

MANAGEMENT OF RENAL TRAUMA A RETROSPECTIVE STUDY- OUR EXPERIENCEPrakash Babu S. M. L¹, Sandeep Puvvada², Avinash Patil³, Arvind Nayak⁴, H. K. Nagaraj⁵**HOW TO CITE THIS ARTICLE:**

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ABSTRACT: In the setting of blunt renal trauma and selected instances of penetrating renal trauma, a non-operative approach may be selected. Deep cortical lacerations with or without urinary extravasations followed by trauma have traditionally been managed by exploration and surgical repair. Patient selection is the preliminary step in adopting a non-operative management strategy to renal trauma. One series, with predominantly blunt mechanisms of injury, documented that 85% of patients were treated successfully without surgery. Ultimately, the exclusion of concurrent injury may be the key point in treating patients non operatively. With improved and easily available radiological imaging facilities like intravenous pyelography, ultrasonography, computed tomography and angiography, we propose that the majority of these injuries can be followed expectantly with delayed intervention if needed. 46 patients of abdominal trauma with significant renal injuries were reviewed. 16 patients had Grade I, 12 patients had grade II, 8 patients had Grade III, 6 had Grade IV renal injuries and 4 patients had Grade v. 37(80.4%) patients responded to conservative management. 9 patients required operative intervention. 25 patients had associated injuries. There was loss of 1 renal unit in 2 cases. With the aid of computed tomography, conservative therapy for severely injured kidneys can yield favorable results and save patients from unnecessary exploration and possible renal loss.

KEYWORDS: Renal Trauma, Penetrating Injury, Hematuria, Conservative Management.

INTRODUCTION: Renal trauma occurs in 8-10% of all blunt and penetrating abdominal injuries. The conservative management of blunt renal trauma was first proposed in the 1940s.^[1] Since then the benefits of this approach have become increasingly apparent with reductions in nephrectomy rate, complications, and hospital stay all being reported.^[1-3] There has been a paradigm shift towards conservative management for severe blunt trauma.^[1,4-9] Successful management of renal injury depends upon accurate assessment of their extent. With the advancement in radiologic imaging modalities and the ready availability of computed tomography allows surgeon to be much more informed about the injuries that they are treating. The range of injuries for which conservative approach can be used has increased recently with the use of ureteric stents, percutaneous drainage and embolization.^[1,4,5,8,10]

There seems to be a wide variation in practice regarding issues such as repeat imaging, inpatient monitoring, thromboprophylaxis, antibiotics, discharge criteria, advice on return to regular activity and follow-up. Here we are presenting our experience in the management of renal trauma.

MATERIALS AND METHODS: We reviewed 46 consecutive patients with abdominal trauma with suspected significant renal injuries during the period Jan. 2007 to Dec. 2014. Male: Female ratio was 4.75: 1. Age ranged from 10-43 years, mean being 27 years. Mode of injury from blunt trauma was 44 cases and penetrating injury was seen in 2 cases. All patients were initially managed by fluid

ORIGINAL ARTICLE

resuscitation and radiographic screening. Radiographic screening included intravenous urography, ultrasound scan and or an abdominal computerized tomography and renal angiography scan with contrast medium were reserved for selective patients. Renal trauma was classified based on the American association for the surgery of trauma (AAST) kidney injury severity scale (Table 1).^[11]

All stabilized patients were managed by careful continuous observation, bed rest, appropriate fluid resuscitation and prophylactic antibiotic coverage, with third generation cephalosporins. Operative intervention for urological injury was not done unless complications developed. The indications for immediate exploratory laparotomy were acute abdomen, rapidly dropping hematocrit or associated injuries as determined by radiographic evaluation. Conservative management consisted of monitoring vital signs, repeated abdominal examinations and serial measurement of hematocrit.

Patients were followed routinely at intervals of 1, 3, 6 and 12 months after the injury and then yearly thereafter. Follow-up evaluations involved blood pressure monitoring and urinalysis on each visit. Intravenous urography was obtained at 8 weeks after injury. Any patient with an abnormal urinalysis or elevated blood pressure was evaluated at shorter intervals.

Table 1 the American Association for the Surgery of Trauma (AAST) kidney injury severity scale⁽¹¹⁾.

GRADE*	TYPE	DESCRIPTION
1	Contusion Hematoma	Normal imaging, non-visible or visible hematuria present Non expanding sub capsular hematoma with no parenchymal laceration
2	Hematoma Laceration	Non expanding peri renal hematoma confined to retroperitoneum Cortical laceration <1 cm without urinary extravasation
3	Laceration	Cortical laceration >1 cm without urinary extravasation
4	Laceration (a) Vascular (b)	Laceration through corticomedullary junction into collecting system Renal artery/vein injury with contained hemorrhage, or partial laceration, or vessel thrombosis
5	Laceration (a) Vascular (b)	Completely shattered kidney Avulsion of renal hilum with devascularised kidney

*advance one grade for bilateral injuries up to grade 3

RESULTS: Of the 46 patients evaluated, 16 (36%) had grade 1 injury (figure 1), 12 (26%) grade 2 injury (Figure 2), 8 (17%) grade 3 injury, 6 (13%) grade 4 injury and 4 (9%) suffered from grade 5 injury (Figure 3).



Fig. 1: Contrast enhanced CT scan showing Left renal grade 1 injury with sub capsular hematoma

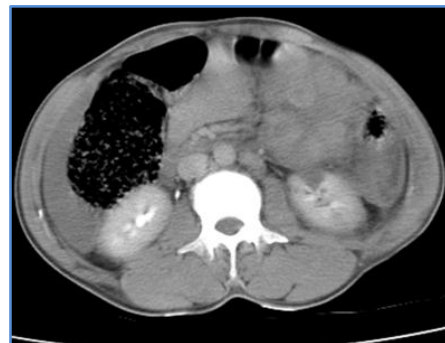


Fig. 2: Contrast enhanced CT scan showing Left renal grade 2 injury with splenic injury



Fig. 3: Contrast enhanced CT scan showing Left renal grade 5 injury with splenic laceration

In our series, the mechanism of injury was road traffic accident (30), pedestrian struck by car (8), assault (3), 5 patients suffered fall from height [Table - 2]. 12 patients had no hematuria, 13 patients initially had gross hematuria, 21 patients had only microscopic hematuria.

Ultrasonography of abdomen and pelvis were done in all cases, abdominal computerized tomography (CT) with contrast was performed in 17 patients, intravenous urography (IVU) in 24, combined IVU + CT in 14, combined IVU + Ultrasound scan in 12, combined ultrasonography, computerized tomography and renal angiography done in 2 patients.

Associated injuries were found in 25 patients, These included small bowel injury (4), liver lacerations (5), pancreas (1), splenic injury (4), long bones fractures (7) and rib fractures(6) [Table - 3]. Preexisting conditions observed were pelvi ureteric junction obstruction in 2 patients, poly cystic kidney disease in 1 patient. 9 patients underwent immediate exploratory laparotomy due to acute abdomen. Of these 9 patients, 4 had repair of bowel injury and liver laceration and 1 underwent splenectomy.

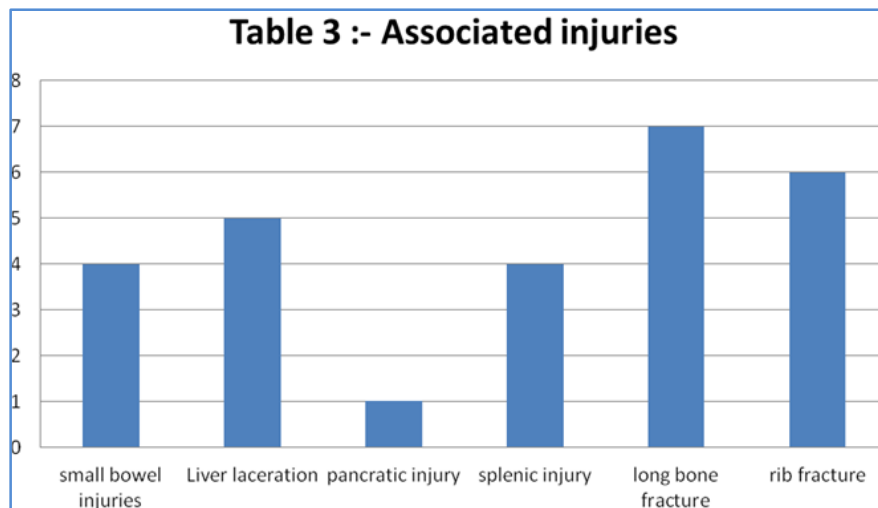
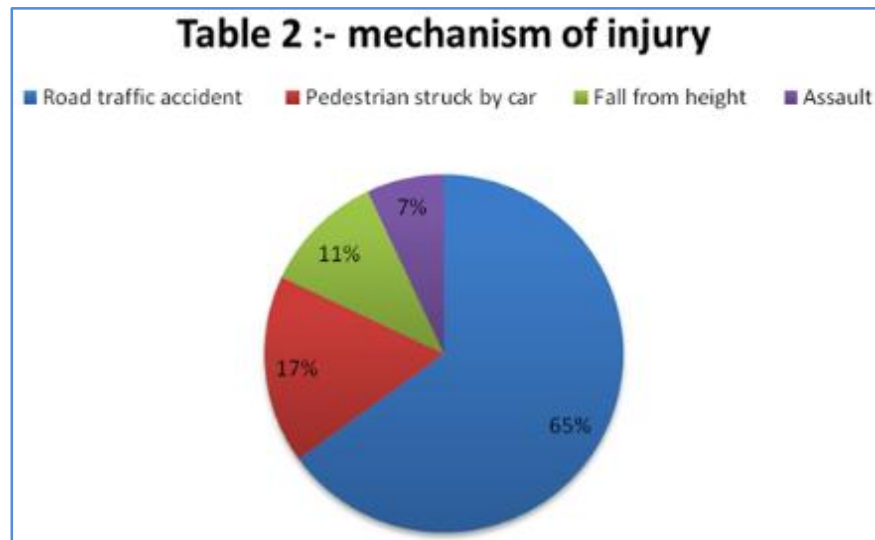
9 patients with gross hematuria who had unstable vital signs and dropping hematocrit in spite of adequate fluid resuscitation and blood transfusions needed renal exploration. Of these patients, 2 lost one renal unit due to shattered kidney and 1 underwent partial nephrectomy for non-viable lower polar parenchyma and 3 patient underwent renorrhaphy. 2 patients died due to poly trauma.

The average hematocrit decrease in patients was 8% (absolute value, range 0-13.6%). 24 patients with blunt trauma required blood transfusion (average 3 units of packed red cells; range 2-6 units).

37 (80.4%) responded to conservative protocol. The hospital stay ranged from 9 to 22 days (average 14.5 days). High grade renal injury patients required longer duration of hospital stay as they required close monitoring and imaging at regular intervals. Majority 9(19.5%) patients with initial gross hematuria had clear urine by hospital day 10. In this series, two renal units were lost. One patient underwent partial nephrectomy and 4 patients required renal exploration. All of them had normal blood urea nitrogen and serum creatinine levels. No patient developed hypertension or page kidney during hospital stay or early follow up.

Majority of our surviving patients had been followed up for more than 12 months. Long-term follow-up examination was difficult to obtain because of transient nature of our city hospital population. Patients were discharged once they were hemodynamically stable as well as interval imaging showed no worsening of renal injury, with reduction in size of perirenal hematoma.

ORIGINAL ARTICLE



DISCUSSION: Nonetheless, absolute contraindications for initiation of conservative management include life-threatening bleeding, renal pedicle avulsion, and the presence of a large, expanding, pulsatile hematoma.^[4,5,8] Additionally, the threshold for intervention may be lower in cases of a solitary functioning kidney or bilateral injuries.^[3] The recently released AUA guideline recommends initiation of conservative management in all patients as long as they are hemodynamically stable.^[9]

The management of renal lacerations by non-operative versus operative methods has been a subject of controversy for more than 2 decades. Patients with major renal laceration and fragmentation with or without urinary extravasation have traditionally been managed by immediate surgical exploration and repair. This approach however is associated with a high rate of nephrectomy. Sagalowsky et al reported nephrectomy rates of 28%, 15% and 33% for patients with gunshot wounds, stab wounds and blunt trauma respectively.^[12] In our series, only two of 46 (4.35%) renal units were lost, and this occurred in a patient who was initially explored. Thus, expectant management of type III injuries yields more favorable results when compared with immediate renal exploration where one can expect a higher nephrectomy rate. Management of patients with grade IV injuries can be particularly challenging. Not only does a difficult decision need to be made between renal exploration and

ORIGINAL ARTICLE

conservative management, but the use and timing of other interventions, e.g. ureteric stenting, percutaneous drainage, and embolization, must also be considered. In one study, even when grade IV injuries were initially managed non-operatively 11% of patients ultimately required renal exploration, 27% required ureteric stenting, and 25% required embolization.^[13]

Given the high rate of renal loss and the improved results with expectant treatment, the decision to perform immediate surgery must be weighed carefully. In decision making process, accurate assessment of the extent of injury is invaluable. Computed tomography has emerged in recent years as an effective means of providing such needed information. In the present series, CT-scanning was used to effectively stage the renal injuries. It also has the advantages of identifying associated injuries which would modify the initial and subsequent management. The data in this study demonstrate that conservative treatment of major renal lacerations are associated with low morbidity.

All of the patients had normal blood urea and serum creatinine levels at the time of discharge. No patient developed hypertension. Watts & Hoftbrand reported an increased incidence of hypertension especially in patients treated expectantly.^[14] According to that study, hypertension could develop after many years. In our limited follow-up examinations, this appears not to be the case, but we agree with Watts & Hoffbrand that these patients need to be followed with regular blood pressure recordings.

Immediate radiologic evaluation gives valuable information in treating patients with renal trauma. The criteria for study has been well established using the criteria of scanning all trauma patients with gross hematuria, microhematuria plus shock, rapidly dropping hematocrits or peritoneal signs the present study shows that no urologic or intra-abdominal injuries were missed. Use of CT staging of renal trauma is superior to IVP and is sufficiently accurate to allow the majority of the patients with major renal injuries to be treated expectantly and to avoid unnecessary exploration with its high risk of renal loss. Unless immediate exploratory laparotomy is indicated because of associated injuries or shock, most major renal injuries can be managed by non-surgical treatment with delayed intervention as needed.

The indications for delayed intervention for urine leak are sepsis, pain, increasing urinoma, ileus, and fistula.^[2,5,9,15] The AUA state that ureteric stenting is preferable to percutaneous drainage in the delayed management of urine leak, and recommend that it is combined with an initial period of catheterization to assist resolution.^[9]

While there is a consensus that patients who deteriorate clinically should either undergo intervention or re-imaging,^[3-5,9] it is less clear whether certain patients who remain stable on conservative management may benefit from routine early re-imaging.

Prescribing bed rest after renal trauma dates back to an era before CT; the original paper advocating it is from 1968 and recommends 3 weeks of bed rest. Yet despite the advent of CT, meaning that we now know much more about the injuries we manage, assigning bed rest is still very common practice ^[4,5,11]. Most of those who advocate bed rest recommend continuing it until the resolution of visible hematuria.^[3,4,11]; however, this policy has been challenged for two reasons.^[6,15] Firstly, the degree of hematuria does not appear to correlate with either symptom improvement or mobility.^[15] Secondly, it leads to prolonged admissions.^[6] with the associated risks of VTE and hospital-acquired infections of this. Reports of average lengths of stay of >1 week in low-grade trauma are probably a consequence of this policy, and do seem excessive. This is particularly so when other studies report safely achieving an average length of stay of <4 days in isolated renal injuries across all trauma grades, using a more liberal policy on mobilization.^[15] Results of a prospective study examining the effect of allowing early mobilization and discharge, regardless of ongoing visible hematuria, are eagerly

ORIGINAL ARTICLE

awaited.^[6] Apart from hematuria, other general discharge criteria apply in renal trauma; being afebrile, tolerating a regular diet, adequate pain control, and maintaining a stable hemoglobin are not contentious criteria.

CONCLUSION: In conclusion, there is a paucity of high level evidence and specific guidance about precisely what conservative management of renal trauma should involve. We believe that non-operative management of major renal lacerations with vascularized fragments is a viable and proper method of treatment. However, in an individual with a major renal maceration associated with a devitalized fragment a heightened awareness of probable complications must exist. If these additional risks would adversely affect survival we believe that immediate exploration and repair are indicated.

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ORIGINAL ARTICLE

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