

Trauma and reconstruction

## High grade renal trauma in a child with rupture bladder and fracture pelvic bones



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### Introduction

Children are more likely to sustain renal injuries after blunt trauma when compared to adults. A child's kidney is larger in relation to the rest of the body and often retains fetal lobulations, which can cause parenchymal disruption easily following a blunt trauma. A child's kidney is less well protected than an adult kidney. Moreover the perirenal fat is less developed, the abdominal muscles are much weaker and the thoracic cage is less well ossified and therefore much more elastic and compressible.<sup>1-3</sup>

Blunt renal trauma is usually the consequence of sudden deceleration of the child's body.<sup>1</sup> The cause of such injuries include falls, sports accidents and contact with blunt objects. Deceleration or crush injuries result in contusion, laceration or avulsion of the less well protected paediatric renal parenchyma. Preservation of kidney and its function remains the primary goal in children due to their projected lifespan. There has been a growing body of literature supporting non-operative management of blunt renal injury, though this approach has not been clearly defined and published guidelines are lacking.<sup>2</sup> Umbriet et al. reported that non-operative management of nonvascular grade IV trauma was successful in more than 80% of children. Most of the renal injuries are often minor in paediatric age group and that observation posed no significant danger to the child. However in serious paediatric renal injuries early detection and staging based on clinical presentation and computerized tomography were critical for determining operative vs nonoperative management. Regardless of the type of management the standard of care should be renal preservation.

### Case report

A 10 year old male child presented to the hospital with history of fall and sustaining blunt injury to the abdomen. The child had tachycardia and marked tenderness over the abdomen. The child was

catheterized in the emergency room and the catheter drained 200 cc of blood stained urine. Blood haemoglobin was 8.9 gm%, Serum creatinine 1.19 mg%, and blood group was B+ve.

Computed tomography (CT) of the abdomen showed contrast filled deep contusions and lacerations with a linear hyper dense tract extending from the right renal cortex to the renal pelvis in the interpolar region with maximum thickness approximately measuring 8 mm. A contrast filled subcapsular collection was noted around the right kidney (Fig. 1). Hyper dense contrast was noted in the paracolic gutter, peritoneal space, perivesical space suggesting a possibility of bladder injury.

The bladder was grossly distended and showed foley's catheter in situ. Fractures of both superior and inferior pubic rami were seen and the left fracture fragment impinging on the bladder was also seen (Fig. 2). A diagnosis of right renal injury (grade IV/V) with bilateral pubic rami fracture with bladder injury was made. The child was stabilised, blood arranged and consent obtained.

The child was explored under general anaesthesia using a pfannenstiel incision. The bladder was identified and so also the fracture fragment piercing the bladder (Fig. 3b). The fracture fragment was put back in place. The extraperitoneal tear of the bladder was repaired (Fig. 3a). The peritoneal surface of the bladder was also examined, but showed no injury. Open reduction and internal fixation of left superior pubic rami (Fig. 3c) was done along with closed reduction and external fixation of the pelvis was done. The child had an uneventful recovery. The external fixators were removed after three months. Repeat CT abdomen revealed the renal injury was stabilised and the perirenal hematoma was completely absorbed.

### Discussion

The initial assessment of a child with blunt renal trauma is very critical so as to determine hemodynamic stability and the need for

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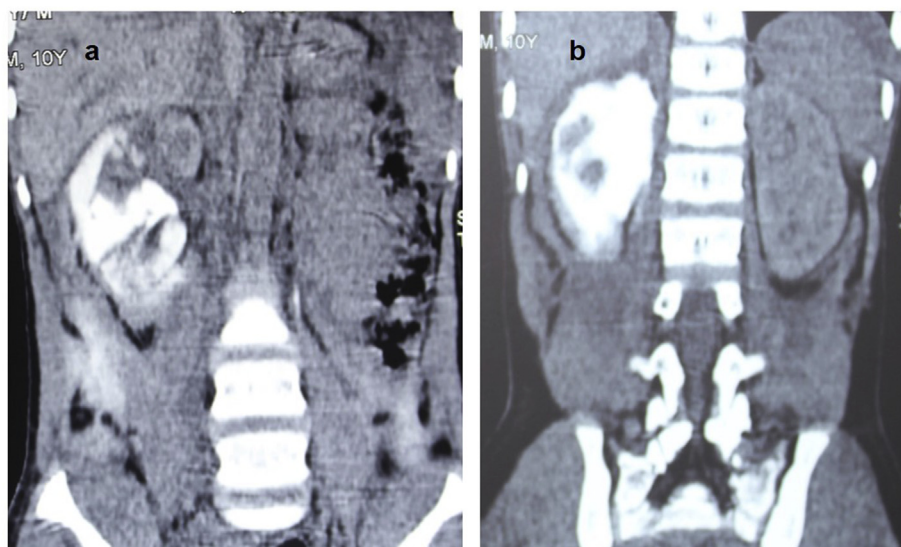
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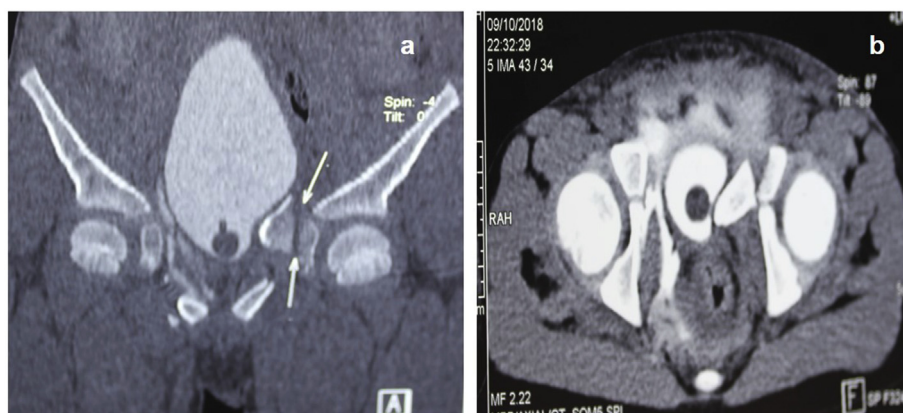
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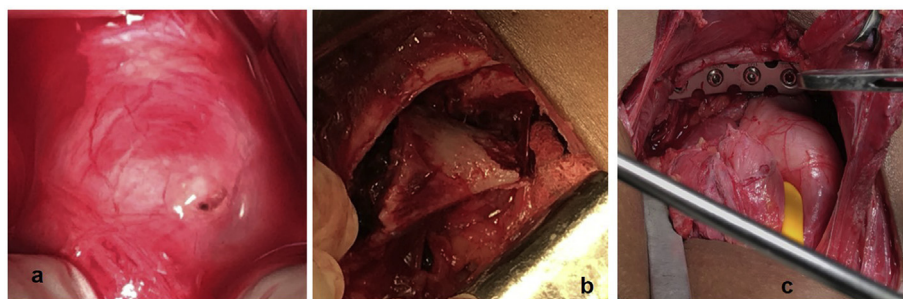
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**Fig. 1.** Computed tomography (CT) of the abdomen showed contrast filled deep contusions and lacerations with a linear hyper dense tract extending from the right renal cortex to the renal pelvis in the inter-polar region with maximum thickness approximately measuring 8 mm. A contrast filled sub-capsular collection was noted around the right kidney.



**Fig. 2.** Fractures of both superior and inferior pubic rami were seen and the left fracture fragment impinging on the bladder was also seen.



**Fig. 3.** a. The extraperitoneal tear of the bladder seen. b The fracture fragment piercing the bladder seen. c. Open reduction and internal fixation of left superior pubic rami.

immediate operative intervention. Not all children with renal trauma require imaging. CT imaging is indicated in all children with significant abdominal, flank or pelvic pain, ecchymosis or abrasions over lower chest and upper loin region, lower rib fractures and those with significant microscopic haematuria or gross haematuria.<sup>3</sup> Based on clinical parameters and CT staging, one can select either operative or non-operative management.

All hemodynamically stable grades I to III injuries can be managed conservatively.<sup>3</sup> Once haematuria resolves the child may begin ambulation and can be discharged home. It is necessary to repeat a post-injury CT/functional scan at 3 months. If the kidney demonstrates adequate healing with preserved function, no further imaging is

necessary, however the child should continue to be on follow-up and monitored clinically for late posttraumatic renal complications, such as hypertension.

For high-grade renal injuries specifically (grades IV and V), the non-operative management is still possible in a large percentage of children. If non-kidney related surgeries are excluded then the overall non-operative rate would be around mid-90%.<sup>2-4</sup> Reported intervention rates vary from 20% to 65%. Richards et al.<sup>5</sup> published their retrospective review of pediatric major blunt renal injuries (grade 3 or higher) at a children's hospital over a 5-year period. No patients required laparotomy or nephrectomy, though 22% of patients received a blood transfusion and 44% of patients underwent ureteral stent placement.

Radmayr et al.<sup>1</sup> retrospectively studied 254 children with a mean age of  $10.56 \pm 3.8$  years. 166 presented with a grade I trauma and 88 had a grade II-V lesion. Diagnostic evaluation included various standard lab tests such as urinalysis and routine blood parameters, ultrasound, IVP and/or CT. However, 18 children had a severe polytrauma with laceration of other vital organs. Most of the renal injuries could be treated conservatively. Surgical treatment options included immediate exploration, reconstruction, partial resection, or even nephrectomy. The child's kidney is more susceptible to injuries than the adult kidney because of some special anatomic features of the child's body. Renal function can be salvaged even in high grade injuries and associated injuries can be managed as necessary.

#### Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://>

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