

High Grade Renal Injury can be Safely Managed Non-operatively

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Abstract

Background: Among trauma patients, genitourinary injury occurs in 2%-5% of cases; with the kidney having the highest incidence of involvement. Grade IV/V renal injuries are typically associated with findings that necessitate intervention. However, non-operative management has been described even in severe cases. Our objective is to present our renal trauma experience in the blunt trauma patient population.

Methods: We performed a retrospective chart review of all trauma patients from April 1, 2010-March 31, 2015. Those sustaining renal trauma were identified and patient demographics, injury parameters (grade of injury, injury severity score-ISS, cause and mechanism of injury), operative vs. non-operative management, outcomes (hospital length of stay-HLOS, ICU length of stay-ILOS) and discharge (mortality or disposition) were captured.

Results: 8,054 patients were admitted to MDMC, with 112 meeting our inclusion criteria with 94 graded renal injuries. Renal operative management was noted in 6% of patients with ureteral stent placement (one Grade I), nephrorrhaphy (one Grade II), nephrectomy (two grade Vs, one grade IV) and renal vein repair (one grade IV). Non-operative management of the renal injury occurred in 94% of cases.

Conclusion: Low-grade injuries do well with nonoperative management. However, Grade IV/V injuries can be challenging to manage. A significant concern is seen with the presence of major vascular or pelvicalyceal injury. Minimally invasive techniques by interventional radiology, vascular or urology surgery are ideal when possible. In conclusion, non-operative management for all grades of kidney injuries, despite the severity, is appropriate for the hemodynamically stable trauma patient.

Keywords: Renal injury; Trauma; Genitourinary; Grade; AAST grade of renal injury

Introduction

The kidney is the most commonly injured organ of the genitourinary system and occurs in up to approximately 5% of blunt trauma cases [1]. The American Association for the Surgery of Trauma has described an injury scoring scale in order to uniformly classify renal injuries [2]. This scale ranges from grades 1 to 5, beginning with an uncomplicated hematoma to a completely shattered kidney. Historically, injuries to the GU system that led to operative intervention usually resulted in nephrectomy. However, it has been well demonstrated that kidney injuries can be managed successfully with conservative management [3]. Over the past several decades, advancements in both diagnostic imaging and minimally invasive techniques have allowed for this change in practice. This has resulted in more severely damaged kidneys being managed conservatively [4]. Today, most injuries that require an intervention are amendable to procedures such as interventional radiology embolization, percutaneous drainage or endoscopic stenting [5]. This has greatly increased the kidney salvage rate and has minimized the associated complications with invasive interventions [3,4,6]. It has been well demonstrated that most low-grade injuries, I-III, do well with

expectant management. However the Grade IV and V renal injuries are typically associated with findings involving injury to the urine-collecting or vascular systems, which often necessitate intervention [2].

The purpose of this study was to review the experience at our trauma center in successfully managing Grade IV and V renal injuries non-operatively.

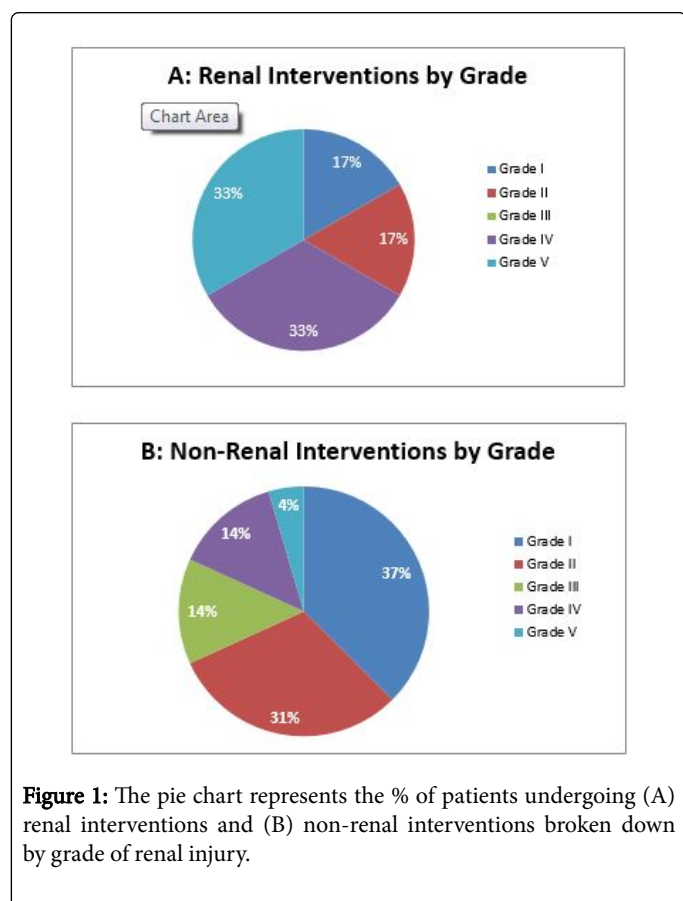
Materials and Methods

After Institutional Review Board approval, the trauma registry was queried for all patients sustaining renal injuries between April 1st, 2010 and March 31st, 2015. All patients \geq 18 y/o with blunt renal injuries were included. Any patients that died in the ED or within 24 hours of admission were excluded. Data collection comprised of patient demographics (age, sex, ethnicity), injury severity score (ISS), cause of injury, hospital length of stay (HLOS), ICU length of stay (ILOS) and mortality. Additionally, the CT mediated American Association for the Surgery of Trauma (AAST) grade of injury and type of intervention (surgical exploration, minimally invasive interventional radiology or endoscopic procedures) were recorded for all patients.

Results

Our registry identified 8,054 patients admitted to the trauma service at our Level I trauma center during the time period queried. Of these patients, 1% (n=112) met the inclusion criteria with 84% (n=94) received radiographic scans amenable to AAST grading of injury. The demographics of the patients were 39 ± 18 y/o and 74% male. The race of our patient population consisted of 29% African American, 33% Caucasian, 35% Hispanic, 2% other and 1% Asian. The average ISS, hospital length of stay, and intensive care unit (ICU) length of stay was 20 ± 15, 8 ± 12 days and 4 ± 6 days respectively. The cause of injury was 58% motor vehicle collision, 23% fall and 19% other.

We admitted 32% (n=38), 30% (n=35), 17% (n=20), 15% (n=17), 6% (n=7) for Grade I-V patients respectively. One patient had bilateral renal injuries with Grade 3 on the left kidney and Grade 4 on the right kidney. In this patient population, 6% (n=6) patients underwent renal-specific procedures and 94% (n=88) underwent non-renal related procedures. Among the renal associated procedures, 17% (n=1) were grade I, 17% (n=1) were grade II, 0% were grade III, 33% (n=2) were grade IV and 33% (n=2) were grade V injuries (Figure 1A). Non-renal related procedures by grade are summarized in Figure 1B.



In the patients who underwent renal related procedures, the grade I patient underwent a ureteral stent placement, the grade II underwent a nephrorrhaphy, 1 grade IV underwent a nephrectomy, second grade IV underwent a renal vein repair and finally, two grade V injuries underwent nephrectomies. The distribution of intervention for renal vs. non-renal related procedures are summarized in Tables 1 and 2.

Procedures	Grade of injury				
	1	2	3	4	5
Nephrorrhaphy	0	1	0	0	0
Nephrectomy	0	0	1	0	1
Renal vein repair	0	0	0	1	0
Ureteral placement stent	1	0	0	0	0

Table 1: Renal related procedure relative to grade of injury.

Procedures	Grade of injury				
	1	2	3	4	5
No interventions	26	20	10	11	2
IVC repair	0	0	0	0	1
SBR	3	0	0	0	1
Exlap, NTD	0	3	1	1	0
Hepato, IVC	0	1	0	0	0
Hepatorrhaphy	0	1	0	0	0
SBR, splenectomy	1	0	0	0	0
Bladder repair	1	0	0	0	0
Hemicolectomy	0	0	1	0	0
Liver repair	0	1	0	0	0
Splenectomy, hepat	1	1	0	0	0
Exlap, hemorr	1	0	0	0	0

Table 2: Non-renal related procedure relative to grade of injury.

Discussion

A paradigm shift towards conservative, non-operative management is noted in patients presenting with renal trauma [3,4,6]. Our study demonstrated safe non-operative management of patients with high grade (IV-V) renal injury. The change from operative exploration to non-operative management has been seen in the majority of cases over the past few decades [7]. This shift has been aided by improved imaging modalities which allows for a better understanding of the injury, along with minimally invasive techniques. Computed tomography is the gold standard for identifying renal injuries [8]. Given the above, blunt renal trauma has significantly evolved and is nearly always treated conservatively without the need for surgical intervention [5]. Non-invasive management strategies can only be initiated in the hemodynamically stable trauma patient [7]. Some institutions use clinical status of the patient as the sole determinant for intervention despite imaging characteristics or grade of injury [9]. In our study, we demonstrate that grade IV and V patients may be safely managed non-operatively.

However, the occasional case may require exploration and will oftentimes result in nephrectomy. This is most often the case with high-grade renal injuries, especially Grade V. Our study showed a 3%

nephrectomy rate with 2 grade V injuries and 1 grade IV injury. McGuire et al found grade V injuries and the need for platelet transfusion as predictors for emergent intervention [9]. Surprisingly, our results showed a grade 1 renal injury requiring a ureteral stent. Initial imaging showed the grade 1 renal hematoma which we assumed progressed to a higher grade causing extrinsic compression on the ureter, necessitating an intervention. Our results also showed 33% of the grade V injuries requiring a renal intervention. However, grade IV injuries can be more challenging to manage with only 14% of our grade IV injuries necessitating an intervention for the renal trauma [10]. American Urological Association (AUA) recommends observation on stable patients with urinary extravasation and renal parenchymal injury despite the depth [7]. An important distinction to make is to identify concomitant injuries in these trauma patients which may dictate the need for intervention irrespective of the renal trauma. In our study population, 22% of the patients necessitated operative intervention which did not include intervention for renal trauma.

A few limitations to our study would be the small sample size may not be an accurate representation of interventions needed for grade of injury, along with the lack of follow-up seen in our patient population. Majority of patients did not have outpatient follow-up, so possible late interventions were not accounted for. Future multicenter studies are needed to obtain the numbers necessary for extrapolating true outcomes.

Conclusion

Our data supports that Grade IV-V renal trauma may be safely managed non-operatively, irrespective of grade of injury given patient is hemodynamic stable.

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