

Management of blunt renal trauma in a tertiary hospital of South India: A retrospective single centre study

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Abstract

Background: Blunt renal trauma are usually caused by high-energy collisions such as road traffic accidents (RTA), fall from a height. They occur in 5 to 10 % of all trauma. Majority of hemodynamically stable patients with blunt renal trauma are successfully managed non operatively. **Aims and Objective:** To review the management of blunt renal trauma in our centre. **Materials and Methods:** A retrospective study of 22 patients was carried out in JSS Medical College and Hospital from January 2017 to January 2019. All blunt renal injuries were graded according to American Association for the Surgery of Trauma (AAST) organ injury severity scale. The following data were collected: demographics, mechanism of injury, associated injuries, admission hemoglobin, blood transfusion, CT findings, renal injury grade, presence of other organ injuries on CT scan, type of management, indication for operative intervention, operative procedures, operative findings, any other interventions required, hospital stay, morbidity, and mortality. **Results:** There were 22 renal injuries. Majority of them had Road Traffic Accidents and assault. Grade 2-3 were most common in 12 cases followed by grade 1 in five cases, grade 4 in three cases and finally grade 5 renal injury was seen in three cases. Three grade 5 injuries and two Grade 4 needed exploration for hemodynamic instability and underwent emergency nephrectomy otherwise all cases were managed successful nonoperatively. There was no mortality due to blunt renal trauma. **Conclusion:** Conservative management of blunt renal trauma without associated abdominal injury is feasible in patients who are hemodynamically stable at presentation. Advancements in imaging techniques and improved critical care have favoured the conservative approach for even the severe grade of injuries.

Keywords: Blunt renal trauma; Injury severity scale; Renal arterial thrombosis.

Introduction

The kidney is the most commonly injured genitourinary organ in blunt trauma followed by the bladder in both adult and pediatric populations. As in adults, pediatric blunt renal trauma has trended to nonoperative management. Renal injury occurs in up to 5% of trauma patients, and accounts for 24% of traumatic abdominal solid organ injuries. The majority of blunt renal injuries are low grade and 80 to 85% of these injuries can be managed conservatively [1,2,3]. Incidence is higher in male with male to female ratio of 3:1. It is more frequent in between the second and third decades [1]. The pathophysiology of blunt renal trauma is not completely understood but it seems that the major elements that cause the trauma are deceleration and acceleration forces.

Based on severity, renal injuries were divided in five grades using the classification of the organic injuries survey committee from the American Association of Surgery in Trauma (AAST) [1,2,3]. The development of validated renal injury scoring system has led to improved staging of injury severity that is relatively easy to monitor. CT scan has proved to be an effective means of staging renal trauma [4,5].

Abdominal sonography has not been shown to add information during initial evaluation of severe abdominal trauma. The relative indications for renal exploration can be nonviable tissue, urinary extravasation, incomplete staging, and arterial thrombosis. These injuries may coexist with bleeding, and it is this combination that lead to renal exploration. Transcatheter embolization is an effective alternate to surgical intervention for the management of traumatic

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bleeding sites. Nonoperative management has become the rule for the majority of blunt renal injuries, with higher rates of renal salvage and decreased morbidity compared to primary surgical management [1,2]. The nonoperative management scheme is not standardized amongst all urologists, but typically involves a period of bed rest, monitoring of vital signs and serial hematocrit measurements, with either selective or routine use of early follow-up imaging. Our center has previously advocated routine follow-up imaging 2 to 4 days after blunt renal trauma to identify patients that may require intervention for delayed complications [2].

The kidney is covered by fat and the Gerota fascia in the retroperitoneum, and the renal pedicle and ureteropelvic junction (UPJ) are the major attachment elements; therefore, deceleration forces on these elements may cause renal injury like rupture or thrombosis [6,7]. Acceleration forces may cause collision of the kidney in its surrounding elements, like the ribs and spine, and cause parenchymal and vascular injury. We evaluated 22 of our cases of blunt renal trauma and share our experience here that with proper resuscitation, aggressive management conservative treatment can be the first line of treatment for renal trauma [7,8].

Materials and Methods

We analyzed data of all patients who presented in emergency after blunt renal trauma from January 2017 to January 2019. It was a retrospective study done in our hospital. All patients who were admitted for blunt renal trauma and who underwent both conservative treatment and surgical treatment in urology department were included in the study. Patients with head injury were excluded in our study. This might lead to a selection bias for higher grade injuries in this study. Other limitations of our study included the small number of patients, retrospective design, and lack of long-term follow-up.

Results

Twenty two renal injuries were identified. The mean age of the 22 patients was 28 ranging 18 to 65 years. There were 19 (86.37%) males and 3 females. Majority 18 of them were involved in Road traffic accident followed by fall from a height in 4 cases. Other injuries associated with renal injury were rib fractures in 9 cases mostly in adults, hemothorax in two, pulmonary contusions in two, splenic injuries in three cases, liver injuries in three cases and spine fractures in two cases. Table 2 shows the AAST grading of all the blunt renal trauma. Two Grade 4 injuries and three Grade 5 who were hemodynamically unstable despite of aggressive resuscitation and concomitant liver and splenic injuries needed exploration for hemodynamic instability and underwent nephrectomy otherwise all cases were managed successful nonoperatively (Table 3). Two patients underwent splenectomy for Grade 5 splenic injury. CT scan was repeated in 11 cases; most of them repeated for grade 4 and 5 injuries and in cases with persistent hematuria or collection suggestive of urinoma seen in USG abdomen. Blood transfusions were needed in 15 cases. All grade 4-5 renal injuries required blood transfusion with two third of patients requiring transfusion in grade 2-3 renal injuries. Grade 1 renal injuries did not require any blood transfusion. There was no mortality due to blunt renal trauma during admission in the hospital.

Institution ethical committee approval was taken and patients consent were taken for same. Patient's data was obtained from hospital medical records, chart review and radiological trauma films. All blunt renal injuries underwent contrast enhanced CT scan and were graded according to AAST organ injury severity scale which was divided into five categories based on Radiological findings. The AAST grade of renal injury, the overall injury severity of the patient, and the requirement of blood transfusion were the primary factors in determining the patient's need for nephrectomy and overall outcome. The AAST grade is a predictor for morbidity in blunt and penetrating renal injury, and for mortality in blunt injury. The AAST grade has a statistically significant correlation with the need for surgery (from 0 to 93%) and for the risk for nephrectomy (0–86%) [5,6].

Patient's age, sex, injury mechanism, degree of hematuria, resuscitation measures, treatment options, operative findings, duration of hospitalization and complications were recorded. Hemodynamically unstable patients at presentation were resuscitated and stabilized before imaging. The renal injuries were graded according to AAST. Most renal trauma (75% to 85%) are classified as minor (Grade I to III). Majority of them is treated conservatively. The remaining 15% of cases represent major injuries (Grades IV to V), 5% are grade V. Surgery is limited to patients with grade V pedicle avulsion and in patients hemodynamically unstable despite aggressive resuscitation [1]. Conservative management consisted of continuous hemodynamic monitoring, parenteral fluid therapy with crystalloid, colloid or blood transfusion, hematocrit determination, prophylactic antibiotics and bed rest until gross hematuria settled. Early complications were assessed during hospital stay and late complications from patient's record when they returned to hospital for follow up.

Table-1: Demographics of patients with blunt renal trauma.

Age Distribution	Numbers	Percentage
20-30 yrs	9	40.90
31-40yrs	7	31.18
41-50yrs	3	13.63
51-60yrs	3	13.63

Table-2: American Association for the Surgery of Trauma (AAST).

AAST Grade of Renal Injury	AAST Grade of Renal Injury	No of Patients	Percentage
1	Parenchymal contusion Subcapsular hematoma	3	13.63
2	Parenchymal laceration less than 1cm deep Perirenal hematoma confined to renal retro peritoneum	7	31.18
3	Parenchymal laceration greater than 1cm. deep without collecting system involvement	5	22.72
4	Parenchymal laceration into collecting system	4	18.18
5	Parenchyma shattered,Hilar avulsion with renal devascularization	3	13.63

Table-3: AAST grade and clinical characteristics of patients

AAST Grade of Renal injury	Mean Hb at presentation (gm/ dl)	Mean Total blood transfusion received (units)	Management	Complications/ Intervention	Mean Total hospital stay (days)
1	10	0	Conservative (3)	None	4
2	9.5	1	Conservative (7)	None	5
3	8	2	Conservative (5)	None	5
4	6.8	3	Conservative (2) Nephrectomy (2)	Urinoma in one/ Percutaneous Nephrostomy placed	8
5	5.5	5	Nephrectomy (3)	Prolong hospital stay,bleeding	10

Discussion

Blunt renal trauma is the most common mechanism accounting for 80 to 85% of all renal injury. Blunt renal trauma may be classified as minor or major [3] Blunt trauma due to motor vehicle is the most common mechanism of renal injury [1]. Motor vehicle accident was also the major cause of blunt renal trauma (89%) in our study. All the patients with grade IV and V injuries in our study were involved in motor vehicle accidents. It seems that a large impact force is required to cause major injury. In this study, the most frequently injured intra-abdominal organ was the liver followed by the spleen. Most studies report a similar result as the liver and the spleen are the most frequently associated injuries [8]. Associated liver injury was reported to be 14%–28%, and associated spleen injury was 16%–33%. In our study all patients of grade V and two patients of grade IV underwent nephrectomy. Indication of laparotomy was hypotension (not responding to resuscitation) and associated Liver and splenic injury. All other patients were treated conservatively [3,4]. No death was observed in non-operative group. The concept of conservative treatment of blunt renal trauma is not new. All patients of Grade, II, III and 50% of Grade IV in our study were treated conservatively.

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Indication of exploration was hypotension and acute abdomen. Hemodynamic stability was the indication for conservative management. The goals of nonoperative management of blunt renal injury are to identify, manage, and limit associated complications – including urinary extravasation, urinoma, infection, bleeding, and, most importantly, loss of renal function or unnecessary nephrectomy. Such complications have been reported in 3% to 33% of patients after renal trauma [10]. Clinical management of such complications is directed primarily by objective clinical signs and symptoms (i.e., hemodynamic instability, increasing pain, fever and leukocytosis, decreasing hematocrit and blood transfusion requirement) and not by imaging results [11]. Even in cases where imaging results demonstrate known harbingers of urologic complications (devascularized segments, urinary extravasation), continued nonoperative management has proven practicable, with intervention based on clinical rather than radiographic criteria [11].

Although management of renal contusion and minor laceration is usually straightforward, there is no consensus on optimal management of high-grade injury. In the absence of clear-cut indications like ongoing life threatening hemorrhage, expanding retroperitoneal hematoma and pulsatile retroperitoneal hematoma different management strategies emerge. Some groups advocate exploration based on injury grade alone, the presence of devitalized segments or presence of urinoma. The reported operative rate for blunt renal trauma is 2-10%. Of the operative interventions, 70% resulted in nephrectomy. Similar to other studies an increased risk of nephrectomy was seen in our study with high American association for surgery of trauma grades and this grading was the most powerful predictor of nephrectomy. When grade III, IV renal injuries are managed expectantly, delayed renal bleeding is found in 13-25%.



Figure-1: Grade 5 Renal Injury

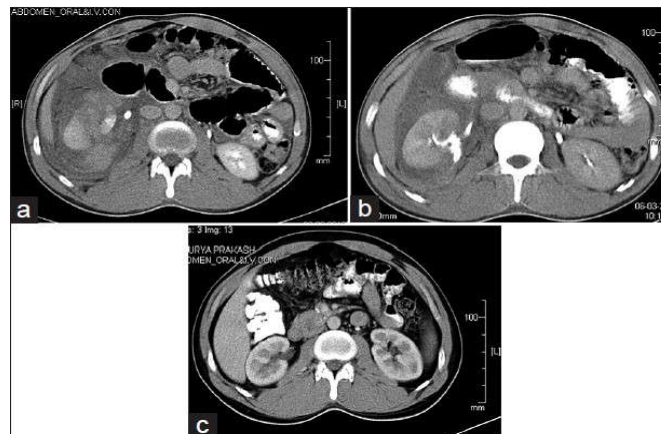


Figure-2: Axial section of CECT pictures showing (a) initial CT showing Grade IV renal injury, (b) contrast extravasation after 48 hours, and (c) completely resolved hematoma at 1-year follow up

Repeat abdominal CT imaging with a delayed phase is recommended between 36 and 72 hours after initial injury for Grades 3 through 5 blunt renal injury [10]. In our study, not all Grade III-IV underwent repeat CT scan and CT was not repeated if patient's condition is stable and there is no persistent or new onset hematuria or collection in USG abdomen. Urinoma occurs in 1% to 7% of all patients with renal trauma and resolves spontaneously in most case [3] Persistent urinoma requires intervention in the form of retrograde DJ stenting or Percutaneous Nephrostomy (PCN)

Conclusion

Conservative rather than operative management is preferred in high-grade blunt renal injury [11,12]. This is due to improvements in the resuscitation therapy quality of trauma surgeons and the development of highly selective angioembolization. However, there is an increased complication rate in high-grade injuries, and close observation is recommended for high-grade renal injury after conservative management. Advancements in imaging techniques and improved critical care have favored the conservative approach for even the severe grade of injuries.

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