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# CONSERVATIVE MANAGEMENT OF RENAL INJURY IN CHILDREN

Urology

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## ABSTRACT

The kidney is the organ most commonly associated with Urological trauma and is involved in 1–20% of blunt trauma cases The severity of renal trauma can range significantly and the grading system of the American Association for Surgery of Trauma (AAST) classifying Renal Injuries as Grades I-V is followed universally and the management options vary with the grade of Injury. The goal of renal trauma management is preservation of functional renal parenchyma with minimal morbidity and Nonoperative management has become more commonplace in recent times, with the advent of interventional radiology and improvements in imaging. However, emergency nephrectomy remains the gold standard treatment for acute uncontrollable renal haemorrhag In this paper discussion about renal trauma in children and the role of conservative management is out-lined along with a case history of a 12 year old girl with a history of trivial fall over a stone who presented with compliants of abdominal pain and no other clinical signs of renal injury and was diagnosed radiologically as Grade IV renal injury with urinary extravasation. She was managed conservatively and was treated by Internal ureteral stenting and Blood Transfusion and she became better and was discharged.The child is on regular follow up and her renal function has improved well.

## KEYWORDS

Renal trauma, Renal Injury, Endourology, Internal stenting, Urinoma, Conservative grade 4 renal injury, AAST.

## INTRODUCTION:

The kidney is the organ most commonly associated with urological trauma and is involved in 1–20% of trauma cases The severity of renal trauma can range significantly, and thus the management options likewise can vary.

Blunt trauma is responsible for 90% of the genitourinary injuries in children, with approximately 90% having coexisting injuries to the thorax, spine, pelvis, femur or intra abdominal organs. Traumatic injury to the kidney accounts for greater than 60 % of the paediatric genitourinary injuries. The trauma can vary from mild contusion of kidney parenchyma to the avulsion of renal pedicles causing infarction of the entire kidney. The paediatric kidney is believed to be more susceptible to trauma because it is protected by an immature, pliable thoracic cage, weak abdominal musculature, less perirenal fat and is at a lower position in the abdomen than its adult counterpart. In contrast to adults, in children, haematuria is a very unreliable sign in determining the need to screen for renal injures. In some studies there is no evidence of gross or microscopic hematuria in up to 70% children sustaining Grade 2 or higher renal injury. The goal of renal trauma management is preservation of functional renal parenchyma The recent advances in radiology, improvements in haemodynamic monitoring, validated renal injury scoring systems and essential details about the mechanisms of injury allow successful nonoperative management strategies aiding renal preservation. When blunt trauma is accompanied by significant urinary extravasation, percutaneous drainage, internal stenting, can result in the complete resolution of persistent urine leakage.

## CASE REPORT:

A twelve year old girl who sustained blunt abdominal injury following a trivial fall while playing and fell over a stone two days prior was brought to the casualty department of the hospital with history of abdominal pain for two days, more over the left side of abdomen, history of one episode of haematuria and history of pain while passing urine for the past two days.

On physical examination, her vitals signs were: temperature, 38.3°C (100.9°F); heart rate, 125 beats per minute; blood pressure, 107/52 mm Hg; and respiratory rate, 30 breaths per minute. She was in no acute distress. Her abdomen was soft with bowel sounds were audible but had severe tenderness over the left Lumbar and left Iliac regions on palpation. No bruising were noted and there was no palpable mass. Her urine was light red on macroscopic examination. Laboratory examination indicated that the her haemoglobin was 9.4gm% and pcv Haematocrit 28, Blood Urea 24mgs% and Serum creatinine was 1.2 mgs/dl. Urinalysis showed numerous red blood cells and 8 to 12 pus cells per high-power field. Chest X-ray and ECG were normal . Ultrasound abdomen reported as to consider Intra parenchymal haematoma left kidney. Patient was subjected to a CT Scan of the Abdomen which revealed a complete transection (deep laceration) involving the upper interpolar region of left kidney with involvement of upper pole calcyces and upper infundibulum with contrast leak into perinephric space and smaller lacerations (depth of 1.5cm) involving posterior aspect of inter and lower pole of left kidney with presence of perinephric urinoma and haematoma with AAST grade IV injury all other solid organs being normal.( figure 2 -6). Urologist opinion obtained and the child kept under strict bed rest and her vital parameters and haematocrit values were monitored periodically. The child was haemodynamically stable and the nature of the injury, its progress and complications were explained to her parents. To avoid the formation of persistent urinoma and infection of the haematoma the child was subjected to Cystouretheroscopy with left sided Retrograde Pyelogram which revealed contrast extravasation from the upper calyx and left Double J stenting done (Figure-7) and urinary bladder drained via a foleys catheter. Post operatively the patient was transfused two units of screened, compatible packed red cells and was monitored intensively for any defecit in haematocrit value periodically and was under strict bed rest and broad spectrum antibiotics and supportive medication. The child's vital parameters, haemoglobin and renal function tests remained stable. A repeat Ultrasound Abdomen revealed resolution of the haematoma over the stent. The child was discharged from hospital on the fifth day under antibiotic care and adviced strict bed rest and regular follow up. Repeat Ultrasound Abdomen after 2 months showed near complete resolution of perinephric hematoma and no signs of urinoma and the stent was removed. The Dimercapto-succinic acid Renal scintigraphy (DMSA) scan was performed 3 months after injury and no definitive loss in the calculated renal activity fraction on the side of the lesion was noted. No hypertension developed in the patient during the 12 month follow up period.

**INTRA PARENCHYMAL HAEMATOMA LEFT KIDNEY**

**Figure -1**

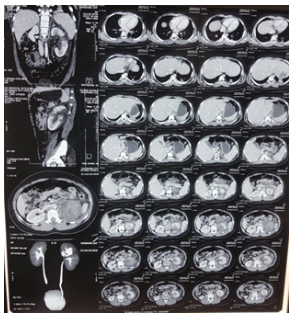


**Figure-2**

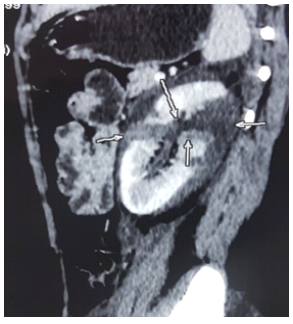


**Figure -3**

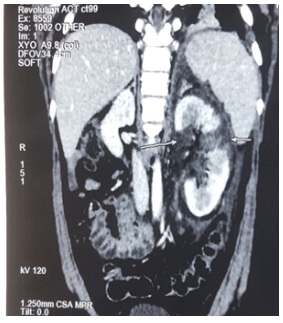



**Figure-4**

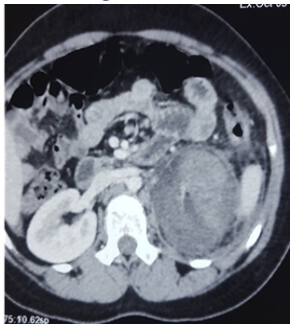


**Figure -5**


**Figure-6**

**Figure -- 7**

Figure -1 : Usg Abdomen Showing Intra-parenchymal Hematoma

Figure - 2 To 6 : Ct Abdomen Showing Complete Transection (deep Laceration) Involving The Upper Interpolar Region Of Left Kidney With Involvement Of Upper Pole Calcyces And Upper Infundibulum With Contrast Leak Into Perinephric Space And Smaller Lacerations (depth Of 1.5cm) Involving Posterior Aspect Of Inter And Lower Pole Of Left Kidney With Presence Of Perinephric Urinoma And Haematoma With Aast Grade Iv Injury All Other Solid Organs Being Normal.

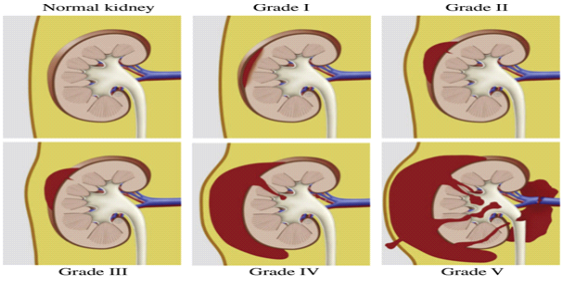
Figure -7 : C-arm Image Intensifier Showing Dj Stent (L)

## DISCUSSION:

Renal injury occurs in 1%–5% of all traumas, causing disability or even death.. Blunt trauma is caused primarily by motor vehicle collisions, followed by falls, contact sports and pedestrian accidents. In the majority of cases, renal injuries are minor and self-limiting. In urban areas, the percentage of penetrating injuries can reach 20% or higher, caused mostly by fire arms and stab wounds. The latter tend to be more severe and are more likely to require surgical management. The improvements in imaging and the use of a validated renal injury grading system has helped to predict, more acutely and with greater ease, outcomes such as mortality and the need for nephrectomy. The treatment of renal trauma is still controversial, but over the last decade a consistent trend has been noted, in which conservative management is being more commonly used over surgical management.

Though renal trauma is more commonly seen in young males, with a mean age of 30.8 years, Children are considered to be at increased risk for genitourinary tract trauma owing to unique anatomic differences between children and adults. The kidneys are larger relative to the size of the child's body, are positioned lower in the abdomen, and are also less protected because of decreased perirenal fat, weaker abdominal wall musculature, and a poorly ossified thoracic rib cage. Additionally, because many pediatric kidneys retain their fetallobulations, the risk for renal parenchymal disruption and lower pole amputation is increased. Furthermore, the renal capsule and Gerota fascia are less developed than in adults, creating a greater potential for laceration, nonconfined bleeding and urinary extravasation. Lastly, because of the relative mobility of a child's kidney, rapid deceleration is more likely to result in renal pedicle injury and Uretero Pelvic Junction disruption. Mechanisms of blunt renal injury include pedestrian / motor vehicle crashes (60%), falls (22.5%), sports injuries (10%), assault (3.5%), and other causes (4%)

The American Association for the Surgery of Trauma (AAST) in1989 classified renal injuries into five grades in order of increasing severity based on findings during surgery with a strong correlation with CT findings but did not adequately classify certain subtypes of injuries within grades IV and V. Hence in 2011, a revision of the original scale was done by Buckley and McAninch including segmental vascular injuries and ureteral pelvic injuries and establishing a more rigorous definition of severe grade IV and V renal injuries.




**AAST Renal Injury Grade System**

| Grade | Type of Injury | Description | Management |
|---|---|---|---|
| I | Normal contusion | Microscopic or gross hematuria, urologic studies normal | |
| | Hematoma | Subcapsular, non-expanding without parenchymal laceration | 75% of Renal traumatic Injuries |
| II | Hematoma | Non-expanding perirenal hematomas confined to the retroperitoneum | Non operative management is usual. |
| | Laceration | Superficial parenchymal lacerations less than 1 cm in depth without urinary extravasation | Routine follow up CT not required. |
| III | Laceration | Parenchymal lacerations greater than 1 cm in depth without urinary extravasation | |
| IV | Laceration | Parenchymal lacerations extending through the renal cortex, medulla, and collecting system | Operative Management usually deferred unless patient is hemodynamically unstable |

| | | | |
|---|---|---|---|
| | Vascular injury | Injuries involving the main renal artery or vein with contained hemorrhage | |
| V | Vascular injury | Completely shattered kidney | Operative Management. |
| | | Complete avulsion of renal hilum which devascularized kidney | |

Grade I injuries are the most common type of renal injury (75%–85% of cases) and in most cases, are generally managed conservatively.

Grade II injuries include non-expanding perinephric haematomas confined to the retroperitoneum and superficial cortical lacerations measuring less than 1 cm in depth without collecting system injury. Most of these cases are treated conservatively in stable patients. In patients with renal trauma that does not involve the renal vessels, the conservative management success rate is up to 95%.

Grade III injuries correspond to a laceration greater than 1 cm, without the collecting system's involvement and can be managed conservatively in stable patients, but for many of them an expectant approach should be considered. Intervention may be needed in cases with active arterial bleeding which can, in most cases, be taken care of by angiographic embolization, with surgery being needed in only those with haemodynamic instability.

Grade IV injuries involve deep parenchymal lacerations extending through the renal cortex and medulla into the collecting system and injuries involving the main renal artery or vein with contained hemorrhage and segmental infarctions without associated lacerations.The management of patients with these injuries can be particularly challenging and can be given a trial of conservative management provided the patient is haemodynamically stable, with no expanding haematomas. The PCS injury and urinary extravasation can also be resolved with a conservative approach, sometimes assisted with stenting, percutaneous nephrostogram or drainage of urinoma. In cases resolution failure, surgical repair or nephrectomy may be warranted.

Grade V injuries with complete ureteropelvic disruption and renal pedicle avulsion need surgical repair. However, partial ureteropelvic injury can be managed with stenting or proximal urinary divergence. Renal artery thrombosis and devascularization can be managed with thrombolysis or stenting to preserve renal function if intervention is within a few hours of injury. Others may need a nephrectomy. Partial nephrectomy remains an option in those in whom a reasonable amount of functional renal parenchyma can be preserved Non operative therapy consists of bed rest, close monitoring of vital signs and urine output, serial abdominal examinations, serial haemoglobin determination, transfusion as indicated and intravenous broad spectrum antibiotics.Urinomas are perinephric collections that form as urine extravasations through major parenchymal disruptions or ureteropelvic junction (UPJ) lacerations. Most urinomas are asymptomatic and will resolve spontaneously.

Internal ureteral stenting was the most successful single intervention in the patients with urinoma and offers some advantages over percutaneous approaches, include improvements in quality of life during convalescence owing to increased patient comfort, avoidance of catheter care, avoidance of urine collecting bags, reduction of dislodgment potential, and psychologically the avoidance of an external catheter. These potential advantages are particularly important in children who may be less cooperative or compliant. The stents typically are left in place for 6 weeks to facilitate healing or until image documented resolution of the urinoma is seen. In addition, for pediatric patient populations, internal drainage is more cosmetically appealing and less of a social burden.

Both immediate and long-term complications of high-grade renal trauma can be significant and are likely to require follow up after discharge.

Common associated complications of renal trauma include infection, urine leak, loss of renal function, and hypertension. Urinary tract infection is the most prevalent amongst such patients managed in intensive care, and in certain cases perinephric abscess may develop.

## CONCLUSION:

All patients with haematuria after abdominal trauma should raise suspicion for renal injury, however, hematuria may not be present in patients with main renal artery thrombosis and devascularization. FAST is a rapid and well accepted tool for triage of these patients. CECT is the modality of choice to grade the renal injuries based on the AAST classification system and also to look for associated complications. CT, usually performed in a single phase - early nephrographic, provides information about parenchymal injuries and it is in this phase that other visceral organs can also be evaluated. In order to seek further information regarding renal function, PCS injury and confirming arterial extravasations, additional delayed images may be acquired. Most renal injuries can be managed conservatively. Procedures like urinary divergence, stenting for PCS or ureteric injury, and angioembolization for pseudoaneurysm or active bleeding, are minimally invasive procedures which expand the borders for conservative management and surgery is needed only in those with higher grade injuries or in those with failure of conservative management. We are publishing this case report to create awareness about the role of conservative management in Grade 4 renal injuries in haemodynamically stable patients since there are very few literature evidence available on conservative management of Grade 4 renal injuries in children.

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