Injury Extra 41 (2010) 109–111

Contents lists available at ScienceDirect

Injury Extra

journal homepage: www.elsevier.com/locate/inext

Case report

Bilateral nephrectomies following rupture of polycystic kidneys in blunt renal trauma

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ARTICLE INFO

Article history:
Accepted 6 July 2010

Renal trauma accounts for approximately three percent of all trauma admissions. Most cases are self-limiting and minor but blunt renal trauma results in a spectrum of injuries ranging from simple contusions to renal pedicle avulsion.[2,3] Patients with known renal abnormalities are at increased risk of injury from blunt abdominal trauma. Here we present a patient with polycystic kidney disease (PCKD) who suffered blunt abdominal trauma resulting in multicystic heamorrhage. The subsequent management of this patient was dictated in part by her transfusion requirements and pre-existing renal function. Consideration of the above factors is important given the high incidence of eventual renal transplantation requirements in these difficult patients.

1. Case reports

A 58-year-old female with a history of polycystic kidney and liver disease was involved in a motor vehicle collision with a tree. She was the restrained driver with air bag deployment. Her PCKD had already progressed to end-stage renal disease for which she underwent home haemodialysis. Prior to the accident, she still made urine and was not on fluid restriction at home. Upon arrival to the emergency department she was hypertensive and tachycardic. On physical exam, she had an obvious left forearm deformity. Her abdomen was soft and slightly distended but without peritoneal signs. There was gross haematuria upon urinary catheter placement. Laboratory studies showed a normocytic anaemia with a haemoglobin of 8.0 g/dl. Radiological studies showed a left forearm fracture as well as a left pneumothorax that required tube thoracostomy. CT of the abdomen and pelvis demonstrated multiple cysts of the liver and kidney and free pelvic fluid. No active extravasation was noted within either kidney which took up the majority of her abdominal cavity as shown (Fig. 1).

The patient was monitored in the intensive care unit. Serial laboratory values 4 h later demonstrated a haemoglobin of 6.3 g/dl which prompted a transfusion of four units of packed red blood cells (PRBC). Over the ensuing 6 h, she became somewhat haemodynamically labile and only transiently responded to crystalloid fluid infusions. Given her marginal response to intravenous fluid resuscitation and blood transfusion in the face of continued haemodynamic lability, it was decided to take the patient to the operating room for an exploratory laparotomy.

A standard midline laparotomy was performed. Upon entering the abdomen, the spleen and liver were noted to be without obvious injury. Haematoma was noted within the retroperitoneum and upon mobilization of the right colon approximately 1.5 L of clotted blood was evacuated. The right kidney was noted to have a ruptured cyst that had stigmata of recent haemorrhage and a right nephrectomy was performed (Fig. 2). Subsequently, we performed a medial visceral rotation of the left colon. The left kidney was also noted to have multiple haemorrhagic cysts and a left nephrectomy was performed (Fig. 3). The remainder of the exploration revealed no further intra-abdominal injuries. Post-operatively the patient remained haemodynamically stable. Her forearm fracture and rib fractures were treated non-operatively and her chest tube was discontinued uneventfully. Her diet was advanced on post-operative day three and she was discharged home on post-injury day eight. She remains on haemodialysis three times a week and is currently awaiting renal transplantation.

2. Discussion

PCKD is a hereditary disease of either autosomal dominant or recessive inheritance. Autosomal dominant polycystic kidney disease (ADPCKD) is the prevalent form affecting 1 in 400 to 1 in 1000 persons in the United States and is the most common genetic cause of chronic kidney disease.[4,6] In addition to renal cysts, these patients often have liver, pancreatic, splenic, brain, ovarian and testicular cysts. Mitral valve prolapse, abdominal and inguinal hernias, and cerebral artery aneurysms are also associated with PCKD. ADPCKD is thought to arise from anomalies in the PKD1 and PKD2 genes found on chromosomes 16 and 4, respectively. Our patient was noted to have a PKD1 abnormality, which is the more

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doi:10.1016/j.injury.2010.07.237

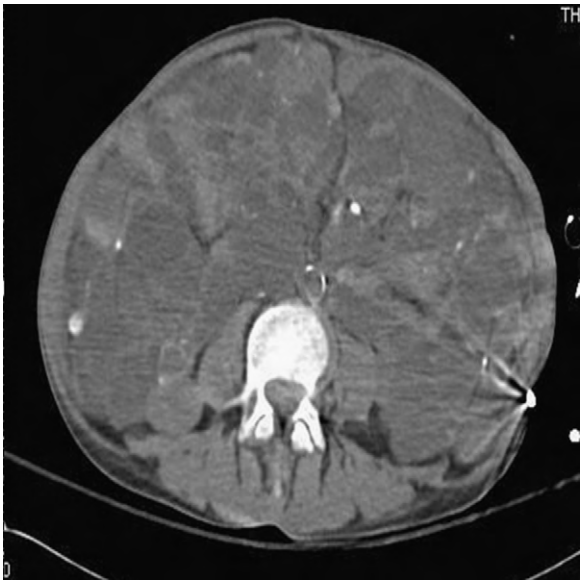

Fig. 1. CT of abdomen/pelvis multiple cysts of kidney containing blood.

common variant found in 85% of cases.[13] Patients typically present in their fourth decade of life with haematuria, proteinuria, and renal insufficiency. Forty-five percent of these patients progress to ESRD by 60 years of age.[6] Aggressive medical management of

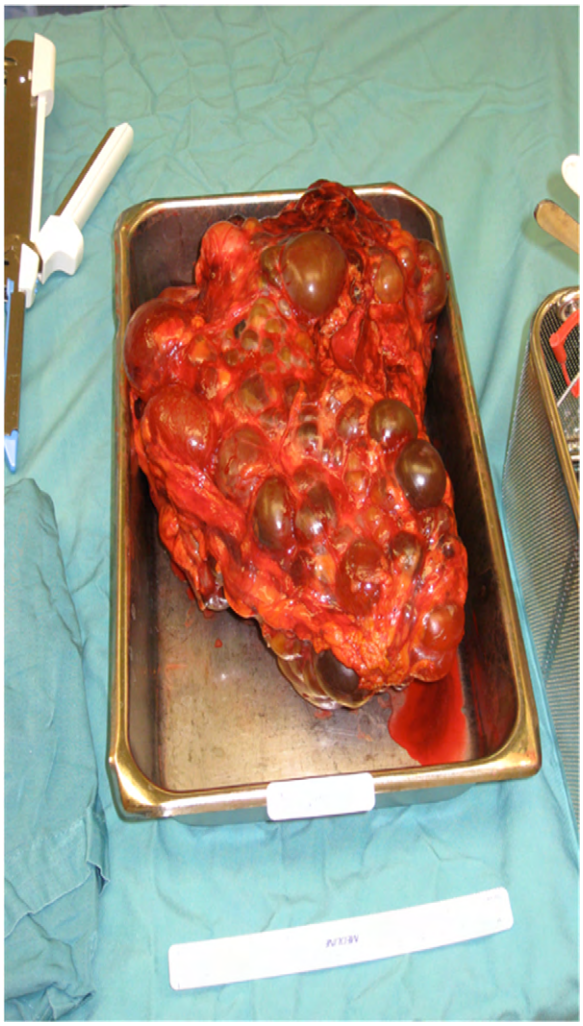

Fig. 2. Multiple haemorrhagic cysts were noted within the left kidney.

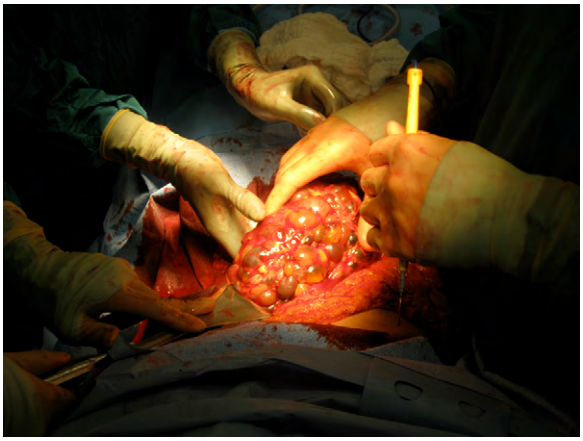

Fig. 3. Left kidney.

hypertension is paramount in these patients and helps to combat the progression to end-stage renal disease.

The recessive form, unlike its dominant counterpart, presents much earlier in life and is typically more clinically severe. The incidence is 1 in 20,000 live births. The majority of patients progress early to ESRD and all have some form of hepatic involvement ranging from cysts to cirrhotic changes with associated portal hypertension.[10]

Pre-existing renal pathology is reputed to result in increased renal injury from blunt trauma due to gross pyelographic distortion.[8] A literature review revealed one case of bilateral rupture of polycystic kidneys that required bilateral nephrectomy by Leslie et al.[7] A more recent case report by Reay et al. in 2008 described a haemodynamically unstable patient with PCKD and a grade IV renal injury on CT scan who subsequently underwent selective arterial catheterization and coil embolization of a left renal artery branch pseudoaneurysm with frank extravasation.[12] The patient was treated successfully and recovered without loss of renal function. A further report by Dinkel et al. in 2002 demonstrated successful use of microcatheter selective embolization in nine patients with previously normal kidneys.[3] This method was used to treat grade III to grade V renal injuries in order to avoid operative intervention.

Interventional radiological interventions are well documented for the treatment of penetrating and iatrogenic renal injuries but there has been less documentation regarding its use in blunt renal trauma. The case series by Dinkel et al. illustrated its successful use in blunt renal injury and Reay et al. demonstrated its particular use in polycystic kidney disease.[3,12]. Unfortunately, our patient was not a suitable candidate for embolization as she had remained haemodynamically unstable despite active resuscitation and therefore required operative intervention. Furthermore, our patient had already progressed to ESRD requiring haemodialysis prior to her trauma. The patient presented in Reay's case report had normal renal function prior to their insult. Therefore, the benefit to risk ratio of saving her heavily diseased kidneys was not as overwhelming.

In the setting of blunt renal trauma involving PCKD patients, the patient's premorbid condition should be taken into consideration prior to the treatment. PCKD is a progressive disease and a leading cause for the renal transplantation. Minimizing the blood product transfusions when possible may lessen the patient's risk of antigenic exposure thus limiting the risk of patient sensitization. Sensitization is a significant factor predicting the outcome of kidney transplants. Multiple blood transfusions have been consistently linked with elevated reactive antibody levels and increased sensitization. Elevated antibody levels from blood

transfusions have been linked to hyperacute rejection, delayed graft function, and poor graft survival rates in addition to longer transplant waiting times.[1,5,9,11]. Angiographic embolization with the purpose of preserving renal function would be most useful in patients not already requiring renal replacement therapy. However, in patients already undergoing renal replacement therapy, early operative intervention may indeed lessen the antigenic effects of blood transfusion improving the likelihood of successful renal transplantation.

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