

Morbidity and Mortality Profile of Renal Trauma in a Tertiary Trauma Care Center: A Prospective Observational Study

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Introduction:

Renal tissue is highly important for homeostasis, and with current medical knowledge and practices we can restore it. Renal injury accounts for ~50% of all genitourinary cases, affecting the working-class population, which is aged around 30 years. With increasing motor vehicle usage, falls, sports activity, train-related accidents, and assaults, renal tissue is at high risk of injury especially from rapid deceleration or penetrating injury. Conservative or nonoperative management is now becoming the backbone of renal trauma management. Here we have addressed renal trauma and its management in a tertiary trauma care center.

Patients and methods:

This study was carried out prospectively using data from the Department of General Surgery on patients who were hospitalized for renal injury due to blunt/penetrating abdominal trauma over a period of 6 months. Patient characteristics, clinical presentation, management strategy, and outcome were evaluated.

Results:

Thirty patients were hospitalized and had a mean age of 26.5 years. The majority of patients had suffered a blunt trauma, with falls and road traffic accidents being the common causes. A grade of renal injury of 1, 2, or 3 was the most common. Twelve patients required some form of operative intervention, whereas 18 patients required nonoperative management. Pain was the most common postoperative complication. Six of 30 patients required nephrectomy. The mortality rate was 3.34%.

Conclusion:

Most of the renal injuries are low grade and managed nonoperatively. However, we need to assess the patient carefully as many of these patients have polytrauma and may require other modalities of treatment. Overall nephron preserving approach is the treatment of choice. Computerized tomography, which has superior sensitivity and specificity for abdominal trauma, is the imaging of choice towards the assessment of renal and other abdominal injuries. This can also help in conserving penetrating and high-grade renal trauma. Use of computerized tomography has reduced the rate of nephrectomy drastically. Hence, nonoperative management can be a rediscovered modality of management and can take center-stage position in the protocol of managing renal trauma.

Keywords: computerized tomography, nonoperative management, renal trauma.

Introduction:

Management of renal injury by nonoperative versus operative methods has been a subject of controversy for more than two decades. The goal of either treatment regimen is preservation of renal function while minimizing morbidity [1].

Renal injury accounts for ~50% of all cases of genitourinary trauma, and more than 50% of cases involve patients under the age of 30. Blunt trauma comprises 90% of all renal injuries, the remaining 10% being penetrating. With increased access to weapons and small arms, there is a trend toward open injury [2]. Common causes of blunt trauma are motor vehicle accidents, falls, sports accidents, and assaults. Rapid deceleration, which commonly occurs in motor vehicle accidents or falls, may cause intimal tears in the renal artery or even complete avulsion of the renal pedicle. Penetrating injury to the kidney is usually caused by knife and bullet wounds. Approximately 85% of



penetrating trauma cases involving the kidney are associated with injury to other abdominal organs [2].

Renal injury accounts for 10% of the abdominal injury internationally. Although most of the time renal injury is of lower grade, in association with other visceral injuries it can be fatal [2]. The widespread use and anatomic detail provided by computed tomographic (CT) imaging has now supplanted the much less-sensitive and less-specific excretory urography (intravenous pyelography) for grading purposes. Contrast enhanced computed tomography (CECT) has proved to be superior in terms of sensitivity and specificity in the detection of renal and abdominal visceral injuries, compared with other modes of investigations known [2].

The evaluation and management of renal injuries, occurring in up to 10% of abdominal trauma cases, has evolved over the past two decades. Advances in radiographic staging [3], improvements in hemodynamic monitoring, validated renal injury scoring systems, and essential details about the mechanisms of injury allow successful nonoperative management strategies for renal preservation [4–6]. The majority of blunt and many penetrating injuries to the kidneys no longer require absolute surgical intervention despite association with other visceral injuries.

Abdominal viscera can be severely disrupted by primary blast [7]. The treatment of such injuries is not dissimilar to that of any other cause of abdominal trauma. Solid organs such as kidneys can become easily lacerated and contused because of the blast waves producing blunt abdominal trauma, which can become severe over a period of time as it can be missed in the initial examination of the patient. The sudden acceleration and deceleration can produce devastating effects on the kidneys, which are suspended in the retroperitoneum only by its pedicle and surrounded by soft tissues like skeletal muscles. Because of the impact the renal pedicle can become avulsed, which can lead to complications ranging from thrombosis of renal vessels to laceration of renal vessels and torrential bleeding.

CECT is the gold standard for genitourinary imaging in renal trauma [8]. Spiral CT is being used in many centers to evaluate renal injuries [9]. Arteriovenous scanning provides visualization of the kidneys in the nephrogenic phase of contrast excretion and is necessary to detect arterial extravasation. Injury to the renal collecting system may be missed as the contrast material would not have had the time to be excreted into the parenchyma and collecting system adequately. Repeated/delayed scanning of the kidneys 10 min after injection of contrast identifies parenchymal lacerations and urinary extravasation accurately and reliably. Expert opinion holds that delayed films may be omitted when the kidneys are deemed normal, and no perinephric, retroperitoneal, pelvic, or perivesical fluid is present. One major limitation of CT is the inability to define a renal venous injury adequately. With normal arterial perfusion, the parenchyma appears normal and the collecting system may contain contrast material. A medial hematoma accompanying the preceding findings strongly suggests a venous injury [3].

Materials and methods:

Data were collected on all patients who were admitted to our

trauma care center over six months period. Patients of any age group, with any mode of injury, with any associated trauma but having any grade of renal injury were enrolled and included those with injury limited to the ureter(s) and urinary bladder. The prostate and urethra were excluded. Patients were monitored until the last day of hospital treatment and were followed up for 1 month after their course of hospital treatment. Results A total of 30 patients were enrolled, with a mean age of 26.5 years. The youngest patient was 2 years and the oldest was 55 years old. Of the 30 patients, 27 had blunt renal injuries and three had penetrating injuries. One patient had a blast injury. Road traffic accidents and falls were the causes of trauma in 10 patients in each group, and were the most common of all mechanisms. Injuries were graded according to The American Association for the Surgery of Trauma's Organ Injury Scaling Committee [10].

GRADES	No. of PATIENTS OUT OF 30
1	11
2	6
3	6
4	3
5	4

Of 30 patients 19 had involvement of the left kidney and 11 had involvement of the right kidney; no patient had bilateral involvement. Nineteen patients presented with hematuria and 11 did not have hematuria. Twelve patients required some form of operative treatment; in all, six of 30 patients required open nephrectomy. Other operative treatments included intercostal tube drainage in one patient, splenectomy in two patients, primary closure of intestinal injury in three, craniotomy in two patients, right hemicolectomy in one patient, and DJ stenting in one patient. With respect to nephrectomy grade, five injuries were of grade 3, two were of grade 4, and one was of grade 3.

Of three penetrating injury patients only one required nephrectomy as the patient was clinically unstable and had a grade 4 renal injury. Postoperative complications were as follows: pain in 11 patients; hypertension, controlled by medication in one patient; wound infection in three patients; and paralytic ileus, which resolved with conservative management in two patients. No other major complications were observed. There was one mortality case out of 30 patients; that patient had a grade 5 injury.

Discussion:

Renal injury from external trauma is the most common of all injuries of the genitourinary system. Most of the renal injuries are of low grade and are managed conservatively. The key to successful management of patients with renal trauma is accurate assessment of the extent of renal injury. McAninch and Federle demonstrated the usefulness of CT [8] in differentiating minor from major renal injuries, and subsequently Bretan et al. [8] documented its superior sensitivity and specificity over excretory urography. CT has the advantage of identifying associated intra-abdominal injuries, which would modify the initial and subsequent management. Even high-grade injuries and penetrating trauma from gunshot or stab wounds to the kidney can be managed nonoperatively if they are carefully staged and selected. Nash et al. [11] examined the reasons for nephrectomy



in cases of renal injuries and found that 23% required nephrectomy in otherwise re-constructable kidneys because of intraoperative hemodynamic instability [12]. The management of renal lacerations by conservative versus operative methods has been a subject of controversy for more than two decades. Proponents of conservative management argue that immediate surgical exploration may result in an increased nephrectomy rate and the injured kidney has the potential for spontaneous recovery with few significant complications [13–15]. Furthermore, many potential complications are amenable to endoscopic or percutaneous procedures without increasing the risk for delayed sequelae. Those who advocate immediate surgery believe that a conservative approach increases the likelihood of significant morbidity from persistent urinary extravasations with urinoma formation, sepsis, and delayed hemorrhage. In contrast, Matthews and colleagues observed that urinary extravasations from grade 4 parenchymal laceration or forniceal rupture could be managed nonoperatively with an expectation of spontaneous resolution in 87% of patients [16]. Perinephric abscess following renal trauma is very uncommon and can be managed by percutaneous drainage. Patients with major renal lacerations and fragmentation with or without urinary extravasations have traditionally been managed with immediate surgical exploration and repair. Mendez stated that such injuries require surgery but such approaches, however, are associated with a high rate of nephrectomy [12,16]. Cass and Ireland reported 15 nephrectomies in 22 patients who underwent immediate surgical exploration [16]. Sagalowsky et al. [12] reported nephrectomy rates of 28, 15, and 33% in patients with gunshot wounds, stab wounds, and blunt trauma, respectively. Dobrowolski et al. [17] reported complications in 9% of patients who were managed conservatively and in 5% of patients after surgery. It is observed such similar studies that penetrating abdominal trauma use to undergo a higher number of nephrectomies but as the management and understanding of natural course of renal and abdominal trauma evolved, even now penetrating abdominal trauma patients can be subjected to non-operative management with '*masterly inactivity*'.

The management of renal trauma revolves around proper triage of patients, proper examination, and obtaining of proper history associated with trauma. Bedside, FAST is preferred in unstable patients, in whom emergency celiotomy is required. CECT abdomen is the gold standard in diagnosing, staging, and detecting associated injuries, compared with other diagnostic modalities. For unstable patients with renal injury, we should consider renal exploration with nephrectomy; this approach has fewer short-term and long-term complications. Although according to old studies and protocols peritoneal breach requires laparotomy as seen in many penetrating modes of injury, clinical stability and CT definitely give us a window of opportunity to avoid nephrectomies. Newer advances in the field of interventional radiology will also have a major role in avoiding nephrectomies.

Conclusion:

Non-operative management has become the preferred approach specially in low grade renal trauma patients. Even in high grade trauma non-operative approach can be effectively used specially in clinically stable patients and vigilant monitoring. CECT has become investigation of choice for diagnosis and monitoring specially patients with hemodynamically stable high-grade

trauma.

Conflict Of Interest: None

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