

# Role of Conservative Management in High Grade Renal Injuries: Our Experience at a Tertiary Care Centre

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## ABSTRACT

**Introduction:** Renal injuries account for up to 1–5% of all trauma related injuries. Over the years there has been a shift towards non-operative treatment for blunt renal trauma. The aim of our study was to assess outcomes of patients managed conservatively (non-operatively) for high grade blunt renal injury at our centre.

**Material and methods:** The study was conducted in a retrospective manner using hospital records of last 5 years. All patients with blunt renal injuries were included. These patients were categorized based on AAST(1989) injury grading and further subdivided into operative and non-operative management groups. These management strategies were analyzed in terms of 'failure of non-operative management', complications and need for adjunctive procedures. Descriptive analysis was done using Microsoft Excel(2010, ver14) software.

**Results:** Forty three patients were included in the study with a mean age of 44.6 years. Out of the total, 28 had grade I – III injuries, 11 had grade IV and 4 had grade V injuries. All the grade I-III patients were managed conservatively and required no adjunctive procedures. One (9%) of grade IV and 2(50%) of grade V injuries underwent immediate exploration. Out of 10 cases of grade IV injuries which underwent non-operative management, 3(30%) required delayed exploration and none of the grade V injuries required delayed exploration. Complications included urinary tract infection (UTI) (6 cases), persistent hematuria (3 cases), hypertension(2 cases), urinoma (2 cases) and ileus(2 cases) .All complications were Clavien grade 1-2 with no mortalities overall.

**Conclusion:** If the patient is hemodynamically stable, even grade IV and V blunt renal injuries can be managed conservatively, as is seen in our study where failure of non-operative management occurred in only 30% of grade IV and none of the Grade V injuries.

**Keywords:** High-grade Renal Injury, Surgical Exploration, Conservative, Non-Operative Management, Nephrectomy.

Tri-phasic CT imaging has now supplanted the much less sensitive and less specific excretory urography /intravenous pyelography (IVP) for grading purposes.<sup>4</sup> Advances in radiographic injury grading, improvements in hemodynamic monitoring, validated renal injury grading systems, and essential information about the mechanisms of injury allow successful non operative management strategies for renal preservation even in cases of high grade (Grade IV and V) or severe renal injuries.<sup>5</sup> Assessment of trauma history and physical examination (including hemodynamics) findings combined with imaging provides maximal guidance for treatment decisions.<sup>6</sup> The main purpose of this study is to assess if conservative (non-operative) management will suffice in high grade renal injury also.

## MATERIAL AND METHODS

The study was carried out in a single tertiary health care centre catering to semi-urban population in and around Tirupati, Andhra Pradesh, India. The study was conducted in a retrospective manner and data was obtained from available hospital medical records after obtaining appropriate institutional clearances. All patients with renal trauma who presented to our centre during the period between May 2014 and June 2019, were included in the study. Patients with penetrating renal injuries were excluded as these cases underwent exploration as per institutional protocol. All the patients with blunt renal injury, diagnosed radiologically or surgically were graded using American association for the surgery of Trauma (AAST) grading of renal injury with grade IV and V considered to be high grade injuries in this study.<sup>7,8</sup> Though the revised (2018) AAST grading was

## INTRODUCTION

Renal injuries account for up to 1–5% of all trauma cases and is the third most commonly injured organ following abdominal trauma.<sup>1,2,3</sup> The management of renal injuries has evolved over the past few decades with a shift towards non operative management more so in low grade renal injuries. Grading of renal trauma refers to the use of appropriate imaging studies to define the extent of injury. Numerous models have been proposed for staging and management of renal trauma according to the severity of the injury. The widespread availability and anatomic detail provided by

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introduced, our study followed the 1989 grading in order to avoid any ambiguity (Table 1) (Figure 1 and 2).<sup>9,10</sup> Patients were divided according to management of renal injury in to 2 groups; Operative management and conservative/Non-operative. A patient was considered to be part of operative group if exploration was conducted within 24 hours of admission (allowing adequate time for resuscitation and assessment for transient response). On the other hand, no exploration within 24 hours would categorize the patient into non-operative group. By definition operative management in our study included any surgical intervention such as partial nephrectomy, renorrhaphy, auto-transplantation or nephrectomy. Non operative cases included those managed with absolute bed rest, resuscitation with fluid and blood transfusions, renal angio-embolization, Double-J stenting, percutaneous drains/nephrostomies, serial Hb%, hematocrit, complete urine examination (CUE), prophylactic antibiotic coverage and intensive monitoring of clinical parameters and vitals.

Indications for operative management were hemodynamic instability at presentation or deterioration with conservative management. Patients who were hemodynamically unstable at presentation with no response to fluid resuscitation underwent emergency exploratory laparotomy. If the patient had deterioration of clinical parameters (fall in hematocrit/hypotension with persistent gross hematuria) during the course of conservative/non-operative management (i.e. after 24hours) and subsequently had to undergo exploratory laparotomy, it was considered failure of non-operative management. The outcomes of each management strategy was assessed in terms of need for exploration (immediate or delayed), complications and need for adjunctive interventions. Details noted during follow-up visits included clinical history, blood pressure monitoring, local examination, CUE, hematocrit, serum creatinine and imaging (USG/CT) if done. This study was done using descriptive analysis, and data analyzed using Microsoft Excel (2010, ver14) software.

## RESULTS

A total of 43 patients were included in the study, out of which 38 were male and 5 females with ages ranging from 8-65 yrs (mean 44.6 years). Mechanism of blunt trauma causing renal injury was motor vehicle crash in 33 (77%) patients, fall from height in 6 (13%) patients and assault in 4 (10%) patients. Six patients presented (13%) with gross hematuria and shock (SBP<90mm at presentation), 10 (23%) with gross hematuria alone, 20 (47%) patients with microscopic hematuria and the rest (17%) had neither hematuria nor shock. The grades of injury in all cases and the line of management followed were analyzed (Table 2). Grade I to III injuries were noted in a total of 28 cases and were all managed conservatively with repeat USG at 72 hours, monitoring by CUE, serum creatinine, and serial hematocrit. These patients were subsequently discharged after hematuria subsided and/or improved clinically (1-2 weeks). Eleven patients were found to have Grade IV renal injuries, out of which one case underwent immediate exploration and nephrectomy in view



Figure-1: Contrast enhanced CT: grade IV injury left kidney.



Figure-2: Grade V injury, left shattered kidney.

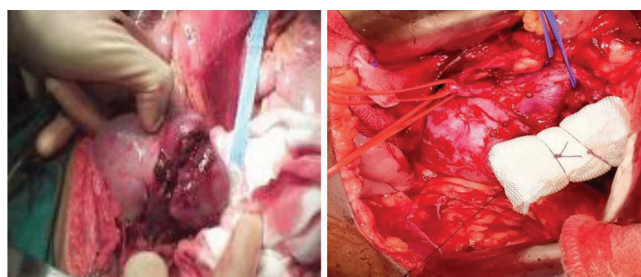


Figure-3: Renorrhaphy for grade IV injury.

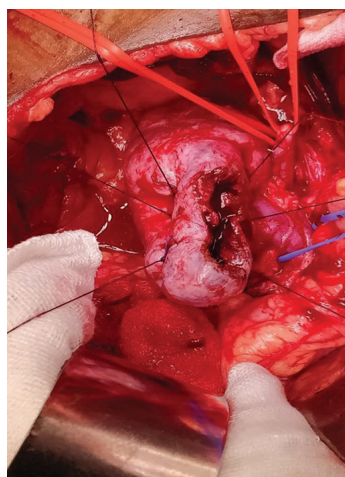


Figure-4: Lower pole nephrectomy.

Grade	Type	1989	2018 revised
I	Contusion Hematoma	Microscopic or gross hematuria, urologic studies normal Subcapsular, nonexpanding without parenchymal laceration	Subcapsular hematoma and/or parenchymal contusion without laceration
II	Hematoma Laceration	Nonexpanding perirenal hematoma confined to renal retroperitoneum < 1 cm parenchymal depth of renal cortex without urinary extravasation	Perirenal hematoma confined to Gerota fascia Renal parenchymal laceration ≤1cm depth without urinary extravasation
III	Laceration	>1cm parenchymal depth of renal cortex without collecting system rupture or urinary extravasation	Renal parenchymal laceration >1 cm depth without collecting system rupture or urinary extravasation. Any injury in the presence of a kidney vascular injury or active bleeding contained within Gerota fascia
IV	Laceration Vascular	Parenchymal laceration extending through renal cortex, medulla, and collecting system Main renal artery or vein injury with contained hemorrhage	Parenchymal laceration extending into urinary collecting system with urinary extravasation Renal pelvis laceration and/or complete ureteropelvic disruption Segmental renal vein or artery injury Active bleeding beyond Gerota fascia into the retroperitoneum or peritoneum Segmental or complete kidney infarction(s) due to vessel thrombosis without active bleeding
V	Laceration Vascular	Completely shattered kidney Avulsion of renal hilum, devascularizing the kidney	Main renal artery or vein laceration or avulsion of hilum Devascularized kidney with active bleeding Shattered kidney with loss of identifiable parenchymal renal anatomy

**Table-1:** American Association for the Surgery of Trauma Organ injury Severity Scale for the Kidney.<sup>5</sup>

Grade of renal injury	Number of patients	Initial non-operative management	Initial operative management	Failure of Non operative management	Overall operative management
Grade I	9	9(100%)	0	0	0
Grade II	14	14(100%)	0	0	0
Grade III	5	5(100%)	0	0	0
Grade IV	11	10(90.9%)	1	3(30%)	4(36.4%)
Grade V	4	2(50%)	2	0	2(50%)
Total	43	40(93%)	3(6.97%)	3(6.97%)	6(13.9%)

**Table-2:** Table showing number of patients belonging to various grades of renal trauma, line of management with their outcomes.

of hemodynamic instability. The rest were given trial of conservative management. After 24 hours, 3 grade IV cases were taken up for exploration in view of deteriorating clinical parameters and hemodynamic instability. These three cases subsequently required nephrectomy, renorrhaphy (for mid pole laceration, Figure 3) and lower pole nephrectomy (for lower pole laceration, Figure 4) in one case each. Out of the 4 cases of Grade V injuries, 2(50%) underwent immediate nephrectomy and 2 cases were managed conservatively without need for delayed intervention.

Most common complication seen was urinary tract infection (UTI) in 6 patients, persistent hematuria seen in 3 cases, hypertension 2 cases, persistent urinoma 2 cases and prolonged ileus in 2 cases. All complications were Clavien grade 1-2 and were managed with antibiotics and close observation and did not require any other adjunctive interventions. Overall, the success rate of conservative

management in our study was 100% in Grade I-III, 70% in Grade IV and 100% in Grade V injuries. All patients were followed up for a minimum of 3-18 months with a median follow up of 6 months. There were no mortalities either in operative or non-operative group.

## DISCUSSION

Treatment strategies for blunt renal injuries have changed over the last few decades. Managing higher grades of renal trauma by non-operative methods has been a subject of discussion. But over the last few decades Non-operative management has become the favored approach even in managing high grade renal trauma. Mingoli et al in their meta-analysis of over 13,000 renal trauma cases found that non-operative management was the most prevalent strategy used in 82.4% of for renal trauma patients versus 17.3% who underwent operative management.<sup>1</sup> Earlier studies

such as by Buckley et al showed success with non-operative management in grade IV renal injuries, more recent studies have shown higher rates of renal salvage in grade V injuries also but only if patient is hemodynamically stable as observed by Altman et al.<sup>11</sup> In our study, out of the 15 cases of high grade renal injury, conservative management was successful in 9 patients while 6 patients required operative management because of hemodynamic instability. Immediate renal exploration was done in 3 cases, one case of grade IV injury, 2 cases grade V injuries and all the three underwent nephrectomy. Delayed renal exploration (nephrectomy 1 case, 1 case renorrhaphy and 1 case lower pole nephrectomy) was done in 3 cases, all of which were grade IV injuries and were hemodynamically unstable. The high rate of nephrectomy (100%) in the patients undergoing immediate exploration can be attributed to motive of exploration being 'damage control' and not 'renal salvage'. Moreover, surgeons undertaking such emergency exploration are seldom trained in performing renal salvage procedures.<sup>12</sup> Literature affirms that conservative management of blunt renal injuries of Grade I–III in the absence of exsanguinations from the kidney may be treated expectantly. Increasingly, successful non operative treatment of blunt Grade IV injuries and even Grade V are being reported. Available literature seems to support at least a trial of conservative therapy, if possible, in these patients. Grade V vascular injuries will still likely require a speedy nephrectomy. The low complication rates in our study demonstrate that conservative management is associated with low morbidity. High rate of nephrectomy in cases of Grade V (50%) in our study is probably because of the severity of injury. In our study, 3 patients (6.97%) underwent immediate surgery because of haemodynamic instability and 3 patients (6.97%) underwent delayed surgery because of deteriorating clinical parameters and haemodynamic instability during conservative management, which is comparable to 9.67% in Toutouzas et al study.<sup>13</sup> In our study out of the 40 patients who were kept on conservative management, 3 patients (7.5%) required delayed surgery because of haemodynamic instability, and 37 patients (92.5%) were successfully managed non-operatively which is comparable to 84% of patients managed non-operatively in Toutouzas et al study. The renal salvage rate (includes renorrhaphy, partial nephrectomy and non-operative management) was 90.7% for the entire population and 97.5% among patients selected for non-operative management, which is comparable to 76.2% and 90.3% in Vander Wilden GM et al study.<sup>14</sup> Patients especially those managed conservatively should be followed up carefully for any complications till a minimum of 3 months.<sup>12</sup> Follow-up or 'delayed' CT scans in patients being managed conservatively are no longer recommended unless there is clinical deterioration or suspicion of delayed complications such as urinomas or vascular complications (arteriovenous fistulas/ pseudo aneurysms).<sup>12</sup> Surprisingly, there were no low grade renal injuries (I-III) in the cases undergoing immediate exploration. This suggests possible under-reporting of renal injuries when other organ injuries were found to be cause of the hemodynamic instability at the

time of exploration. The zero mortality in our study can be attributed to the fact that ours is a referral centre with most of the patients being referrals and very few direct admissions. Only those patients deemed fit or hemodynamically stable for being transferred probably made it to our centre alive.

The retrospective nature of the study and the small number of cases studied were the major limitations. The ideal study as in most cases would be a prospective randomized study, which is not feasible or ethical in acute life threatening situations as in this study. Being the next best option, Retrospective Systematic reviews are currently the gold standard for assessing feasibility of conservative/Non-operative management of renal trauma.<sup>15</sup> The revised (2018) AAST grading system was not followed as the study period included renal injuries occurring prior to the newer grading. As most studies till now have used the 1989 grading system and the implications of the newer grading system are yet to be deciphered, our study is comparable to available literature.<sup>16</sup>

## CONCLUSION

Immediate laparotomy remains the first line of management in all trauma patients who remain hemodynamically unstable despite of adequate resuscitation. For patients who are stable, contrast enhanced CT imaging is the gold standard investigation for diagnosis and grading of the renal injuries. Subsequent management can then be based upon the clinical status often beginning with a 'wait and see' strategy. If the patient is hemodynamically stable, even grade IV and V injuries can be managed conservatively, as is proven from the outcomes of our study with failure of non-operative management in only 30% of grade IV and none of the Grade V injuries.

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