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Case Report

Renal artery injury in paediatric blunt abdominal trauma

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management. The risks involved with a non-operative approach are missed or delayed diagnosis and even death from haemorrhage or sepsis. The risks involved with operative approach are non-therapeutic laparotomy and complications of surgery. Non-operative management is the standard of care for most haemodynamically stable children with blunt solid organ injury. Those who fail non-operative management usually do so within the first 12 h. Here we report an interesting case of paediatric BAT with renal artery injury.

Case report

A 3½-year-old male child patient was brought to our hospital with alleged history of sustaining BAT due to getting crushed between two auto-rickshaws on 21 Jul 2013. He was brought to our hospital 4 h after the injury after receiving first aid in a civil hospital. On examination, the child was drowsy and unresponsive; he was in shock with cold clammy extremities, tachycardia and hypotension. There was an abrasion on left posterior lumbar region; abdomen was soft with no distension, with tenderness on right side and right renal angle; bowel sounds were present.

The child was resuscitated immediately. Ultrasonogram of the abdomen revealed haemoperitoneum and a large retroperitoneal haematoma displacing the right kidney anterolaterally. Contrast enhanced computerized tomography (CECT) scan revealed haemoperitoneum, a 13 × 6 × 5.4 cm retroperitoneal haematoma in posterior perinephric space displacing the right kidney anterolaterally and encasing the inferior vena cava (IVC). The right renal artery was not visualized and there was total absence of blood flow in right

Introduction

Traumatic injury results in more deaths in children than all other causes combined. Motor vehicle collisions, automobile versus pedestrian accidents and falls are associated with the greatest risk of intra-abdominal injury.¹ Children are more vulnerable to blunt abdominal trauma (BAT) than are adults, since they have relatively compact torsos with smaller anterior-posterior diameters, which provide a smaller area over which the force of injury can be dissipated. Also they have relatively larger viscera, less overlying fat, and weaker abdominal musculature.

The spleen and liver are the most commonly injured solid organs followed by the kidney. Abdomen-to-handlebar collisions are associated with a high risk of small bowel and pancreatic trauma.² The key challenge involved in management of BAT is whether to go for non-operative or operative

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Fig. 1 – CECT abdomen showing a large retroperitoneal haematoma displacing the right kidney anterolaterally, no vascularity of right kidney, a large haemoperitoneum and normal vascularity of left kidney.

kidney (Fig. 1). Urine investigation revealed no gross or microscopic haematuria and haemoglobin was 7.4 mg/dl.

The patient was shifted for emergency exploratory laparotomy. At laparotomy there was haemoperitoneum of 300–400 ml, tear of gastrocolic ligament, tear on proximal jejunal mesentery and large pulsatile retroperitoneal haematoma. Renal pedicle control was achieved after which the kidney was approached by mobilizing the ascending colon and was found to be dusky, turgid and of doubtful viability. There was complete rupture of right renal artery; the proximal end (aortic side) was retracted behind the IVC and thrombosed. The distal end was tattered and found only in strands. The renal vein, renal pelvis and ureter were intact. Also there was a superficial laceration on upper pole of right kidney. Right nephrectomy was done, the tear of small gut mesentery repaired and abdomen was closed in layers. Patient was transfused blood intraoperatively and on first postoperative day. He was discharged on the 9th postoperative day after an uneventful recovery.

Discussion

Kidney is the most common genitourinary organ injured from external trauma and it occurs in up to 10% of abdominal trauma cases.³ The diagnosis of renal injury begins with a high index of clinical awareness, followed by urinalysis and imaging. Particular attention should be paid to mechanism of injury, complaints of flank or abdominal pain and physical signs such as abdominal tenderness, ecchymosis, and abrasions. Absence of haematuria on initial urinalysis does not exclude a serious renal injury. The degree of haematuria and

the severity of the renal injury need not consistently correlate.⁴

CECT scan is considered the gold standard for grading of renal injury. Children being at a greater risk for renal trauma after BAT, imaging studies should be liberally used in them.⁵ Renal injuries are classified based on the American Association for the Surgery of Trauma Organ Injury Severity Scale.⁶ Grade I–III injuries are minor that could be managed conservatively. Grade IV injury involves parenchymal laceration extending through renal cortex, medulla, and collecting system or injury to the main renal artery or vein with contained haemorrhage. Grade V injury means a completely shattered kidney or avulsion of renal hilum, devascularizing the kidney. Grade IV and V injuries mostly require surgical exploration, but even these high-grade injuries can be managed without renal operation in selected patients. The management of renal trauma is influenced by the presence of concomitant injuries; approximately 80%–90% of renal injuries have major associated organ injury such as that of spleen, liver and hollow viscus requiring surgical exploration.

During urgent laparotomy for other organ injuries in BAT, if optimal preoperative renal images are available that support the impression that non-operative management is appropriate for renal injury, exploration of the renal fossa is not performed. In the absence of imaging and in the presence of active significant bleeding from the renal fossa into the peritoneal cavity, or a visibly expanding or pulsatile haematoma, exploration of the retroperitoneum is required to urgently control significant vascular injury. In the absence of such findings, or in patients planned for a damage control approach, retroperitoneal exploration may be avoided.

Renal artery injury is a very rare entity which is shown by a study from the American National Trauma Data Bank. Out of a total of 945,326 blunt trauma admissions, 517 patients (0.05%) had injuries to the renal artery, of which, renal artery injury was the only intra-abdominal injury in only 87 patients.⁷ The renal artery can be completely avulsed or thrombosed.

In avulsion injury, revascularization should be attempted only if warm ischaemia time is less than 4 h.⁸ For major renovascular injuries, immediate nephrectomy is advocated. Even when repair is possible, renal salvage rates are as low as 33% for main renal artery reconstruction even in the best centres.⁹

Renal autotransplantation is an option for renal arterial injuries and extensive ureteral injuries, particularly in patients with single kidney or horseshoe kidney, but the same was not possible in our patient since the warm ischaemia time was more than 4 h and the kidney was already of doubtful viability.

Main renal artery thrombosis from blunt trauma, occurs secondary to deceleration injuries. The mobility of the kidney results in stretch on the renal artery, disrupting the arterial intima and causing thrombosis. Prompt diagnosis by CT or angiography may lead to immediate renal exploration, but outcomes for salvage remain dismally low. When repair is attempted in renal artery thrombosis, the area of injury should be excised and a replacement graft done with hypogastric or

splenic artery. Indications for revascularization are limited and should be considered only in selected patients with bilateral renal artery occlusion or unilateral injury of single kidney in an attempt to restore adequate renal function to avoid long-term dialysis.⁷ High rates of infection and hypertension occur in patients with failed revascularization. Among those undergoing nephrectomy, parenchymal, vascular, or combined injury of the kidney is the indication in 77% of patients and haemodynamic instability is the indication in 23%.¹⁰

Segmental renal arterial injuries result in ischaemic infarction to a segment of the kidney, which should be observed non-operatively when diagnosed unless associated with a parenchymal laceration. If the laceration with infarction is greater than 20% of the parenchyma, careful consideration should be given to endovascular embolization or surgical correction.

To summarize, isolated renal injuries are very uncommon in BAT and a high level of clinical suspicion is required to diagnose such patients. Renal artery injury is even more of an uncommon entity which has happened in our patient. The absolute indications for renal exploration are haemodynamic instability with shock, expanding/pulsatile renal haematoma (on laparotomy), suspected renal pedicle avulsion injury and ureteropelvic junction disruption.

Conflicts of interest

All authors have none to declare.

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