ORIGINAL RESEARCH

Impact of Conservative Management on the Outcome of Patients with Traumatic Renal Injury at a Tertiary Trauma Center

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Objective: To report the outcomes of patients with traumatic renal injury who were managed conservatively in a tertiary trauma center from date of admission to discharge
Patients and Methods: The study is a comprehensive chart review on patients diagnosed with traumatic renal injury, managed conservatively between January 2013- August 2018. Demographic data including age and gender were recorded.
Results: A total of 92 patients with renal injury were managed in East Avenue Medical Center from January 2013 to August 2018. Only 25 of them were managed conservatively and were included in this study. The patients included in this study had Grade II to V renal injuries and were sent home stable and improved.
Conclusion: Renal injury may be a life-threatening event in a setting of acute trauma. But if handled appropriately, it can be managed safely without the need for surgical intervention.

Keywords: renal injury, trauma

Introduction

The kidney is the most commonly injured genitourinary organ resulting from any external trauma with an incidence as high as 50% and 70 - 80% being a consequence of blunt trauma.[1] Incidence is higher in male, with a male to female ratio of 3:1 with a higher incidence between the second and third decade of life.[2] In patients who suffered abdominal trauma, 10% have renal injury and about 90% are due to blunt trauma. Majority of blunt renal trauma are due to motor vehicle accidents, fall from heights and direct assaults, while penetrating injuries are mostly gunshot and stab wounds.[1]

Based on severity, renal injuries are divided in five grades using the classification of the Organic Injuries Survey Committee from the American Association for the Surgery of Trauma (AAST). Among those with blunt injuries, 25% are high-grade renal injuries which are categorized as Grade IV or Grade V in the AAST Organ Injury Severity Scale for the Kidney.[1] (Table 1) Non-operative management of Grade I to III injuries is widely accepted, however management of grade IV and V injuries remains more controversial. Non-operative or conservative management consists of continuous hemodynamic monitoring, parenteral fluid therapy with crystalloid, colloid or blood transfusion, serial hematocrit determination, prophylactic antibiotics and bed rest until gross hematuria has settled.[3]

Non-operative management of renal injuries begun in an attempt to avoid the increasing nephrectomy rates associated with renal

exploration in earlier studies. To date, non-operative management strategies for renal preservation have become increasingly successful due to advances in radiographic staging, improvements in hemodynamic monitoring, validated renal injury scoring systems, and essential details about the mechanisms of injury. Widespread use of computed tomography has demonstrated spontaneous healing of ruptured kidneys.

Some blunt and penetrating abdominal trauma may require laparotomy because of associated non-urologic injury but even in these cases, it may not be necessary to explore the kidney. The only absolute indication for kidney exploration is a pulsatile and expanding retroperitoneal hematoma that suggests renal artery laceration.[6] Cheng, et al. in their study of 16 patients with Grade III renal injuries, 81% were successfully managed conservatively.[7] In a retrospective study done by Matthews, et al. among 126 subjects with blunt renal injury, 90% were treated conservatively. Overall, results were excellent in 87% of the cases. 4 deaths were reported but were unrelated to the renal injury.[8]

The East Avenue Medical Center (EAMC) has a wide experience when it comes to treating and managing trauma cases brought in all year round in the emergency room. As one of the leading trauma centers in the country, EAMC is likewise supporting evidence-based claims that renal injury can be managed conservatively.

The results of this study may give additional supporting data locally that patients with renal injury may indeed be managed conservatively. This study aims to report the outcomes of patients with traumatic renal injury who were managed conservatively in a tertiary trauma center from date of admission to discharge.

Patients and Methods

The study is a comprehensive chart review on patients diagnosed with traumatic renal injury and managed conservatively between January 2013-August 2018 at the East Avenue Medical Center. Demographic data including age and gender were recorded.

Included were patients with blunt and penetrating renal injuries diagnosed between January 2013 to August 2018, who were managed conservatively. Excluded were patients who underwent surgery to repair renal injury, and those who were initially managed conservatively but were operated on eventually.

Subjects were categorized according to grade of renal injury and the following data were recorded: mechanism of injury, concomitant injuries, incidence of hematuria, need for blood transfusion, number of days of catheterization and total days of hospital stay.

Data were computed as mean for the numerical variables and as number of cases and percentages for the categorical values.

Results

A total of 92 patients with renal injury were managed in East Avenue Medical Center from January 2013 to August 2018. Only 25 of 92 patients were managed conservatively and were included in the study. Sixy seven underwent surgical intervention and were excluded from the study. Among those who needed surgical intervention, 4 were female and 63 were male patients. Nineteen patients underwent nephrectomy, 16 partial nephrectomy and 32 patients underwent nephrorrhaphy. Sixty one patients were discharged after recovery at the ward, and 6 patients expired. Majority of the cases (51) were penetrating injuries; 19 from stab wounds and 30 from gunshot wounds. Sixteen patients had blunt abdominal trauma from fall, mauling, and vehicular accidents. The renal injuries were graded using the ASST Grading System for Renal Injury. There were no patients with Grade I injury, 11 had Grade II, 19 had Grade III injury, 31 had Grade IV injury and 6 had Grade V injury.

Patients managed conservatively were predominantly male, comprising 92% of the population. Ages ranged from 3 to 67 years old, with an average of 26.88 years old. (Table 2) Eight were due to fall, 16 were due to vehicular accidents and one was a penetrating injury due to stab wound. (Table 3) The average hospital stay among patients was 19.49 days.

Based on the ASST Grading System for Renal Injury, out of the 25 subjects, there were no Grade I injury, 3 (12%) had Grade II, 7 (28%) had Grade III, 12 (48%) had Grade IV and 3 (12%) had Grade V injuries. (Table 4)

Patients who suffered Grade II renal injury (3) initially presented with microscopic hematuria and none presented with gross hematuria. One (33.33%) required blood transfusion and two (66.66%) did not. All patients had concomitant injuries associated with the trauma. The indwelling Foley catheter was removed on an average of 9.66 days. These patients were sent home after an average of 25.6 days.

The 7 patients who suffered Grade III renal injury initially presented with microscopic hematuria and none presented with gross hematuria. Two (28.57%) required blood transfusion and five (71.43%) did not. Four (57.14%) suffered concomitant injuries, and 3 (42.86%) did not. The indwelling Foley catheter was removed on an average of 6.57 days. These patients were sent home after an average of 15.8 days.

Of the 12 patients patients who suffered Grade IV renal injury, 3 (25%) initially presented with microscopic hematuria and 9 (75%) presented with gross hematuria. Nine (75%) required blood transfusion and three (25 %%) did not. Seven (58.33%) suffered concomitant injuries, and 5 (41.66%) did not. The indwelling Foley catheter was removed on an average of 9.25 days. These patients were sent home after an average of 15.91 days.

Among 3 patients who suffered Grade V renal injury, 1 (33.33%) initially presented with microscopic hematuria and 2 (66.66%) presented with gross hematuria. All 3 (100%) required blood

Table 2. Age distribution

Age (years)	No. of Subjects (n/25)	Percentage
Pediatrics (≤18 yrs. old)	8	32%
Adult (>18yrs old)	17	68%

Table 3. Mode of injury

Mode of Injury	No. of Subjects (n/25)	Percentage
Fall	7	28%
VC- 4 wheel vehicle	3	12%
VC- motorcycle	14	56%
Penetrating	1	4%

Table 4. Grade of injury

Grade Renal Injury	No. of Subjects (n/25)	Percentage
I	0	0
II	3	12%
III	7	28%
IV	12	48%
V	3	12%

Table 1. American Association for the Surgery of Trauma organ injury severity scale for the kidney

Grade	Type	Description
I	Contusion, Hematoma	Microscopic or gross haematuria, urologic studies normal, Subcapsular, non-expanding without parenchymal laceration
II	Hematoma Laceration	Non-expanding perirenal hematoma confined to renal retroperitoneum; <1 cm parenchymal depth of renal cortex without urinary extravasation
III	Laceration	Laceration >1 cm parenchymal depth of renal cortex without collecting system rupture or urinary extravasation
IV	Laceration Vascular	Parenchymal laceration extending through renal cortex, medulla, and collecting system; Main renal artery or vein injury with contained hemorrhage
V	Laceration Vascular	Laceration completely shattered kidney Vascular avulsion of renal hilum, devascularizing the kidney

transfusion and suffered concomitant injuries. The indwelling Foley catheter was removed on an average of 11.33 days. These patients were sent home after an average of 20.66 days. (Table 5)

Discussion

The incidence of significant injuries (Grades II to V) is about 5.4% of all renal trauma cases.[9] Computed tomography (CT) is currently the gold standard diagnostic tool for the evaluation of blunt abdominal trauma, in a hemodynamically stable patient. It is used to accurately assess the severity of renal injury, determine the presence of urinary extravasation and perirenal hemorrhage and determine the status of the renal vascular structures.[10]

The current indications for radiographic imaging of the kidney include the following: 1) All penetrating trauma with a likelihood of renal injury who are hemodynamically stable enough to have a CT, 2) All blunt trauma with significant acceleration or deceleration mechanism of injury, specifically rapid deceleration as would occur in a high-speed motor vehicle accident or a fall from heights, 3) All blunt trauma with gross hematuria, 4) All blunt trauma with micro-hematuria and hypotension, 5) All pediatric patients with greater than 5 RBCs/HPF.[6]

Computed tomography is also used to determine the grade of renal injury according to the ASST grading system and to guide the succeeding management. Decision-making in high-grade blunt renal injuries is difficult due to conflicting recommendations in the literature. In addition, renal trauma is rarely an isolated event and often occurs in the presence of multiple other injuries. Thus, the surgeon must use multiple clinical and radiologic factors to determine the proper course of treatment. Non-operative management of Grade I to III injuries is widely accepted; however management of Grade IV and V injuries remains more controversial. Grade V injuries, however, are still treated operatively at many institutions and several studies have concluded that Grade V injury is a predictor for operative management.[11]

Increasing number of studies support the success in conservatively managing even Grade V renal injuries in patients who are hemodynamically stable. Altman, et al. studied 13 patients with Grade V renal injury, 6 underwent non-operative management. They found that patients who were managed conservatively had fewer days in ICU, less transfusion requirements, and had fewer complications. They concluded that Grade V renal injuries can be successfully managed conservatively if the patient is hemodynamically stable.[12]

This study supports the evidence that patients with significant grade renal injury can in fact be managed conservatively. The patients included in this study had Grade II to V renal injuries and 100% of the patients who were managed conservatively were sent home stable and improved. However, the need for blood transfusion was noted to be highest in Grade IV and V renal injuries as well as the presence of gross hematuria. The duration of indwelling catheter was longest as well in those with Grade V injuries. The length of hospital stay did not depend on the

Table 5. Data summary

Grade of renal injury	Age (Ave)	Hospital Stay	Mode of Injury			Need for Blood Transfusions		Presence of Hematuria		Concomitant Injuries		IFC removal (days)
			Fall	Vehicular	Penetrating	Yes	No	Gross	Micro	Yes	No	
I (0)	-	-	-	-	-	-	-	-	-	-	-	-
II (3)	29	25.6	1 (33.33%)	2 (66.6%)	0	1 (33.33%)	2 (66.6%)	0	3 (100%)	3 (100%)	0	9.66
III (7)	33	15.8	0	6 (85.7%)	1 (14.3%)	2 (28.57%)	5 (71.43%)	0	7 (100%)	4 (57.14%)	3 (42.86%)	6.57
IV (12)	24.4	15.91	6 (50%)	6 (50%)	0	9 (75%)	3 (25%)	9 (75%)	3 (25%)	7 (58.33%)	5 (41.66%)	9.25
V (3)	20.3	20.66	1 (33.33%)	2 (66.6%)	0	3 (100%)	0	2 (66.6%)	1 (33.3%)	3 (100%)	0	11.33

grade of renal injury which may be due to other factors influencing the management and recovery of the patients such as their concomitant injuries

There are recognizable limitations of this study. This is a retrospective study of 25 patients and the data from this population may not be applicable to a wider range of subjects. The study also included only the short-term outcome which assessed the patients from date of admission to discharge only. It may be recommended to do post-discharge follow-ups with the subjects to better determine the long-term outcomes for this given population. It may also be prudent to include in further studies the specific concomitant injuries these patients acquired that might have affected the definitive outcome.

Conclusion

Renal injury may be a life-threatening event in a setting of acute trauma. But if handled appropriately, it can be managed safely without the need for surgical intervention.

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