

UCSF

UC San Francisco Previously Published Works

Title

Role for Conservative Management in Grade V Renal Trauma

Permalink

<https://escholarship.org/uc/item/0hb2178g>

Journal

Investigative Urology, 209(3)

ISSN

0021-0005

Authors

Hakam, Nizar
Shaw, Nathan M
Lui, Jason
et al.

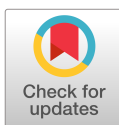
Publication Date

2023-03-01

DOI

10.1097/ju.00000000000003102

Peer reviewed



Role for Conservative Management in Grade V Renal Trauma

Nizar Hakam , Nathan M. Shaw, Jason Lui, et al.

Correspondence: Riccardo Mastroianni (email: Benjamin.Breyer@ucsf.edu).

Full-length article available at <https://doi.org/10.1097/JU.0000000000003102>.

Study Need and Importance: Nonoperative management of renal trauma is widely adopted especially in cases of low-grade injury. Few data exist on the American Association for the Surgery of Trauma grade V kidney injuries; thus, we examined a population of these patients in the National Trauma Databank between 2017 and 2019.

What We Found: We assessed 1,474 patients with grade V renal trauma who survived to discharge, of whom 557 (37.8%) were managed conservatively, defined as the absence of surgical or procedural intervention other than ureteral stent or percutaneous drain placement (see Table). In the multivariable analysis, penetrating trauma mechanism (OR 0.13, 95% CI 0.09-0.19, $P < .001$) and receiving transfusion (OR 0.22, 95% CI 0.17-0.29, $P < .001$) were associated with decreased odds of conservative management. In the total 1,919 patients with grade V injuries, rate of conservative management was similar (38.1%). After excluding 110 patients who died in the emergency department, there were 1,809 patients, of whom 625 (34.6%) were managed conservatively.

Limitations: The main limitation to this study is the lack of radiological data; thus, renal trauma grade misclassification may be present. We were not able to compare specific injury patterns between patients managed conservatively and operatively. Lack of treatment intent hindered efficacy assessment of treatment approaches.

Interpretation for Patient Care: A significant portion of patients with grade V renal trauma are amenable to conservative management. These data suggest that hemodynamic stability is an important deciding factor driving management. Clinical trials are needed

Table. Clinical Characteristics of Patients With Grade V Renal Trauma Who Survived to Discharge, Stratified by Management Approach

	Conservative management N=557	Operative management N=917	P value
Age, mean (SD), y ^a	28.9 (18.7)	30.7 (14.5)	.047
Sex, male, No. (%) ^b	388 (69.7)	740 (80.7)	< .001
Penetrating injury, No. (%)	51 (9.2)	482 (52.6)	< .001
Injury Severity Scale, median (IQR) ^c	34 (26-38)	34 (26-41)	.47
Pulse, mean (SD)	98.3 (25)	103.2 (26.9)	.0005
Hypotension, No. (%) ^d	179 (32.1)	252 (27.5)	.057
Glasgow Coma Scale, median (IQR)	15 (15-15)	15 (14-15)	.0006
Transfusion, No. (%)	152 (27.3)	594 (64.8)	< .001
Trauma center level, No. (%)			< .001
I	252 (45.2)	536 (58.5)	
II	117 (21)	142 (15.5)	
III	28 (5)	11 (1.2)	
Missing	160 (28.7)	228 (24.9)	
Associated injuries, No. (%)	350 (62.8)	789 (86)	< .001
Liver	182 (32.7)	416 (45.4)	< .001
Spleen	191 (34.3)	349 (38.1)	.145
Pancreas	28 (5)	188 (20.5)	< .001
Intestine	38 (6.8)	376 (41)	< .001
Peritoneum	10 (1.8)	80 (8.7)	< .001
Adrenal	69 (30.5)	89 (25.1)	.155
Abdominal aorta	6 (1.1)	29 (3.2)	.011

Abbreviations: IQR, interquartile range; SD, standard deviation.

^a All normally distributed continuous variables are expressed as a mean (SD) and were compared using t -test.


^b All categorical variables are expressed as a frequency (%) and were compared using χ^2 test.

^c All skewed continuous variables are expressed as a median (IQR) and were compared using Mann-Whitney test.

^d Hypotension was defined as systolic blood pressure.

to establish efficacy of such management in patients with stable clinical status and can avoid immediate surgical intervention.

Role for Conservative Management in Grade V Renal Trauma

Nizar Hakam ¹, Nathan M. Shaw,¹ Jason Lui,¹ Behzad Abbasi,¹ Jeremy B. Myers,² and Benjamin N. Breyer^{1,3*}

¹Department of Urology, University of California San Francisco, San Francisco, California

²Division of Urology, Department of Surgery, University of Utah, Salt Lake City, Utah

³Department of Epidemiology and Biostatistics, University of California San Francisco, San Francisco, California

Submitted June 14, 2022; accepted November 29, 2022; published December 7, 2022.

Support: None.

Conflict of Interest: The Authors have no conflicts of interest to disclose.

Ethics Statement: Institutional Review Board exemption was provided given data were de-identified.

Author Contributions: Data acquisition: NH, JL; study conception and design: NH, NS, BB. All Authors performed data analysis/interpretation. All Authors participated in drafting or critically revising the article. All Authors approved the article for submission.

Data Availability: Data are available through the American College of Surgeons (ACS) via <https://www.facs.org/quality-programs/trauma/quality/national-trauma-data-bank/datasets/>. The Authors do not own rights of sharing the raw data.

* Correspondence: Department of Epidemiology and Biostatistics, University of California, San Francisco, 1001 Potrero, Suite 3A, San Francisco, CA 94110 (telephone: 415-206-8805; email: Benjamin.Breyer@ucsf.edu).

Editor's Note: This article is the fifth of 5 published in this issue for which Category 1 CME credits can be earned. Instructions for obtaining credits are given with the questions on pages 647 and 648.

Purpose: We assessed the use of conservative management for American Association for the Surgery of Trauma grade V renal trauma in the National Trauma Databank.

Materials and Methods: We used data of grade V renal trauma patients in the 2017-2019 National Trauma Databank. Conservative management was defined by the absence of surgical or procedural intervention except for ureteral stent or percutaneous drain placement. We initially analyzed patients who survived to final hospital discharge and reported the percent utilization of conservative management. We then repeated our analysis in the overall grade V population and in all those who did not die in the emergency department.

Results: Of 1,474 who survived to discharge, 557 (37.8%) patients were managed conservatively. In the adjusted analysis, penetrating trauma mechanism (OR 0.13, 95% CI 0.09-0.19, $P < .001$) and receiving transfusion (OR 0.22, 95% CI 0.17-0.29, $P < .001$) were associated with decreased odds of receiving conservative management. Overall, there were 1,919 patients with grade V injury, of whom 731 (38.1%) were managed conservatively. Mortality rate was 22.8% in those managed conservatively vs 23.8% in those who had intervention. After excluding 110 patients who died in the emergency department, there were 1,809 patients, of whom 625 (34.6%) were managed conservatively. Mortality rate was 22.6% in the operatively managed group and 10.9% in the conservatively managed group.

Conclusions: A substantial portion of grade V renal trauma cases were managed successfully without intervention in the National Trauma Databank. Further research is needed to identify radiological phenotypes suitable for nonoperative management and to overcome possible renal trauma grade misclassification.

Key Words: acute kidney injury, conservative treatment, nephrectomy

NONOPERATIVE management of renal trauma has gained wide support and is the preferred approach for low-grade injuries.^{1,2} This approach was shown to successfully decrease operative intervention and nephrectomy rates by up to twofold and sixfold, respectively, with improvements in patient outcomes.^{3,4}

Despite the appropriate use of nonoperative approach in many renal injuries, American Association for the Surgery of Trauma (AAST) grade V

injuries continue to require intervention largely. Though not being considered an absolute indication for surgical intervention by the AUA's Urotrauma Guidelines, nephrectomy is reported to occur in up to 86% of grade V injuries.^{5,6}

Conservative management has been explored in severe renal injuries in appropriately selected patients based on clinical status.⁷⁻⁹ Nevertheless, there are few data on conservative management for grade V injuries

and what are available consist of small studies.^{7,9,10} We sought to better understand current management trends in conservative management for grade V injuries by examining outcomes in the National Trauma Databank (NTDB). We hypothesized that a small population of patients with favorable clinical parameters may be amenable to successful nonoperative intervention.

METHODS

Study Population

We used data from the 2017-2019 NTDB, a large hospital-based trauma registry maintained by the American College of Surgeons.¹¹ Institutional Review Board exemption was provided given data were de-identified.

We selected patients with grade V renal trauma using AIS (Abbreviated Injury Scale) score 541628 ($n = 1,919$).¹² We initially included patients who survived to final hospital discharge ($n = 1,474$) since we aimed to explore whether conservative management represents a potential treatment option for grade V renal trauma. The NTDB has limited ability to assess efficacy of conservative management since it lacks data on operative intent, and thus we cannot separate patients who died while being managed conservatively vs patients who died before making it to the operating room and were intended to undergo surgery. Nevertheless, we also assessed the use and outcome of conservative management in the entire population with grade V trauma ($n = 1,919$), and in all patients with grade V renal trauma after excluding those who died in the emergency department ($n = 1,809$) with the hypothesis that this would exclude those who died early and did not have a chance of going to the operating room.

Study Variables

Conservative management was defined by the absence of any surgical intervention. Percutaneous (non-angiography) drain or cystoscopic stent placement, for the presumed treatment of urinary extravasation, was exempted and considered conservative. Operative management was categorized as nephrectomy (International Classification of Diseases, 10th revision [ICD-10] codes 0TB00ZX; 0TB00ZZ; 0TB10ZX; 0TB10ZZ; 0TB40ZZ; 0TC10ZZ; 0TD00ZZ; 0TT00ZZ; 0TT04ZZ; 0TT10ZZ; 0TT14ZZ; 0TT20ZZ; 0TT30ZZ; 0TT40ZZ; 0TT47ZZ; 0TV40CZ), operative (ICD-10 codes 04Q90ZZ; 04QA0ZZ; 04UA3JZ; 06Q90ZZ; 06QB0ZZ; 0TM60ZZ; 0TN10ZZ; 0TQ00ZZ; 0TQ10ZZ; 0TQ14ZZ; 0TQ30ZZ; 0TQ40ZZ; 0TQ64ZZ; 0TQ70ZZ; 0TJ50ZZ; 0TJ98ZZ; 0WJH0ZZ; 0WJH4ZZ; 0WJG0ZZ; 0WJG3ZZ; 0WJG4ZZ; 0WJJ0ZZ; 0W3H0ZZ; 0W3J0ZZ; 0W3G0ZZ; 0W3H0ZZ), and renal angiobolization (ICD-10 codes 04L90ZZ; 04L93CZ; 04L93ZZ; 04L94CZ; 04L94ZZ; 04LA0CZ; 04LA0ZZ; 04LA3DZ; 04LA3ZZ; 04LA4DZ; 04LA4ZZ; 04V93DZ; 04VA3DZ; 04VA4DZ; 06L90ZZ; 06LB0ZZ; 06LB3DZ; 04HA3DZ; 04L93DZ; 04L93DZ). We collected: age, sex, mechanism of trauma, Injury Severity Scale,¹³ pulse, systolic blood pressure, and Glasgow Coma Scale at arrival to the emergency department, blood transfusion (ICD-10 codes 30230N1; 30230P1; 30233H0; 30233H1;

30233N0; 30233N1; 30233P1; 30243N1; 30253H1; 30253N1; 30263H1; 30263N1), trauma center level, and associated other organ injuries (liver, spleen, pancreas, intestine, peritoneum, adrenal, and abdominal aorta).

Statistical Analysis

We reported descriptive statistics as frequency and percentage for categorical variables, while continuous variables were expressed as mean (SD) if normally distributed and the median and first and third quartiles if nonnormally distributed. Our primary aim was to determine the proportion of patients who were managed conservatively among those who survived to discharge. We also report the percent utilization and mortality among the overall population and in those who did not die in the emergency department.

Characteristics of patients who underwent conservative vs nonconservative management were compared using a *t*-test or Mann-Whitney for continuous variables, and χ^2 or Fisher exact test for categorical variables. Logistic regression analysis was performed to identify factors independently associated with receiving conservative management. Model goodness-of-fit was assessed using Hosmer-Lemeshow goodness-of-fit test. Linearity assumption for continuous variables was assessed using restricted cubic splines.

Statistical analyses were performed using Stata 17 with *P* value < .05 considered statistically significant. We followed the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) statement guidelines for reporting observational studies.¹⁴

RESULTS

There were 1,474 patients with grade V renal trauma who survived to discharge (Figure 1) with a mean age 30 years (SD 16.2), 1,128 (76.5%) males, and 533 (36.2%) with a penetrating trauma mechanism. A total of 557 (37.8%) patients were managed conservatively. Conservatively managed patients had ureteral stents in 42 (7.5%) and percutaneous drains in 5 (0.9%) cases. In the 917 who were not conservatively managed, the most common interventions were operative ($n = 649$, 70.8%) including renorrhaphy in 49 (5.3%), nephrectomy ($n = 615$, 67.1%), and kidney angioembolization ($n = 182$, 19.8%). Seventy-one out of 917 (7.7%) patients underwent multiple procedures.

Patients managed conservatively had more favorable hemodynamic parameters compared to those managed nonconservatively, exhibiting lower mean pulse rate (98.3 vs 103.2, $P = .0005$) and receiving fewer blood transfusions (27.3% vs 64.8%, $P < .001$); they also suffered fewer penetrating injuries (9.2% vs 52.6%, $P < .001$) and were less likely to be treated at a level I trauma center (45.2% vs 58.5%, $P < .001$; Table 1). The presence of other abdominal injuries was also associated with lower likelihood of conservative management for most injuries (Table 1). In the adjusted analysis, penetrating trauma mechanism (OR 0.13, 95% CI 0.09-0.19, $P < .001$) and receiving transfusion (OR 0.22, 95% CI 0.17-0.29, $P < .001$)

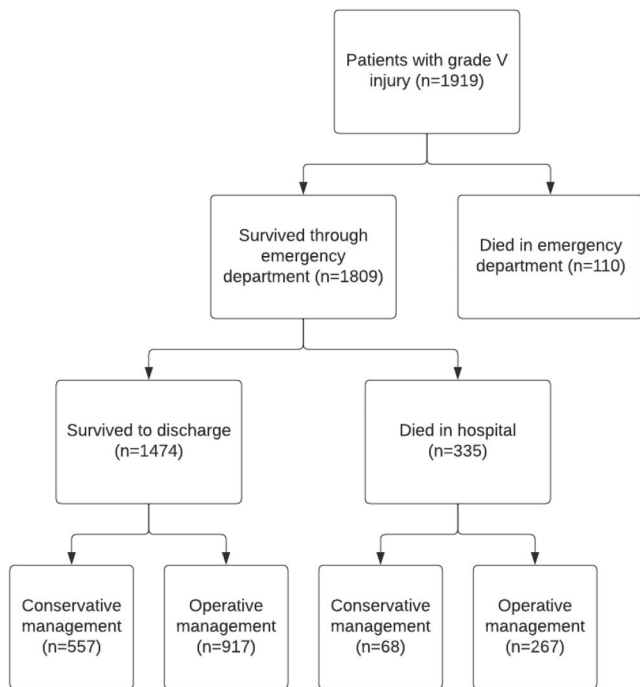


Figure 1. Description of grade V renal trauma population in the National Trauma Databank.

were associated with decreased odds of receiving conservative management (Table 2). Increasing age was associated with decreased odds of conservative

Table 1. Clinical Characteristics of Patients With Grade V Renal Trauma Who Survived to Discharge, Stratified by Management Approach

	Conservative management N = 557	Operative management N = 917	P value
Age, mean (SD), y ^a	28.9 (18.7)	30.7 (14.5)	.047
Sex, male, No. (%) ^b	388 (69.7)	740 (80.7)	< .001
Penetrating injury, No. (%)	51 (9.2)	482 (52.6)	< .001
Injury Severity Scale, median (IQR) ^c	34 (26-38)	34 (26-41)	.47
Pulse, mean (SD)	98.3 (25)	103.2 (26.9)	.0005
Hypotension, No. (%) ^d	179 (32.1)	252 (27.5)	.057
Glasgow Coma Scale, median (IQR)	15 (15-15)	15 (14-15)	.0006
Transfusion, No. (%)	152 (27.3)	594 (64.8)	< .001
Trauma center level, No. (%)			< .001
I	252 (45.2)	536 (58.5)	
II	117 (21)	142 (15.5)	
III	28 (5)	11 (1.2)	
Missing	160 (28.7)	228 (24.9)	
Associated injuries, No. (%)	350 (62.8)	789 (86)	< .001
Liver	182 (32.7)	416 (45.4)	< .001
Spleen	191 (34.3)	349 (38.1)	.145
Pancreas	28 (5)	188 (20.5)	< .001
Intestine	38 (6.8)	376 (41)	< .001
Peritoneum	10 (1.8)	80 (8.7)	< .001
Adrenal	69 (30.5)	89 (25.1)	.155
Abdominal aorta	6 (1.1)	29 (3.2)	.011

Abbreviations: IQR, interquartile range; SD, standard deviation.

^a All normally distributed continuous variables are expressed as a mean (SD) and were compared using *t*-test.

^b All categorical variables are expressed as a frequency (%) and were compared using χ^2 test.

^c All skewed continuous variables are expressed as a median (IQR) and were compared using Mann-Whitney test.

^d Hypotension was defined as systolic blood pressure <90 mm Hg.

management especially in the young population under 20 years of age. This trend seemed to flatten in older patients (Figure 2). Being treated at a level I trauma center and the presence of any associated injury were also associated with lower likelihood of conservative management (Table 2).

There were 1,919 patients with a grade V injury in total, regardless of mortality status. Of those, 731 (38.1%) were managed conservatively. Total nephrectomy rate was 42% (807 patients in total). Mortality rates were comparable between those managed conservatively and those who underwent intervention (22.8% vs 23.8%). After excluding 110 patients who died in the emergency department from the overall population with grade V injury, there were 1,809 patients, of whom 625 (34.6%) were managed conservatively. Mortality rate was 22.6% in the operatively managed group and 10.9% in the conservatively managed group.

DISCUSSION

We report a large cohort of patients with AAST grade V renal trauma of whom a substantial proportion were successfully managed conservatively. Our study demonstrated 37.8% of 1,474 patients who survived to discharge did not require surgical intervention. This percentage did not vary much when the denominator was set as the overall population with grade V injury (38.1% of 1,919 patients) or all patients who did not die in the emergency department (34.6% of 1,809 patients). Our results show that a conservative approach may be safe and effective in a subset of patients with grade V renal injuries in whom nephrectomy rates continue to be high. Perhaps unsurprisingly, clinical characteristics such as stable vitals were significantly associated with pursuing conservative management. Similarly, those patients with penetrating injuries were more likely to undergo operative intervention. This may reflect a more complex subset of grade V patients; however, it may also represent a cohort that is likely to go to the operating room based on other injuries. There are some data to suggest that if patients undergo an operation for other injuries there is an increasing likelihood of renal exploration, repair, or nephrectomy.¹⁵ We observed a similar trend where conservative management was less likely with most associated abdominal injuries. While these data are confounded by injury severity, the increased operative rate in penetrating injury may be at least in part explained by operative exploration for other life-threatening injury. Furthermore, when considering those who survived through the emergency department, those managed conservatively had a lower mortality rate compared to those undergoing surgery. We believe this is related to selection bias driven by patients who are relatively

Table 2. Multivariable Analysis of Factors Associated With Receiving Conservative Management Adjusting for Age, Sex, Penetrating Mechanism, Transfusion, Pulse Rate, Glasgow Coma Scale, Hypotension, Trauma Center Level, and Presence of Any Associated Injury

	Odds ratio	95% Confidence interval	P value
Age			< .001
Age'			< .001
Age''			.001
Male sex (reference female)	1.39	1.03-1.89	.03
Penetrating mechanism (reference blunt)	0.13	0.09-0.19	< .001
Transfusion	0.22	0.17-0.29	< .001
Pulse rate			.18
Pulse rate'			.16
Pulse rate''			.35
Glasgow Coma Scale	0.97	0.94-1.01	.19
Hypotension	1.25	0.84-1.84	.26
Trauma center level			
I	Reference		
II	1.79	1.26-2.58	.001
III	6.2	2.32-16.5	< .001
Missing	1.07	0.77-1.48	.69
Associated injury	0.59	0.43-0.82	.002

Age and pulse rate were modeled with restricted cubic splines. Age', Age'' and Pulse rate', Pulse rate'' represent the spline terms corresponding to Age and Pulse rate factors, respectively.

lower risk within the grade V subset being selected for conservative management. An important question is whether specific injury phenotype or patient clinical status (hemodynamics) are more important factors to delineate this group. Though our data lack radiological characteristics to inform this discussion, they provide evidence that grade V renal trauma patients are not necessarily a homogenous group, and that nonoperative management is feasible in at least a subset probably consisting of cases with stable vitals and blunt mechanism. Another interesting finding was that patients were more likely operatively managed at level I trauma centers compared to non-level I centers. We postulate several hypotheses to explain possible influence of center level on management approach. Differences in both injury assessment and management style may be related to availability of resources such as imaging modalities and minimally invasive techniques. Cases presenting at level I centers may be more complex injuries leading to higher likelihood of surgery. It may be also related to greater comfort managing trauma at bigger centers, which increases surgical exploration.

Our study is not the first to document successful use of nonoperative management for grade V injuries, though only sparse reports are available in the literature. In a cohort by Altman et al, there were 13 patients with grade V blunt trauma treated between 1993 and 1998, of whom 6 (46%) who had significantly lower transfusion requirements than the others were managed nonoperatively with success.⁷ McGuire et al conducted a trial of conservative management for 90

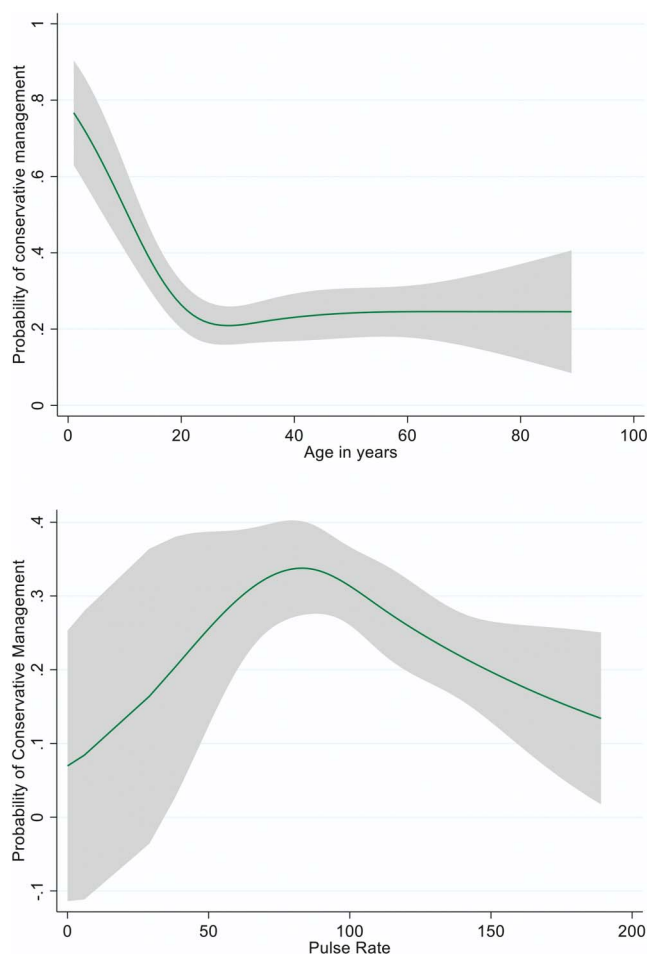


Figure 2. Multivariable logistic regression model predicted probability of outcome depicting the association between receiving conservative management and age (top panel) or pulse rate (bottom panel), modeled with restricted cubic splines. Gray bands represent 95% confidence intervals.

renal trauma patients who did not require emergency intervention; these included 15 with grade V injury.¹⁰ Though success rate specific to grade V was not reported, only 9/90 experienced complications that required further procedural intervention. This implies that the trial of conservative management was successful in at least 6 out of 15 grade V cases. van der Wilden et al reported on 26 patients with grade V renal trauma who did not require immediate intervention and were offered a trial of nonoperative management, which was deemed successful in 24 (92%).⁹ Wright et al examined 413 cases of grade V injuries from the 1994-2003 NTDB and found that around 62% were managed operatively, with a 60% nephrectomy rate among grade V cases.¹⁶ Our study thus demonstrates a decrease in the use of nephrectomy where only 42% of all grade V patients (or 41.7% of those who survived to discharge) underwent nephrectomy.

This analysis has limitations that bear special mention. Crucially, given the absence of imaging data, there is no way to independently verify the AAST

grading for the patients in this analysis. Therefore, an alternative hypothesis is that there is a subset of grade V injuries that are miscategorized at onset and those can be managed conservatively in line with the existing literature on management of renal injury. We cannot tell whether misclassification, if it exists, is due to database coding inaccuracy or misclassification by participating trauma centers submitting data to the NTDB. Nevertheless, many studies have previously used the NTDB to understand renal trauma management based on grade similar to our study.¹⁷⁻¹⁹ Many patients with grade V renal injury did not survive either from that injury or from associated injuries. We do not know why patients died and how their treatment or lack of treatment factored into their death. The NTDB lacks the clinical information to perform an intention-to-treat analysis and thus bias regarding surgical intent is unmeasured. We evaluated the hypothesis that there exists a subset of grade V renal injuries that do not require intervention, which was feasible to study given the database limitations. Our data suggest that hemodynamic parameters remain a key decision factor, as surgery was avoided in stable patients, yet we do not know if the subset of grade V renal traumas amenable to conservative management are systematically different than those for which intervention is imperative. Grade V kidney trauma encompasses several phenotypes

including a shattered kidney, vascular avulsion, and lacerated renal artery; our data lack radiographic findings to delineate these distinctions that may represent prognostically heterogeneous groups. Future efforts should aim at further understanding grade V injuries with intention-to-treat analysis and should aim to assess the efficacy of conservative management for grade V patients. This could be achieved by conducting a clinical trial that offers conservative management to all patients who are stable enough to avoid immediate surgery.

CONCLUSIONS

A substantial portion of patients with grade V renal trauma were managed successfully without intervention in the NTDB. While this may call into question the accuracy of NTDB for high-grade renal injuries, it also suggests that there is the possibility of nonoperative management in these severely injured patients. Hemodynamic stability seems to be the important deciding factor to select treatment approach. Further research is needed to potentially identify specific radiological phenotypes suitable for nonoperative management and to overcome possible renal trauma grade misclassification that may be present. Both operative intervention and angioembolization remain commonly utilized as part of grade V renal trauma management.

REFERENCES

- Santucci RA, Fisher MB. The literature increasingly supports expectant (conservative) management of renal trauma—a systematic review. *J Trauma*. 2005;59(2):491-501.
- Broghammer JA, Fisher MB, Santucci RA. Conservative management of renal trauma: a review. *Urology*. 2020;70(4):623-629.
- Moudouni SM, Hadj Slimen M, Manunta A, et al. Management of major blunt renal lacerations: is a nonoperative approach indicated?. *Eur Urol*. 2001;40(4):409-414.
- Danuser H, Danuser H, Wille S, et al. How to treat blunt kidney ruptures: primary open surgery or conservative treatment with deferred surgery when necessary?. *Eur Urol*. 2001;39(1):9-14.
- Morey AF, Brandes S, Dugi DD, et al. Urotrauma: AUA guideline. *J Urol*. 2014;192(2):327-335.
- McGeedy JB, Breyer BN. Current epidemiology of genitourinary trauma. *Urol Clin North Am*. 2013;40(3):323-334.
- Altman AL, Haas C, Dinchman KH, Spirnak JP. Selective nonoperative management of blunt grade 5 renal injury. *J Urol*. 2000;164(1):27-31.
- Matthews LA, Smith EM, Spimak JP. Nonoperative treatment of major blunt renal lacerations with urinary extravasation. *J Urol*. 1997;157(6):2056-2058.
- van der Wilden GM, Velmahos GC, Joseph DK, et al. Successful nonoperative management of the most severe blunt renal injuries: a multicenter study of the research consortium of New England Centers for Trauma. *JAMA Surg*. 2013;148(10):924.
- McGuire J, Bultitude MF, Davis P, Koukounaras J, Royce PL, Corcoran NM. Predictors of outcome for blunt high grade renal injury treated with conservative intent. *J Urol*. 2011;185(1):187-191.
- American College of Surgeons. *About NTDB, American College of Surgeons: Quality Programs*. Accessed March 25, 2021. <https://www.facs.org/quality-programs/trauma/tqpc/center-programs/ntdb/about>.
- Kuan JK, Wright JL, Nathens AB, Rivara FP, Wessells H. American Association for the Surgery of Trauma Organ Injury Scale for kidney injuries predicts nephrectomy, dialysis, and death in patients with blunt injury and nephrectomy for penetrating injuries. *J Trauma*. 2006;60(2):351-356.
- Baker SP, O'Neill B, Haddon WJ, Long WB. The injury severity score: a method for describing patients with multiple injuries and evaluating emergency care. *J Trauma*. 1974;14(3):187-196.
- von Elm E, Altman DG, Egger M, Pocock SJ, Gotsche PC, Vandenbroucke JP. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. *Lancet*. 2007;370(9596):1453-1457.
- DiGiacomo JC, Rotondo MF, Kauder DR, et al. The role of nephrectomy in the acutely injured. *Arch Surg*. 2001;136(9):1045.
- Wright JL, Nathens AB, Rivara FP, Wessells H. Renal and extrarenal predictors of nephrectomy from the national trauma data bank. *J Urol*. 2006;175(3):970-975.
- Hotaling JM, Sorensen MD, Smith TG, Rivara FP, Wessells H, Voelzke BB. Analysis of diagnostic angiography and angioembolization in the acute management of renal trauma using a national data set. *J Urol*. 2011;185(4):1316-1320.
- Hotaling JM, Wang J, Sorensen MD, et al. A national study of trauma level designation and renal trauma outcomes. *J Urol*. 2012;187(2):536-541.
- Hakam N, Amend GM, Nabavizadeh B, et al. Utility and outcome of angioembolization for high-grade renal trauma management in a large hospital-based trauma registry. *J Urol*. 2017;197:2022.

EDITORIAL COMMENTS

This study by Hakam et al utilized the National Trauma Databank to evaluate the use of operative intervention for patients with American Association for the Surgery of Trauma grade V renal injuries. The authors found that while most patients (62%) underwent operative intervention, 38% of patients were managed conservatively without a significant impact on mortality. These findings support much of what we already believe we know about high-grade renal trauma: that hemodynamics, rather than injury grading alone, should drive intervention.¹

Notably, however, only about 20% of those who did undergo operative management in this population underwent angioembolization, while 67% underwent nephrectomy. Contemporary evidence would suggest, however, that most of these patients can be managed with angioembolization. In fact, recent data have shown that angioembolization is successful in managing up to 85% of grade V injuries.² So why isn't angioembolization being utilized in more of these patients?

While provider experience likely plays a large role, this may in part be due to the source of the information. Although the National Trauma Databank is nationally representative of American College of

Surgeons level I and II hospitals, data are submitted voluntarily and are a convenience sample for lower-level centers.³ One-third of the patients included in the present study came from level III or unlisted trauma centers, which may affect our interpretation of management trends at high-acuity centers. Additionally, access to immediate interventional radiological procedures is often limited at lower-level centers, which may push more patients to alternative methods of care.

In trauma, decisions need to be made quickly and we are not often afforded the opportunity to delay lifesaving care. This study adds evidence to the decision to avoid surgical exploration and consider nonoperative means of management when hemodynamics allow. Importantly, for those who do require intervention, and in settings where this is available, angioembolization as first-line therapy should be strongly considered.

Niels V. Johnsen^{1*}

¹Department of Urology
Vanderbilt University Medical Center
Nashville, Tennessee

*Email: niels.v.johnsen@vumc.org

REFERENCES

1. Morey AF, Brandes S, Dugi DD III, et al. Urotrauma: AUA guideline. *J Urol.* 2014;192(2):327-335.
2. Hakam N, Amend GM, Nabavizadeh B, et al. Utility and outcome of angioembolization for high-grade renal trauma management in a large hospital-based trauma registry. *J Urol.* 2022;207(5):1077-1085.
3. Hashmi ZG, Kaji AH, Nathens AB. Practical guide to surgical data sets: National Trauma Data Bank (NTDB). *JAMA Surg.* 2018;153(9):852-853.

Management of renal trauma has evolved over the past few decades, with a distinct evolution toward a nonoperative approach.¹ However, there is still some variability in the management of American Association for the Surgery of Trauma grade V renal injuries, where the use of operative intervention and angioembolization continues to be high.^{2,3} This retrospective cohort study analyzes the National Trauma Databank (NTDB) to assess the use of conservative management for grade V renal trauma. Of those who survived to hospital discharge (n=1,474), 37.8% of patients were managed conservatively, which the authors define as the absence of surgical or procedural intervention except for ureteral stent or percutaneous drain placement. In adjusted analysis, 2 clinical characteristics, including penetrating trauma mechanism (OR 0.11) and receiving transfusion (OR 0.22), were

associated with decreased odds of receiving conservative management. The level of hospital acuity also contributed to the likelihood of operative intervention. After excluding 110 patients who died in the emergency department, mortality was noted to be higher among those who were managed operatively (22.6%) compared to those managed conservatively (10.9%).

This study is not without limitations, which the authors acknowledge. Importantly, the NTDB lacks information on intention-to-treat, which challenges the independence of data between patients who initially underwent conservative intervention vs those who failed, or required delayed or salvage operative interventions. Additionally, the NTDB lacks imaging data. Therefore, the accuracy of these grade V injury classifications cannot be verified. This highly heterogeneous group of high-grade

renal injuries cannot be subclassified based on injury phenotypes. Due to the lack of granularity of data available using this database, the cause of death as it specifically relates to the management of grade V renal injury also cannot be well established and may confound the difference in mortality between the conservative and operative groups.

Despite its limitations, this large contemporary study is a helpful contribution to the field of renal trauma, showing that roughly one-third of grade V

renal injuries can be managed conservatively and that nonoperative management in a stable patient can result in a higher renal preservation rate and lower mortality.

James A. Stinson,¹ Jonathan Alcantar,¹ and Courtney M. P. Hollowell^{1*}

¹Cook County Health
Chicago, Illinois

*Email: chollowell@cookcountyhhs.org

REFERENCES

1. Santucci RA, Fisher MB. The literature increasingly supports expectant (conservative) management of renal trauma—a systematic review. *J Trauma*. 2005;59:493-503.
2. Keihani S, Putbrese BE, Rogers DM, et al. The associations between initial radiographic findings and interventions for renal hemorrhage after high-grade renal trauma: results from the Multi-institutional Genitourinary Trauma Study. *J Trauma Acute Care Surg*. 2019;86(6):974-982.
3. Hotaling JM, Sorensen MD, Smith TG III, Rivara FP, Wessells H, Voelzke BB. Analysis of diagnostic angiography and angioembolization in the acute management of renal trauma using a national data set. *J Urol*. 2011;185(4):1316-1320.