



Interventional Radiology in the Management of Urologic Trauma: A Contemporary Review

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Urologic trauma encompasses a spectrum of injuries involving the kidney, ureter, bladder, and urethra, with management strategies increasingly emphasizing organ preservation through minimally invasive, image-guided approaches. The updated American Association for the Surgery of Trauma 2025 grading system provides the most recent guideline for renal trauma classification, reflecting evolving imaging standards and management principles. In parallel, interventional radiology (IR) has assumed an increasingly important role in contemporary trauma care, offering effective, organ-preserving solutions through endovascular and percutaneous techniques. Renal trauma, the most frequent form of genitourinary injury, is now primarily managed non-operatively in hemodynamically stable patients, with transcatheter arterial embolization and stent-based repair serving as cornerstones of hemorrhage control and renal salvage in high-grade lesions. Clinical evidence demonstrates that selective or superselective embolization achieves high technical success and renal preservation, consolidating IR as a key component of multidisciplinary trauma management. Injuries to the lower urinary tract remain complex, but minimally invasive, image-guided interventions are increasingly recognized as integral to modern care, particularly in controlling hemorrhage and preserving function. Superselective embolization, percutaneous urine diversion, and fluoroscopic urethral realignment exemplify how IR provides life-saving, organ-preserving options for ureteral, bladder, and urethral trauma. Collectively, these developments underscore the expanding impact of IR across the full spectrum of urologic trauma management.

Keywords: Urologic injuries; Kidney injuries; Interventional radiology; Embolization, Therapeutic; Endovascular procedures

Introduction

Urologic trauma encompasses a wide spectrum of renal and lower urinary tract injuries, each with distinct diagnostic challenges and management considerations [1-8]. Advances in multidetector computed tomography (MDCT) have mark-

edly improved detection of vascular and collecting system injuries [1], and the 2025 update of the American Association for the Surgery of Trauma (AAST) Kidney Injury Scale reflects these contemporary imaging standards [9]. In parallel, interventional radiology (IR) has become increasingly central to trauma care, offering minimally invasive, organ-preserving options for hemorrhage control and urinary tract reconstruction [10-15].

This review provides an updated overview of renal-trauma mechanisms, imaging evaluation, and the revised AAST 2025 classification, with emphasis on the indications, techniques, and outcomes of IR-based management. It also summarizes the expanding role of image-guided interventions in ureteral, bladder, and urethral trauma, presenting an IR-focused

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framework to support decision-making across the full spectrum of urologic trauma.

Part 1. Kidney

Mechanisms of Renal Injury

Blunt Trauma

The kidney, a retroperitoneal organ shielded by ribs, Gerota's fascia, and perirenal fat, is most often injured by blunt mechanisms such as motor vehicle collisions or falls [6, 7]. Injuries range from cortical laceration to perirenal hematoma and, in severe cases, complete parenchymal rupture [6,7]. Renal trauma occurs in approximately 8–10% of patients with abdominal trauma [6]. Hemorrhage may extend into the collecting system, producing gross or microscopic hematuria [12,16].

High-energy deceleration injury, typical of high-speed collisions, can cause renal artery dissection, thrombosis, or avulsion [17–23]. Data from the National Trauma Data Bank report renal artery injury in 0.05% of blunt trauma cases, accounting for 2.5–4% of all renal injuries, more often than in penetrating trauma [7]. Hematuria may be absent, delaying diagnosis [7]. Renal artery occlusion usually follows intimal disruption and thrombosis [17–19]. On contrast-enhanced CT, global nonenhancement with a delayed cortical rim sign suggests collateral perfusion [4,18].

Penetrating Trauma

Penetrating renal injuries—including stab, gunshot, and iatrogenic tract injuries from nephrostomy or biopsy—create narrow parenchymal tracts and carry a high risk of arterial disruption, pseudoaneurysm, or arteriovenous fistula (AVF) [16,24]. Patients often present with persistent hematuria, occasionally progressing to hemodynamic instability or hemorrhagic shock [16,25–27].

Iatrogenic vascular injury is increasingly observed due to the widespread use of percutaneous nephrostomy, lithotripsy, and renal biopsy. Vascular complications after biopsy, including AVF, were among the first indications for selective renal embolization. Delayed bleeding from pseudoaneurysm or AVF remains a characteristic presentation [28].

Imaging Evaluation

Historically, retrograde ureteropyelography and intravenous pyelography were used to evaluate renal trauma but were limited in assessing parenchymal integrity and are now

obsolete [3].

Ultrasonography (US) is a rapid, bedside, noninvasive tool in acute trauma, mainly for detecting intraperitoneal fluid within the Focused Assessment with Sonography for Trauma, commonly known as the FAST protocol. However, its sensitivity for retroperitoneal hemorrhage and solid organ injury is limited [5,29].

Contrast-enhanced CT (CECT) is now the diagnostic gold standard for suspected renal injury [1,4,30,31]. Modern MDCT provides rapid, high-resolution imaging even in unstable patients, delineating laceration depth, arterial extravasation, segmental devascularization, urinary extravasation, and associated abdominal trauma through arterial, venous, and delayed phases [3]. CT is essential in patients with gross hematuria, those with microscopic hematuria and hemodynamic instability, or those sustaining high-energy mechanisms [1,4,30,31].

Conventional angiography, once a diagnostic modality, is now primarily therapeutic. It is reserved for endovascular management of traumatic AVF, pseudoaneurysm, or active arterial bleeding, and for targeted assessment of renovascular injury when CT is inconclusive [28,32–36].

Classification of Renal Trauma

The AAST Kidney Injury Scale remains the standard framework for grading renal trauma [8,9,28]. Earlier versions focused on laceration depth and perirenal hematoma, whereas the 2025 update incorporates contemporary CT features and links injury patterns to expected management, emphasizing collecting system disruption, segmental devascularization, and major vascular injury [2,9,30]. In this revision, perirenal hematoma is quantitatively assessed using the hematoma radial distance (HRD), defined as the longest perpendicular distance from the renal parenchymal surface to the outer hematoma margin within the superior-inferior boundaries of the kidney. HRD thresholds now contribute to distinguishing lower-grade from higher-grade contusions and lacerations [9].

High-grade categories now include active arterial extravasation, urinary leak, segmental vascular injury, and main hilar disruption, which correlate with the need for IR-directed therapy rather than immediate nephrectomy [28,37]. The scale ranges from minor subcapsular hematoma or contusion (grades I–II) to deep laceration with urinary extravasation or segmental devascularization (grade IV) and to shattered kidney or hilar avulsion with global devascularization (grade V).

The 2025 revision also integrates IR algorithms: grades I–II

are observed; most grade III and many grade IV lesions are managed non-operatively with transcatheter arterial embolization (TAE) when active bleeding or expanding hematoma is present; and even selected grade V cases may be treated with embolization or stent repair if hemodynamic stability is achieved [33,34,36]. This evolution reflects the shift from mandatory nephrectomy to kidney-preserving, image-guided therapy in stabilized patients [33,34,36]. Imaging criteria extracted from the AAST 2025 Kidney Injury Scale are presented in Table 1.

Management Strategies

The main goals in renal trauma management are rapid hemorrhage control, renal preservation, and prevention of complications such as urinary leakage or sepsis [8,11,38-40]. Modern practice favors non-operative or minimally invasive management supported by advances in CT imaging, critical care, and endovascular techniques [1,6,10,13,36,41,42].

Blunt Renal Injury

Blunt trauma accounts for most renal injuries. Low-grade (AAST I-II) lesions, nearly 75% of cases, usually heal with conservative treatment—hemodynamic monitoring, transfusion as needed, and serial hematocrit checks [12,16,37].

Management of grades III-IV is individualized. In hemodynamically stable patients, non-operative management is gen-

erally feasible. The AAST 2025 revision defines active arterial bleeding as a grade IV criterion, underscoring selective or superselective TAE as an appropriate intervention [9,28,37,42]. Embolization is indicated when CT shows active extravasation, enlarging hematoma, or segmental vascular injury [33,34,36].

Surgical exploration is now limited to refractory hemodynamic instability, combined visceral injury, or major urinary extravasation with > 50% devitalized parenchyma. Even in grade V injuries, published clinical experiences demonstrate that selective embolization can achieve kidney preservation in selected stable patients [33,36]. Kwon et al. [34] demonstrated that superselective TAE can be effectively applied even in grade V renal trauma, yielding high technical and renal-preservation success. These results support its adoption as a viable first-line option for hemodynamically stabilized patients whenever feasible.

Penetrating Renal Injury

Penetrating trauma—typically stab or gunshot wounds—has a higher incidence of vascular injury, pseudoaneurysm, and AVF formation [16]. Management parallels that of blunt injury: hemodynamic stabilization, bleeding control, and renal preservation.

Non-operative management is suitable for stable patients with limited parenchymal disruption and minimal urinary

Table 1. Kidney Organ Injury Scale (AAST 2025, Imaging Criteria Only)

AAST Grade	Imaging Criteria
I	Subcapsular hematoma < 3.5 cm without active bleeding; parenchymal contusion without laceration.
II	Parenchymal laceration length < 2.5 cm; HRD < 3.5 cm without active bleeding
III	Parenchymal laceration length ≥ 2.5 cm; HRD ≥ 3.5 cm without active bleeding; partial kidney infarction; vascular injury without active bleeding; laceration extending into urinary collecting system and/or urinary extravasation
IV	Active bleeding from kidney; pararenal extension of hematoma; complete/near-complete kidney infarction without active bleeding; MFK without active bleeding; complete/near-complete ureteropelvic junction disruption.
V	Main renal artery or vein laceration or transection with active bleeding; complete/near-complete kidney infarction with active bleeding; MFK with active bleeding.

Grade based on highest grade assessment made on imaging, at operation or on pathologic specimen. Each kidney should be graded separately based on the highest grade injury it contains. Multiple injuries are not upgraded to a higher level of injury. Grade III vascular injuries are contained vascular injuries, which do not result in active bleeding. These include pseudoaneurysm, arteriovenous fistula, dissection, thrombosis, intimal flap, and mural hematoma. Active bleeding occurs with uncontained (laceration or transection) injuries. On imaging, active bleeding is defined as presence of vascular contrast extravasation seen as a collection of vascular contrast outside of a vessel, demonstrated on arterial or venous or delayed phase. Hematoma around the kidney is measured by HRD and is defined as the longest perpendicular distance from the renal parenchymal border to the hematoma border within the boundaries of superior and inferior kidney margins. This is measured on axial CT images and on the bulk of the hematoma. It does not include a thin sliver of hematoma that extends beyond the bulk of the hematoma or bleeding originating from other organs. Pararenal hematoma is defined as a hematoma that crosses the right border of the IVC for a right-sided bleed, or the left border of the aorta for left-sided bleed, or extends beyond the aortic bifurcation inferiorly. Multifragmented kidney is defined as three or more injured parenchymal segments with fluid or blood between. Renal laceration is defined by its longest length on a single axial image.

AAST, American Association for the Surgery of Trauma; HRD, hematoma rim distance; MFK, multifragmented kidney; CT, computed tomography; IVC, inferior vena cava.

leak [12]. Embolization serves as an adjunct or alternative to surgery when localized arterial bleeding or pseudoaneurysm is identified [16,43]. In unstable patients or those with bowel contamination, surgical exploration or nephrectomy remains necessary.

Delayed hemorrhage—2–3 weeks after injury—is common in penetrating or high-grade trauma due to pseudoaneurysm or AVF formation and is usually controlled by targeted embolization [16,19].

Renal Artery Injury

Renal artery trauma (AAST IV–V) includes dissection, thrombosis, and avulsion, often resulting in devascularization [17–19]. Treatment options comprise nephrectomy, surgical repair, endovascular intervention, or observation. Ischemia beyond two hours generally causes irreversible damage [17,19,32,41].

Endovascular stent placement has largely replaced open repair, offering effective revascularization with lower morbidity [44]. Stent-graft repair is preferred for focal dissection or partial avulsion of the main renal artery with preserved distal flow, while TAE remains the treatment of choice for active bleeding or pseudoaneurysm [44]. These endovascular approaches illustrate the principle of image-guided hemorrhage control and renal salvage over nephrectomy whenever anatomically possible [23,43,45].

Endovascular Techniques

Endovascular therapy is central to modern renal-trauma care, providing rapid hemostasis and renal preservation while avoiding nephrectomy [23, 45]. Two main approaches are used—TAE and endovascular stent-graft placement—depending on vascular injury pattern and hemodynamic status.

Indications and Timing

TAE is indicated for active arterial extravasation in AAST IV–V injuries, pseudoaneurysm, AVF, delayed hemorrhage, and rebleeding after transient stabilization [33,34,36]. It may also be applied prophylactically when a transected segmental artery carries a high rupture risk [33,34,36].

Damage-control interventional radiology—often referred to as DCIR—prioritizes expedient hemostasis over exhaustive superselective attempts; if microcatheterization fails within ~10 minutes, proximal or sacrifice-level embolization is justified to save life before organ [46].

Technical Considerations

Initial angiography with abdominal aortography defines renal arterial anatomy and accessory branches [45]. Coaxial microcatheter systems permit superselective access to segmental branches, minimizing infarction [34]. Superselective TAE is ideal when feasible, whereas proximal embolization may be necessary in unstable patients for damage control [45,46].

Embolic Materials

Choice of embolic agent depends on vessel size and bleeding pattern. Gelatin sponge is preferred for diffuse low-pressure bleeding because it provides temporary occlusion. N-butyl cyanoacrylate (NBCA) offers rapid permanent occlusion for distal or multifocal bleeding. Coils are used for large or high-flow AVFs; detachable types allow precise deployment and reduce migration risk [13,35,45].

Endovascular Stent Placement

Stent-graft placement is indicated for main renal-artery dissection, avulsion, or focal transection with potential for revascularization [20–23,47]. It is also used for contained hemorrhage with preserved distal flow or iatrogenic rupture. Microguidewires and angled sheaths facilitate precise deployment.

Both balloon-expandable and self-expanding stents achieve effective revascularization and exclude extravasation, providing a kidney-preserving alternative to nephrectomy [14,21].

Contraindications and Complications

No absolute contraindications exist, but care is required in patients with renal dysfunction or infection because contrast administration may worsen the injury [45]. In solitary kidneys, maximal selectivity is recommended, although life-saving embolization takes precedence.

Complications include puncture-site bleeding, non-target embolization, and coil migration, which can be corrected with a snare catheter. Post-embolization syndrome—flank pain, leukocytosis, and low-grade fever—usually resolves within 48 hours with supportive care [34,36].

Clinical Outcomes

Renal embolization was first described by Bookstein et al. [24] in 1973 for post-biopsy AVF treatment and has since become integral to renal-trauma management. The evolution of therapy over the past two decades highlights the transition from surgical to conservative and endovascular approaches

for high-grade (AAST IV–V) injuries (Table 2).

In a retrospective clinical series, Kwon et al. [34] achieved an 81% technical success and 79% renal-preservation rate in patients with grade V injuries treated with superselective TAE, reinforcing that endovascular management ensures durable hemostasis and organ salvage even in complex high-grade vascular trauma. Brewer et al. [33] similarly achieved hemostasis without nephrectomy in nine unstable grade V patients and reported durable renal function on follow-up.

Santucci et al. [35] noted that over 78% of high-grade injuries were surgically managed in 2000, whereas May et al. [40] later documented 75% non-operative management—illustrating the paradigm shift toward IR-based care. Hagiwara et al. [14] prospectively treated grade III–V injuries with early angiography, achieving embolization success in 8 of 21 patients and > 90% avoidance of laparotomy. These findings confirm that TAE achieves rapid hemostasis and renal salvage even in high-grade trauma.

For renovascular trauma, Whigham et al. [23] first applied endovascular stenting in 1995; subsequent studies demonstrated durable perfusion and parenchymal preservation [20,22,47]. Although short-term results are excellent, long-term renal-function data remain limited, underscoring the need for multicenter registries [10,13].

Grange et al. [10] reported 93.7% clinical success in 79 emergency renal embolizations with minimal rebleeding and

no major complications. Collectively, evidence from 2000–2025 supports TAE and stent-based therapy as front-line modalities for hemodynamically stabilized high-grade renal trauma, markedly reducing nephrectomy rates and preserving renal function [13,33,34,36]. Continuous advances in embolic materials, rapid trauma imaging, and integration of interventional radiologists within trauma teams will further enhance outcomes and consolidate endovascular therapy as the standard of care for complex renal injuries [13].

Part 2. Ureter

Epidemiology and Mechanisms

Ureteral injury is uncommon, accounting for less than 1% of all genitourinary injuries [48], yet it is clinically significant because of delayed diagnosis and the potential for urinoma, infection, and ischemic stricture [49]. Iatrogenic injury during gynecologic or colorectal procedures remains the most frequent cause, but blunt or penetrating trauma can also damage small peri-ureteral branches, producing concealed retroperitoneal bleeding [50]. When hemodynamic instability or unexplained hematoma persists, selective angiography should be considered.

Imaging Evaluation and Diagnosis

CECT with delayed excretory phase provides the initial

Table 2. Management trends and outcomes in high-grade (AAST IV–V) renal trauma

Study	Year	No. of Cases (Gr IV, V)	Management of Grade IV Injury	Management of Grade V Injury	Key Findings / Relevance to IR
Santucci et al. [35]	2000	2,047* (not stratified)	22% conservative / 9% nephrectomy / 69% renorrhaphy		Early era showing surgery dominant.
Kuo et al. [39]	2002	95 (16, 8)	56% conservative / 25% nephrectomy / 19% exploratory	25% conservative / 63% nephrectomy	Initial shift toward selective non-operative approach.
Wright et al. [8]	2006	6,892 (530, 228)	78% conservative / 22% nephrectomy	44% conservative / 56% nephrectomy	Large registry showing growing non-operative trend.
Elashry et al. [11]	2008	72 (57, 15)	84% conservative / 16% surgical	20% conservative / 80% surgical	IR emerging as bridge to surgery.
Dugi et al. [38]	2010	33 (33, 0)	4A: predominantly conservative; 4B: higher need for intervention	–	Proposed Grade IV risk stratification, supporting selective intervention and predominant non-operative care.
May et al. [40]	2016	47 (39, 8)	97% conservative / 3% surgical	75% conservative / 25% surgical	Contemporary series confirming conservative success.
Kwon et al. [34]	2022	16 (0, 16)	–	81% technical success, 79% renal preservation, 0% mortality after superselective RAE	Demonstrated effective superselective RAE with meaningful renal parenchymal salvage.
Grange et al. [10]	2024	79 (5, 7)	93.7% clinical success, 3.8% re-embolization	Preserved renal function in > 90% of cases	Confirms modern endovascular therapy as first-line for severe renal bleeding.

Abbreviations: AAST, American Association for the Surgery of Trauma; RAE, Renal Arterial Embolization; IR, Interventional Radiology.

*Grade-specific (AAST IV–V) case numbers were not available in the original publication; total cohort size is shown.

roadmap for identifying contrast leakage or abrupt cutoff [51]. Minor arterial bleeding is often angiographically occult, but cone-beam CT (CBCT) can reveal subtle pseudoaneurysms arising from ureteral branches. Park demonstrated that CBCT can localize bleeding points otherwise invisible on standard angiography, guiding rapid and precise embolization [52].

Interventional Techniques and Outcomes

Under fluoroscopic guidance, a 1.5–1.7 Fr microcatheter is advanced into the affected ureteric branch arising from the renal artery, aorta, or common/internal iliac artery. NBCA diluted with iodized oil or detachable coils are selected according to flow and anatomy. Superselective embolization achieves immediate hemostasis without compromising ureteral perfusion. In Park's case, clinical result was favorable, with no ischemic strictures on follow-up [52]. Case reports by Maleux et al. [49] and Kase et al. [50] documented durable control of postoperative or iatrogenic bleeding after microcoil or NBCA embolization. More recently, Saiga et al. [51] reported pseudoaneurysms in ureteral branches of the renal artery successfully treated by combined NBCA-coil therapy. These results confirm that distal embolization is both safe and definitive when performed under flow control. Across contemporary literature, technical success of ureteric-branch embolization approaches 100%, with negligible ischemic complications [49–52].

Part 3. Bladder

Epidemiology and Mechanisms

Bladder trauma represents approximately 1–2% of genitourinary injuries and is frequently associated with pelvic fractures or penetrating pelvic wounds. Most extraperitoneal ruptures heal with catheter drainage, while intraperitoneal dome ruptures require surgical repair. However, focal arterial bleeding from the vesical branches of the internal iliac artery constitutes a specific subset in which IR plays a hemostatic role [53].

Interventional Techniques and Outcomes

The superior and inferior vesical arteries supply the bladder base and dome through anastomotic channels. Injury to these vessels—whether iatrogenic, traumatic, or postoperative—can result in massive hematuria. When cystoscopy fails to localize the bleeding focus, angiography can demonstrate extravasation along the bladder wall. Superselective embolization is

performed with a microcatheter advanced into the vesical branch under roadmap guidance. Embolic agents include gelatin sponge, microcoils, or NBCA depending on vessel caliber and accessibility. Early reports, including Kim et al. [54], showed that distal or superselective vesical artery embolization can achieve immediate hemostasis without significant ischemic complications. A recent case report by Vanheer et al. [53] further confirmed complete bleeding control and preserved bladder function following bilateral vesical artery embolization.

When urethral catheterization is contraindicated, percutaneous suprapubic cystostomy performed by interventional radiologists under image guidance provides urinary diversion and pressure relief, facilitating healing of extraperitoneal tears. Complications such as bladder necrosis are now exceptional and linked to older, non-selective embolization practices. Modern IR techniques using microcatheters and controlled embolic material delivery ensure organ preservation and functional recovery [53,54].

Part 4. Urethra

Epidemiology and Mechanisms

Urethral injuries, particularly those associated with pelvic fracture, remain among the most challenging problems in urologic trauma. They account for approximately 10% of genitourinary trauma and carry high morbidity due to the risk of incontinence, impotence, and recurrent stricture [55,56].

Endovascular Management of Hemorrhage

Although urethral trauma typically presents with urinary retention and extravasation rather than active bleeding, recent literature has reported rare but significant arterial hemorrhage. De Bondt et al. described two cases of post-traumatic urethral hemorrhage originating from arteriospongious fistulae, successfully managed by superselective embolization with microcoils and an ethylene-vinyl alcohol-based liquid embolic agent, achieving complete hemostasis without ischemic complications [57]. This finding expands the role of IR in urethral trauma to include targeted embolization for refractory hemorrhage.

Fluoroscopic Urethral Realignment

Posterior urethral injury differs fundamentally from anterior injury in its mechanism and management. While anterior urethral injuries usually result from straddle trauma or instru-

mentation and can often be managed conservatively with catheter drainage, posterior urethral disruptions occur almost exclusively with pelvic fractures. In these cases, shearing forces separate the membranous urethra from the prostatic apex, creating complete luminal discontinuity surrounded by hematoma and soft-tissue distortion, conditions that complicate endoscopic repair [58-67].

Under combined ultrasound and fluoroscopic guidance, a percutaneous cystostomy tract is first created into the bladder to secure antegrade access. A 4 or 5-Fr angiographic catheter is inserted, and contrast is injected to delineate the proximal urethral stump. This step provides spatial orientation for aligning the disrupted segments. Through the retrograde route, a hydrophilic guidewire and angled catheter are advanced from the external meatus toward the site of disruption under fluoroscopy. The two approaches are visualized simultaneously with biplane fluoroscopy, allowing real-time assessment of the proximal and distal stumps in orthogonal projections.

When the luminal ends can be approximated, the retrograde wire is advanced into the bladder to establish a direct channel. If the two lumina cannot be directly traversed, a snare catheter introduced through the cystostomy tract can capture the retrograde wire to create a through-and-through connection. This technique is particularly valuable when hematoma or displacement prevents direct passage [15]. Once the continuous tract is established, a 14–18 Fr Foley or silicone catheter is gently advanced across the defect with the balloon seated in the bladder. The catheter is typically left in place for 4–6 weeks to permit epithelial healing and mucosal alignment. Follow-up voiding cystourethrography is performed prior to catheter removal to confirm continuity and absence of urine leakage [15].

This fluoroscopic realignment has the advantage of avoiding the need for lithotomy positioning or general anesthesia in patients with pelvic fractures, making it particularly suitable for polytrauma settings [15]. This sequence demonstrates the coordinated precision of IR and urology in re-establishing urethral continuity through minimally invasive, image-guided realignment and emphasizes the principle of functional restoration with minimal disruption, integrating radiologic precision into traditional reconstructive paradigms.

Conclusion

Renal trauma management has evolved toward organ-pre-

serving, minimally invasive strategies, supported by diagnostic and therapeutic advances in MDCT and IR, as well as by the updated AAST 2025 grading system. While most low-grade injuries recover with conservative treatment, TAE and stent-based techniques now constitute the cornerstone of hemorrhage control and renal salvage in high-grade trauma. The integration of IR into trauma care has markedly improved both survival and kidney-preservation outcomes.

Injury to the lower urinary tract remains a multidisciplinary challenge, with the role of interventional radiology still limited but steadily expanding through accumulating experience and research. Early diagnosis and minimally invasive, image-guided interventions are increasingly recognized as integral to modern management, particularly in controlling hemorrhage and preserving function. Superselective embolization, percutaneous urine diversion, and fluoroscopic urethral realignment exemplify how IR offers life-saving, organ-preserving solutions for ureteral, bladder, and urethral trauma.

Author contributions

Conceptualization, investigation, and manuscript writing: C.H.J. All aspects of the work were performed by the corresponding author.

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Conflict of interest

The author declares no conflicts of interest.

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