Predictors of nephrectomy in high grade blunt renal trauma patients treated primarily with conservative intent

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ABSTRACT

Introduction: There is no consensus on the optimal management of high grade renal trauma. Delayed surgery increases the likelihood of secondary hemorrhage and persistent urinary extravasation, whereas immediate surgery results in high renal loss. Hence, the present study was undertaken to evaluate the predictors of nephrectomy and outcome of high Grade (III-V) renal injury, treated primarily with conservative intent.

Materials and Methods: The records of 55 patients who were admitted to our institute with varying degrees of blunt renal trauma from January 2005 to December 2012 were retrospectively reviewed. Grade III-V renal injury was defined as high grade blunt renal trauma and was present in 44 patients. The factors analyzed to predict emergency intervention were demographic profile, grade of injury, degree of hemodynamic instability, requirement of blood transfusion, need for intervention, mode of intervention, and duration of intensive care unit stay.

Results: Rest of the 40 patients with high grade injury (grade 3 and 4) did not require emergency intervention and underwent a trial of conservative management. 7 of the 40 patients with high grade renal injury (grade 3 and 4), who were managed conservatively experienced complications requiring procedural intervention and three required a delayed nephrectomy. Presence of grade V injuries with hemodynamic instability and requirement of more than 10 packed cell units for resuscitation were predictors of nephrectomy. Predictors of complications were urinary extravasation and hemodynamic instability at presentation.

Conclusion: Majority of the high grade renal injuries can be successfully managed conservatively. Grade V injuries and the need for more packed cell transfusions during resuscitation predict the need for emergency intervention.

Key words: Blunt renal trauma, conservative intent, emergency nephrectomy

INTRODUCTION

Blunt trauma is the most common cause of renal injury with road traffic accident as the mechanism of injury in the majority of cases. The management of renal trauma has become increasingly conservative with multiple series showing renal preservation after high grade injury.[1,2] Indications for exploring high grade renal blunt injury remains controversial.[3] In the present study, we evaluated the clinical features and outcome of patients who presented with high grade III-V renal trauma to our institute. The goals were to further refine the absolute indications for exploration and determine the outcomes of conservative management.

MATERIALS AND METHODS

Patients

We retrospectively reviewed the records of all patients with blunt renal injury who presented from January 2005 to December 2012. Patient data was obtained from our medical records department and the data retrieved was complete. Of the total 55 blunt renal injury patients, we identified 44 consecutive patients with high grade injury (grade III-V). Grade was assigned based on contrast enhanced computed
tomography imaging after stabilizing the patient according to the American association for the surgery of trauma kidney injury scale proposed in 1989.[4]

**Treatment**

Regardless of injury grade, all patients who were hemodynamically stable after resuscitation were considered candidates for conservative management. Patients who had ongoing hemodynamic instability despite blood transfusion and resuscitation, who had expanding hematoma and who had a pulsatile retroperitoneal hematoma were considered for immediate exploratory laparotomy. Conservative management consisted of bed rest, analgesia, hydration and broad spectrum antibiotics in the presence of urinoma. Patients treated conservatively were followed-up with continuous hemodynamic monitoring, serial hematocrit determination and abdominal girth measurement. Routine reimaging after 48 h was not obtained in all patients. The indications for repeat imaging were urinary leak (grade IV injuries) and ongoing hemorrhage. Strict bed rest was advised until the gross hematuria resolved and patients were discharged after 3-4 days of ambulation and uneventful hospital stay.

**Statistical analysis**

All statistical analyses were performed by online statistical tool http://www.graphpad.com/quickcalcs/ and a P < 0.05 was considered to be significant. The continuous variables were presented as mean ± standard deviation or median and interquartile range, as appropriate. The categorical data were presented as numbers and percentages. Differences between categorical variables were analyzed using the Fisher exact test (two tailed).

**RESULTS**

Of the 55 patients, 44 (80%) were male, 11 (20%) were female. High velocity automobile and motor vehicle accidents were responsible for 45 of the 55 injuries (81.8%) and the remaining 10 (18.1%) were due to fall from height and assault injuries. At presentation, 35 (64%) patients had hypotension (i.e., systolic blood pressure ≤ 90 mm of Hg). All these 35 patients had high grade renal injury and 7 underwent nephrectomy (4 immediate; 3 delayed).

Of the 55 patients, grade III injuries occurred in 22 (40%), grade IV in 18 (32.7%) and grade V in 4 patients (7.2%). Macroscopic hematuria was seen in 38 patients (71%), microscopic hematuria in 11 (22%) and only 6 patients had no evidence of hematuria. In 15 of 55 patients (27.4%), renal injury was the only intra-abdominal injury. In 19 patients, another major abdominal organ was injured. Liver laceration was seen in 10 (18.1%), splenic injury in 6 patients (10.9%), injury to the duodenum and pancreas in 2 patients (3.6%) and bowel injury in 1 patient (1.8%). Rest of the patients had injuries such as rib fractures, pneumothorax, upper and lower limb fractures, head injury and pelvic fractures.

**EMERGENCY INTERVENTION**

Of the 55 patients, 4 patients (7.2%) required emergency nephrectomy. All of them had grade V injuries [Figure 1]. The patients who needed intervention required more blood transfusion for resuscitation as measured by packed red blood cell units. Out of the 8 patients who required more than 10 units, 6 underwent nephrectomy (4 immediate, 2 delayed), whereas only 1 out of 47 patients who required less than 10 units had delayed nephrectomy (P = 0.0001). Tachycardia, hemoglobin at admission and degree of hematuria were not significant predictors for emergency intervention. In our study, 19 patients had other associated intra-abdominal injuries. In the 4 patients requiring emergency nephrectomy, all of them had associated abdominal injuries - two of them had liver laceration and two had splenic rupture for which splenectomy was done.

**Conservative management outcome**

Of the 44 high grade injury patients 40 required no emergency intervention and underwent a trail of conservative management. In 7 of these 40 patients (all grade IV), complications required procedural intervention - 2 patients for extravasation and 5 patients for secondary hemorrhage [Figure 1]. Extravasation of urine required retrograde insertion of a ureteral stent with percutaneous urinoma drainage. Among patients with secondary hemorrhage, 3 underwent nephrectomy, 1 underwent successful embolization for pseudo aneurysm and 1 underwent renorrhaphy [Figure 2]. Mean time from injury to complications was 14 days. Patients with complications were significantly older and hemodynamically unstable at presentation requiring more packed cell units for resuscitation. In patients with renal trauma with conservative intent who were explored for other intra-abdominal surgery, none of the patients required nephrectomy as there was no expanding or pulsatile retroperitoneal hematoma.

**DISCUSSION**

Renal injuries occur in 1.4% to 3.5% of trauma patients.[3] The vast majority of renal injuries result from

![Figure 1: Number of patients who required intervention grade wise](image_url)
blunt mechanisms like motor vehicle crashes and falls[3]. Most renal injuries are minor. Significant renal injuries including laceration and vascular injuries account for 4-25% of blunt injuries. In our study, the proportion of patients with high grade injuries is 80%, as our institute is a tertiary referral center; patients with high grade injury and hemodynamic instability are usually referred from other centers. Although management of renal contusion and minor laceration is usually straightforward, there is no consensus on optimal management of high grade injury.[3] In the absence of clear-cut indications like ongoing life threatening hemorrage, 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.[5-10] The reported operative rate for blunt renal trauma is 2-10%.[11-12] Of the operative interventions, 70% resulted in nephrectomy, delayed renal bleeding is found in 13-25%.[14] In our study, five of the patients had secondary hemorrhage of which one underwent renorrhaphy, one angioembolization, and three nephrectomy. Two patients required double J stenting plus percutaneous drainage for urinoma. Associated intraabdominal injuries was seen in 34.5% of our patients compared to 43% seen in literature.[15]

CONCLUSION

Majority of the high grade renal injuries can be successfully managed conservatively. Grade V injuries and the need for more packed cell transfusions during resuscitation predict the need for emergency intervention.

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