwent clinical, biochemical, and radiological follow-up for up to six months post-injury

Data completeness was verified before analysis, and missing values were handled by case exclusion.

Patient characteristics

Twelve patients were included in this series, all of whom were male (100%), with a median age of 35 years [IQR: 30-39].

The mechanism of injury was predominantly road traffic accidents (RTA) in 10 cases (83.3%), followed by falls in 1 case (8.3%) and a gunshot wound in 1 case (8.3%).

All injuries were blunt, except for the gunshot wound. The laterality of renal trauma was evenly distributed (6 right, 6 left). Polytrauma was present in 4 patients (33.3%).

At admission, hemodynamic status was stable in most patients, except for one patient with a grade V AAST lesion and moderate instability, and another with a gunshot wound, who was hemodynamically unstable and underwent emergency surgical exploration (Table 1).

Macroscopic hematuria was observed in 9 cases (75%), while microscopic hematuria was found in the 3 cases (25%).

Table 1: Overview of clinical characteristics, management, and outcomes of renal trauma cases.

Parameters	N	Percentages (%)
Sex (male)	12	100
Median age (in years)	35 (30-39)	-
Mechanism of injury		
Road traffic accident	10	83.3
Gunshot wound	1	8.3
Fall	1	8.3
AAST grade		
Grade IV	7	58.3
Grade V	5	41.7
Hemodynamic instability	2	16.7
Management		
Conservative	11	91.7
Surgical (nephrectomy)	1	8.3
Double-J stent placement	5	41.7
Blood transfusion	2	16.7
Early complications	5	41.7
Readmission (30 days)	1	8.3
Median hospital stay (days)	8 (7-11)	-
Renal function at 6 months	-	-
Post-traumatic hypertension	0	0
Final outcome		
Asymptomatic	10	83.3
Mild unilateral deficit	1	8.3
Persistent HTA	0	0

Imaging and classification

Abdominal ultrasonography was performed in 11 patients (91.7%), most often revealing a perirenal hematoma. as shown (Figure 1).

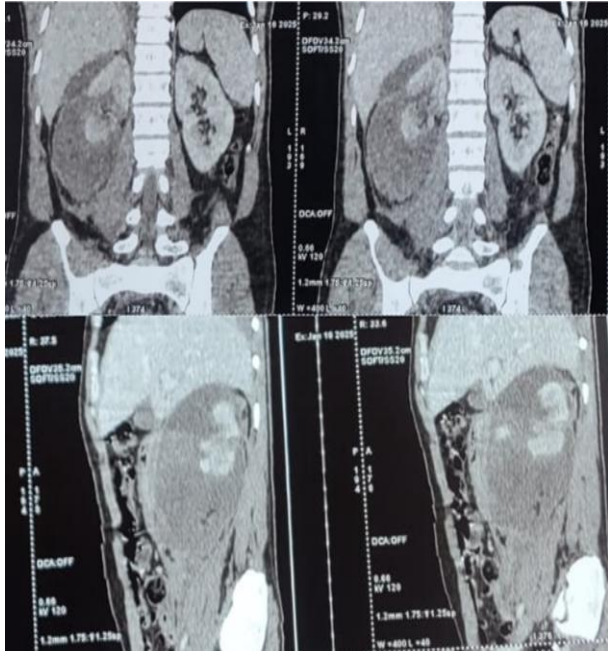


Figure 1: Contrast-enhanced CT images of a renal trauma (AAST grade IV).

Contrast-enhanced abdominopelvic CT scan was performed in all patients (100%).

According to the AAST classification, 7 patients (58.3%) had grade IV injuries, and 5 patients (41.7%) had grade V injuries (Figure 2).

The most common findings were deep renal lacerations associated with perirenal hematoma, contrast extravasation, or urinoma.

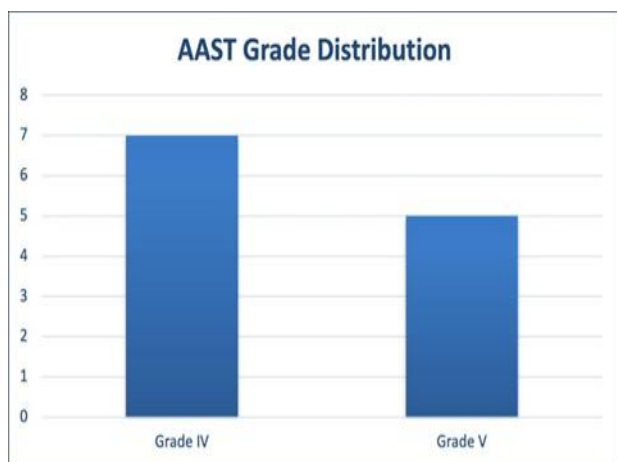


Figure 2 : Distribution of renal trauma according to AAST grade.

Management

A conservative approach was adopted in the majority of cases (11/12; 91.7%).

A double-J ureteral stent was inserted in 5 patients (41.7%), all of whom had urinomas confirmed on follow-up CT.

Only one patient, with a gunshot wound (AAST V) and hemodynamic instability, required emergency surgical exploration and total nephrectomy (Figure 3).

No selective arterial embolization was performed in this series.

Blood transfusion was required in 2 patients (16.7%)-one with a gunshot wound and one with a blunt grade V injury.

The median hospital stay was 8 days [IQR: 7-11].

All conservatively managed patients showed rapid hemodynamic stabilization and favorable outcomes.

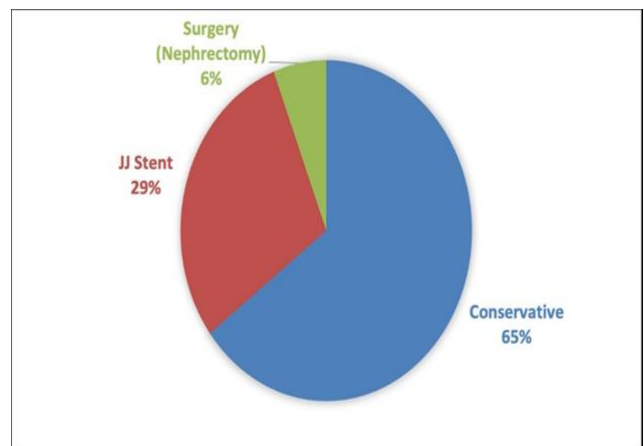


Figure 3: Management strategy of renal trauma cases.

Complications and short-term outcomes

Early complications were observed in 5 patients (41.7%).

Four of them developed a urinoma, diagnosed on follow-up CT performed for persistent flank pain.

All were treated by secondary double-J stent placement, with complete resolution confirmed on imaging follow-up.

Two patients developed secondary urinary tract infections, one of whom also had an associated urinoma (Figure 4).

There was one hospital readmission, for gross hematuria occurring on post-trauma day 10, which resolved with conservative treatment.

No repeat surgery was required after the initial management.

Follow-up imaging was performed in 9 patients (75%), demonstrating complete radiological resolution and good renal functional recovery.

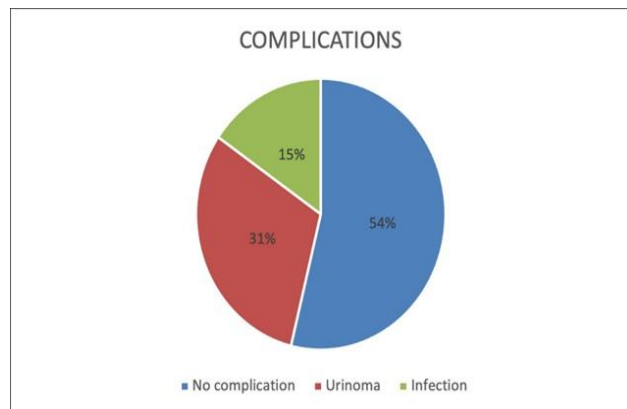


Figure 4 : Post-traumatic complications.

Mid-term follow-up

Biological evaluation showed stable renal function, with a median serum creatinine of 90 µmol/L at six months.

No cases of post-traumatic hypertension were recorded.

At last follow-up, 10 patients (83.3%) were asymptomatic, and 1 patient (8.3%) had mild unilateral functional impairment.

Exploratory analysis by AAST grade

Descriptive comparison showed that grade V injuries were more frequently associated with hemodynamic instability, observed in two out of five patients, whereas no instability occurred among those with grade IV lesions.

Similarly, blood transfusion was required only in patients with grade V trauma, while none of the grade IV cases needed transfusion.

The median hospital stay was also longer in the grade V group (10 days) compared with grade IV injuries (7 days).

Complications occurred more often in grade V injuries (60%) than in grade IV (28.6%), although this difference did not reach statistical significance due to the small sample size.

DISCUSSION

Renal trauma accounts for approximately 1-5% of all abdominal injuries, with most cases resulting from blunt mechanisms, particularly road traffic accidents in young adult males.^{6,7} This male predominance and the frequent association with polytrauma have been described both in African series and in multicentric international studies.^{5,8} Our cohort confirms this profile, with 83% of injuries due to road traffic accidents and a median patient age of 35 years.

Contrast-enhanced CT remains the reference imaging modality for diagnosis and grading of renal injuries.⁹ It allows accurate assessment of laceration depth, contrast extravasation, and urinoma formation, thereby guiding management according to the revised AAST classification.¹ Our results illustrate this pivotal role of CT, performed in 100% of cases, with lesions predominantly classified as grade IV (58.3%) and grade V (41.7%).

This distribution mirrors that reported by Hoge et al and Lanchon et al.^{6,10}

Recent guideline updates have consolidated NOM as the first-line approach for hemodynamically stable patients, including those with severe (high-grade) injuries.^{3,11} Meta-analyses and prospective series confirm that NOM achieves success rates exceeding 85-90%, with satisfactory renal preservation and low morbidity, while markedly reducing the need for surgery.^{12,13} In our series, 11 of 12 patients (91.7%) were treated conservatively, and only one unstable gunshot case required emergency total nephrectomy.

This surgical rate of 8% is consistent with international standards, which range between 5 and 15%.^{3,4}

Indications for surgery remain limited to hemodynamic instability, pedicular avulsion, or major penetrating trauma, in accordance with the criteria defined by Santucci and Fisher.¹⁴

Selective arterial embolization, when available, is an effective alternative that can prevent nephrectomy in many cases of active bleeding.¹⁵ However, this option remains unavailable in several Moroccan institutions, justifying a management strategy centered on NOM combined with radiologic surveillance and internal drainage.^{5,8}

The most common post-traumatic complications are urinoma and urinary tract infection.¹⁶ In our series, the four urinomas detected on follow-up CT were successfully treated by secondary double-J stent placement, achieving complete resolution.

Several authors have confirmed the effectiveness of endouretal drainage for low-output urinary leaks, with healing rates exceeding 90%.^{10,12}

The rate of urinary infection observed in our study (16.7%) is comparable to those reported by Erlich and Kitrey et al Lanchon et al.^{10,13}

The need for follow-up imaging remains debated.

Most authors recommend targeted reassessment for AAST grades $\geq$ IV or in cases of persistent symptoms (fever, flank pain, hematuria).^{3,4,9} Our practice follows these recommendations: 75% of patients underwent follow-up imaging, which confirmed the resolution of urinomas.

Functionally, renal preservation in our cohort is consistent with long-term follow-up studies, which report that over 80% of patients maintain stable renal function.^{12,16} No post-traumatic hypertension was observed in our cohort at six-month follow-up, despite its reported incidence of 5-20% in long-term series.¹⁵

The exploratory comparison between AAST grades IV and V in our cohort showed a clear trend toward more frequent transfusions, complications, and longer hospital stay among grade V injuries.

Although these differences did not reach statistical significance due to small numbers, they are consistent with observations from larger cohorts.^{10,11}

Finally, this series highlights the feasibility of NOM in a Moroccan context lacking interventional radiology, through a combination of close clinical monitoring, judicious CT control, and selective internal drainage.

These findings support the observations of Mingoli et al and Aragona et al showing that comparable outcomes to those of high-resource centers can be achieved provided that management is multidisciplinary and coordinated.^{11,17}

Despite the small cohort, our findings reinforce the global trend toward conservative treatment of severe renal trauma and highlight the feasibility of applying such strategies safely in resource-limited settings.

The main limitations of our study are the small sample size and its retrospective single-center design, which may limit generalizability. Nonetheless, it provides valuable insight into real-world management where interventional radiology is unavailable.

NOM is safe and effective for high-grade renal trauma (AAST IV-V) in hemodynamically stable patients, even in the absence of interventional radiology facilities. Contrast-enhanced CT scan is essential for accurate injury grading, detection of complications, and guidance of therapeutic strategy in renal trauma. Urinoma

represents the most frequent early complication of high-grade renal trauma and can be successfully managed by ureteral double-J stenting without surgical exploration. Surgical intervention should be reserved for patients with hemodynamic instability or severe penetrating injuries. Close clinical and radiological follow-up is crucial to ensure renal preservation and favorable outcomes after conservative management.

CONCLUSION

This case series supports the growing evidence that NOM is a safe and effective strategy for hemodynamically stable patients with high-grade renal trauma, including AAST grade IV and selected grade V injuries. Our experience shows that satisfactory results can be achieved even in centers without access to embolization, provided that patients are carefully monitored and managed with an appropriate multidisciplinary approach.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: Not required

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Cite this article as: Mahanna HA, Kbiro A, Moataz A, Dakir M, Debbagh A, Aboutaieb R. High-grade renal trauma: conservative management experiences in Morocco. *Int Surg J* 2026;13:1439-44.