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Original Article

Epidemiological Analysis of Trauma Patients with Renal Injuries

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Abstract

Introduction: The evolution in the management of renal trauma has been made possible by advances in both imaging and minimally invasive techniques. Nowadays, computed tomography (CT) plays a major role in investigation of renal trauma and is currently the imaging modality of choice.

Aim: To study the epidemiology of renal injuries, complications, early and late, associated with renal trauma, and to study the morbidity and mortality pattern in renal trauma victims.

Materials and Methods: All patients who sustained renal trauma confirmed by investigations were included in the study. This included renal trauma due to road traffic accidents, train traffic accidents, fall from height, assault, and stab injuries.

Results: In the present study, out of total 521 patients admitted with abdominal trauma, 99 had some form of urological injuries (19%). No significant renal injury was missed after CT imaging and the sensitivity of contrast-enhanced CT approached 100% in our series. In the present study, 74% of cases were managed conservatively without any surgical intervention and all these patients recovered well.

Conclusion: Contrary to the findings of most other studies, posterior ureteral disruption injuries seem to predominate among genitourinary trauma in our study. CT scan is the most comprehensive imaging tool to identify and characterize the renal injuries.

Key words: American association for the surgery of trauma classification, Injury, Kidney, Management, Trauma

INTRODUCTION

Trauma is nondiscriminatory and affects in all age group. Despite advances in the technology of motor vehicle collision remains the most common cause of abdominal trauma in this country. Other less frequent causes being blunt trauma to the abdomen includes fall from a height, assaults, bicycle accidents, and horseback riding injuries. Of all the genitourinary organs, the kidney is the most likely to be injured in cases of external trauma and injuries to at least one kidney occur in as many as 10% of abdominal trauma cases. Up to 80% of renal injuries are caused by blunt trauma, due to motor vehicle accident and most significant renal injuries are associated with other major organ injuries.[1-3] The epidemiologic data for renal trauma are highly variable. The variability can be partly attributed to the different etiologies of renal injury. The mechanism of visceral damage in blunt force injuries can be explained by three mechanisms. The first is when rapid deceleration causes differential movement among adjacent structures. As a result, shear forces are created and cause hollow, solid, visceral organs, and vascular pedicles to tear, especially at relatively fixed points of attachment. For instance, the distal aorta is attached to the thoracic spine and decelerates much more quickly than the relatively mobile aortic arch. As a result, shear forces in the aorta may cause it to rupture.[4-6] Similar situation can occur at the renal pedicles, leading to vascular thrombosis and renal infarction. The second is when introabdominal contents are crushed between the anterior abdominal wall and the vertebral column or posterior thoracic cage. This produces a crushing effect, to which solid viscera (e.g. spleen, liver,

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and kidneys) is especially vulnerable. The third is external compression forces that result in a sudden dramatic rise in the intraabdominal pressure and culminate in the rupture of a hollow visceral organ (in accordance with the principles of Boyle's law).[7,8]

Aims

To study the epidemiology, morbidity, mortality, and its complications in renal trauma victims.

MATERIALS AND METHODS

This prospective study was conducted in the Department of Urology at Tirunelveli Medical College. All patients who sustained renal trauma confirmed by investigations were included in the study. This included renal trauma due to road traffic accidents, train traffic accidents, fall from height, assault, and stab injuries. Exclusion criteria: Critically injured patients who expired within 30 min of admission, patients with incomplete evaluation of their traumatic injuries due to any reason, patients who were lost even to the first follow-up, iatrogenic renal trauma as in procedures such as percutaneous nephrolithotomy and unintentional injuries caused during surgical procedures.

We collected data related to age, gender, time and mechanism of injury, degree of found injury (stratified by organ injury scaling for kidney trauma), diagnostic methods, associated injuries, therapeutic approach, clinical outcome, and length of hospital stay.

RESULTS

In the present study, out of total 521 patients admitted with abdominal trauma, 99 had some form of urological injuries (19%) (Table 1). Of all the genitourinary organs, contrary to the findings of most other studies, we had an overwhelming number of posterior urethral injuries associated with pelvic fracture.

Kidney was the second most common genitourinary organ to sustain injury in abdominal trauma in our study. Of the total of 38 patients who sustained renal injuries, 84% (32 out of 38) were males. Only 6 females (16%) sustained renal injuries in our series. Young adults in the age group of 16–30 years were the most frequent to sustain renal trauma. Road traffic accidents were responsible for the vast majority of renal trauma in our series. In the present series, hematuria, either microscopic or gross was present in 76% of all patients who sustained renal trauma. Of the two patients who had pedicle injury, only 1 had evidence of hematuria (Figure 1). Four out of six patients with Grade V renal injuries and two out of five patients with Grade IV renal injuries presented with shock at admission. The information obtained from contrast-enhanced computed tomography (CECT) was used to grade the degree of renal trauma as per the recommendations of American association of the surgery of trauma (AAST) organ injury severity scale for the kidney. Most of the victims in the series had either Grade I or Grade II injuries (Figures 2 and 3).

No significant renal injury was missed after CT imaging and the sensitivity of CECT approached 100% in our series. Splenectomy was required in three patients and repair of the liver lacerations was required in two patients, while the rest of the injuries was managed conservatively

Table 1: Distribution of injuries

Type of injuries	Number of patients
Renal injuries	38
Adrenal injuries	0
Ureteral injuries	2
Bladder injuries	15
Urethral injuries	44

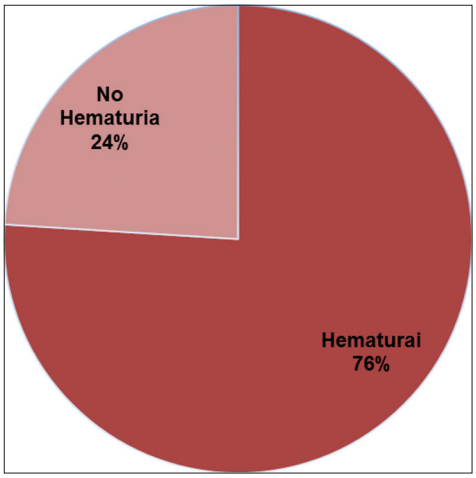

Figure 1: Incidence of hematuria

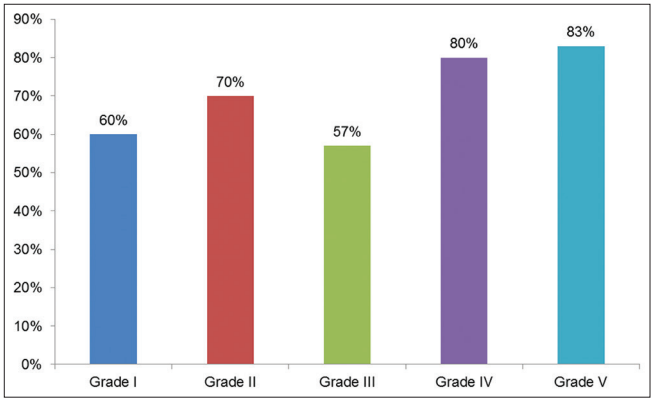

Figure 2: Sensitivity of ultrasonogram in terms of grades of renal injuries

without intervention (Figure 4). Up to 6% of renal units sustaining traumatic injuries may have coexisting congenital anomalies such as congenital ureteropelvic junction obstruction, double moiety, and polycystic kidney disease. One of our patients, an 18-year-old male had bilateral pelvi-ureteric junction obstruction with hydronephrosis and sustained bilateral pelvic injuries following a fall from tree. Percutaneous drainage and DJ stent placement followed by late repair in the form of pyeloplasty were done in that patient. Another patient aged 28 years had autosomal dominant polycystic kidney disease and sustained Grade 2 injury to his right kidney following a road traffic accident. Conservative management was successful in that patient. Hence, the incidence of congenital renal anomalies in this renal trauma series is around 5.2%. In the present study, 74% of cases were managed conservatively without any surgical intervention and all these patients recovered well. Two patients who had Grade IV renal injuries with urinary extravasation required percutaneous drain placement and DJ stent insertion. Two patients who had extensive Grade IV renal injuries with hemodynamic instability required surgical explanation, debridement of devitalized renal tissue, and repair. The nephrectomy rate in this study was around 18% (Figure 5).

Both the patients who presented with secondary hemorrhage had to undergo emergency nephrectomy because of hemodynamic instability. One patient who developed perinephric abscess required an open drainage (Table 2). Of the total of 38 patients who sustained renal injuries, two patients expired. One of these patients had associated duodenal injury and the patient's death was attributed to the complications of the bowel injury. Other patient who expired in the series had concomitant major vessel injury involving inferior vena cava, which was the likely cause of his death. Hence, no death can be directly attributed to the renal trauma alone, irrespective of the grade of the injury.

DISCUSSION

The epidemiology of trauma to the genitourinary system is unfamiliar to those in emergency services. Most of the road traffic accidents involved young people driving two wheelers.[9] Hematuria is the best indicator of trauma to genitourinary system. The presence of microscopic (>5 red blood cells/high power field) or gross hematuria is characteristic. However, the degree of hematuria and the severity of renal injury do not correlate consistently. In up to 36% of renal vascular injuries from blunt trauma, hematuria is absent. Furthermore, gross hematuria has been observed with renal contusions, although it is more likely to be associated with a significant parenchymal injury. In

Table 2: Distribution of complications

Complications	Number of patients
Urinary extravasation	4
Urinoma requiring drainage	2
Perinephric abscess	1
Wound infection (surgical)	2
Secondary hemorrhage	2
Hypertension	4

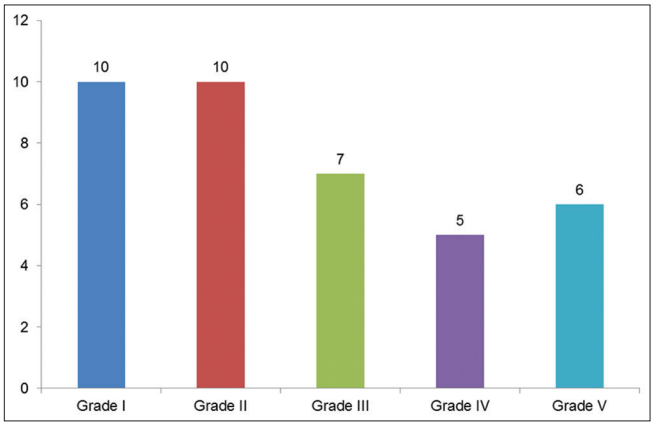

Figure 3: Degree of renal trauma

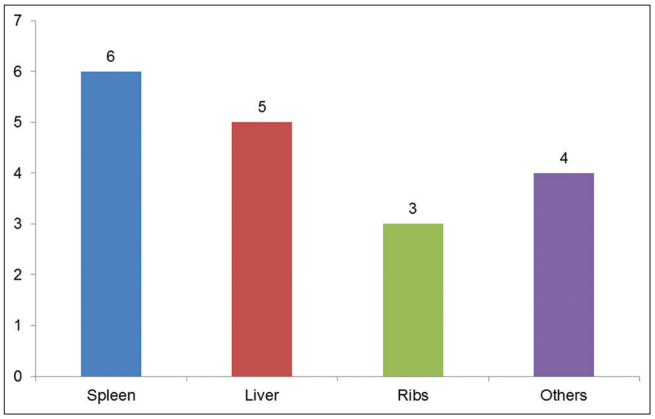

Figure 4: Concomitant organ injury

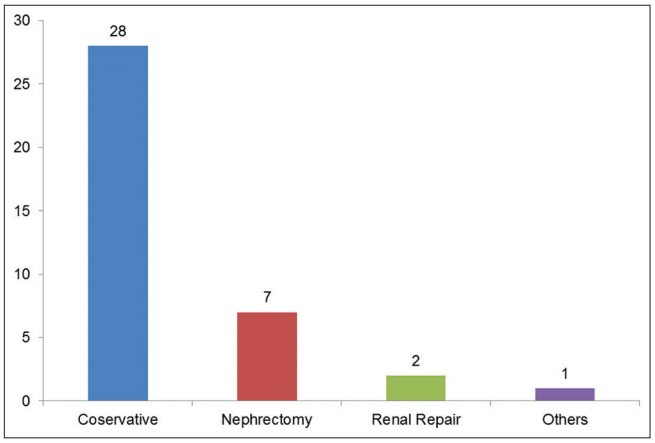

Figure 5: Type of management

patients with blunt trauma, if shock (systolic blood pressure <90 mmHg) is noted with microscopic hematuria, the incidence of significant renal injury increases. All blunt trauma patients with gross hematuria and patients with microscopic hematuria and shock (systolic blood presence <90 mmHg any time during evaluation and resuscitation) underwent renal imaging with CT with intravenous contrast, as per protocol. Patients with penetrating injuries with any degree of hematuria also underwent renal imaging with contrast CT.[10] The information obtained from CECT was used to grade the degree of renal trauma as per the recommendations of AAST organ injury severity scale for the kidney. Most of the victims in the series had either Grade I or Grade II injuries.[11] Approximately 70–80% of renal injuries have major associated organ injury that can affect the choice of management of renal injuries. In the present series, spleen was the organ most commonly traumatized along with the kidneys. Spleen was the organ which was most commonly injured concomitantly with renal injury in the present series.[12] Significant renal injuries requiring intervention are found in only 5.4% of renal trauma cases. A hemodynamically stable patient with an injury well staged by CT can usually be managed without renal exploration. Indeed, 98% of all blunt renal injuries can be managed nonoperatively, Grade IV and V injuries more often requiring surgical exploration. However, even these high-grade injuries can be managed without intervention, if carefully staged and selected.[13]

Penetrating trauma from gunshot or stab wounds to the kidney can be managed nonoperatively if carefully staged with CT. McAninch and Carroll have managed 55% of renal stab wounds and 24% of gunshot wounds in their series without operative interventions.[14]

CONCLUSION

Urological injuries are present in up to 20% of patients admitted with abdominal trauma; hence, urologist has a key role in the management of trauma victims. Contrary to the findings of most other studies, posterior urethral disruption injuries seem to predominate among genitourinary trauma in our study. CT scan is the most comprehensive imaging tool to identify and characterize the renal injuries. Nonoperative management has proven to be successful in majority of the patients sustaining renal trauma. The need for surgical intervention seems to increase with increasing grade of renal injuries. Even penetrating renal trauma, when properly staged can be managed successfully with conservative approach. In this series, two out of three patients with penetrating renal trauma were managed nonoperatively. The nephrectomy rates are high when a patient with polytrauma is explored for other concomitant organ injuries.

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