Clinical Case Report

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The role of renoscintigraphy and surgery in the management of Page kidney

A case report

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Abstract

Rationale: Page kidney is an uncommon condition that hypertension occurs secondary to microvascular ischemia and alternation of small-vessel hemodynamics due to external compression of renal parenchyma and activation of the renin-angiotensin–aldosterone system. There are no specific guidelines for the management of Page kidney in the literatures.

Patient concerns: A 17-year-old teenager who had Fontan procedure for tricuspid and pulmonary atresia in early childhood suffered from sudden onset of severe left flank pain during cardiac catheterization procedure. Left renal artery active bleeding with renal parenchyma compression in association with renin-mediated hypertension led to the diagnosis of Page kidney.

Diagnoses: Page kidney was diagnosed in this case.

Interventions: Urgent embolization was performed to treat left renal artery active bleeding. Because of decreased renal function with elevation of serum creatinine, inadequate blood pressure control with antihypertensive medication, and poor renal blood flow of left kidney, open drainage of perirenal hematoma was done 5 days after catheterization procedure.

Outcomes: After the operation, glomerular filtration rate improved immediately, and left flank pain and hypertension resolved at discharge.

Lessons: The choice of the therapies for Page kidney depended on the clinical presentation of each case. This case pointed out the significance of renoscintigraphy and surgery in the management of Page kidney.

Abbreviations: DTPA = diethylenetriamine pentaacetic acid, GFR = glomerular filtration rate.

Keywords: Page kidney, renoscintigraphy, surgery

1. Introduction

Page kidney is an uncommon condition that hypertension occurs secondary to microvascular ischemia and alternation of small-vessel hemodynamics due to external compression of renal parenchyma and activation of the renin–angiotensin–aldosterone system.[1] Treatment options may range from simple observation, medical treatment, percutaneous or open drainage to nephrectomy. Renoscintigraphy can not only monitor renal function accurately but also determine the appropriate treatment on individual base.

2. Case report

A 17-year-old teenager who had Fontan procedure for tricuspid and pulmonary atresia in early childhood was regularly followed at pediatric cardiology outpatient department. His activity was good without cardiopulmonary distress. This time, he was admitted for routine cardiac catheterization survey. During catheterization procedure, he suffered from sudden onset of severe left flank pain. Urgent computed tomography showed left renal artery active bleeding with large subcapsular hematoma resulting in left renal parenchyma compression (Fig. 1). Selective embolization of the lower pole segmental branch of left kidney with microcoils was performed on the same day. Oliguira, elevation of blood pressure (up to 169/92 mm Hg), serum creatinine (up to 1.38 mg/dL), aldosterone (912.9 pg/mL), and renin (460.4 pg/mL) by subsequent laboratory analyses were also noted, suggesting Page kidney. Treatment with oral amlodipine (5 mg twice per day) to control hypertension was suboptimal. The renoscintigraphy with 3 mCi Tc-99m diethylenetriamine pentaacetic acid (DTPA) revealed poor renal flow of left kidney with 6.53 mL/min of glomerular filtration rate (GFR) (Fig. 2). Therefore, open drainage of perirenal hematoma was done 5 days after catheterization procedure. After the operation, serum creatinine, GFR (Fig. 3) and blood pressure returned to normal range (Table 1).

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Ethics statement: This study was approved by institutional review board of Kaohsiung Veterans General Hospital. There was no need to obtain informed consent from the patient, since all the data were collected and analyzed anonymously and the waiver of informed consent did not and will not have adverse effect on the rights and health of the patient.

The authors have no conflicts of interest to disclose.

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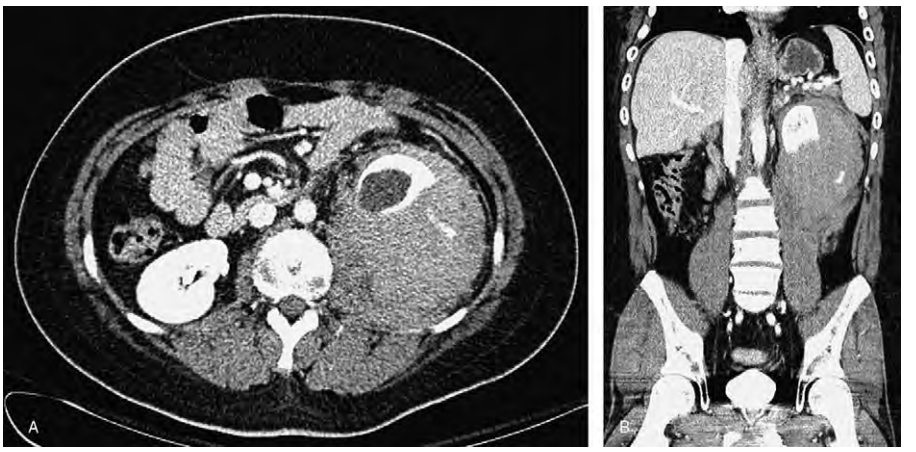

Figure 1. Computed tomography with axial view (A) and coronal view (B) showed left renal artery active bleeding with large subcapsular hematoma resulting in left renal parenchyma compression.

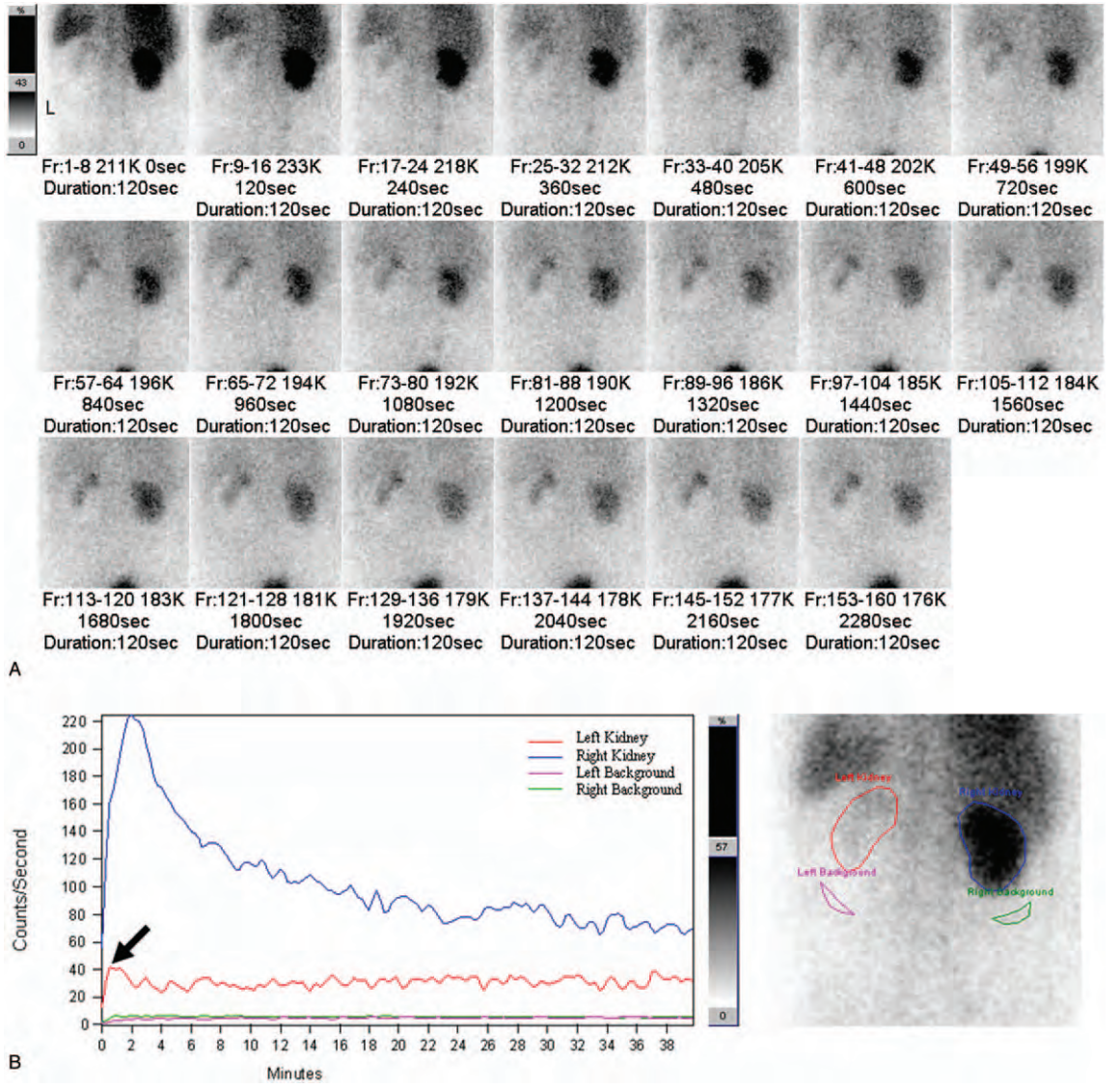

Figure 2. Renoscintigraphy with sequential scintiphotos (A) and time–activity curve (B) before operation revealed poor renal flow of left kidney (arrow).

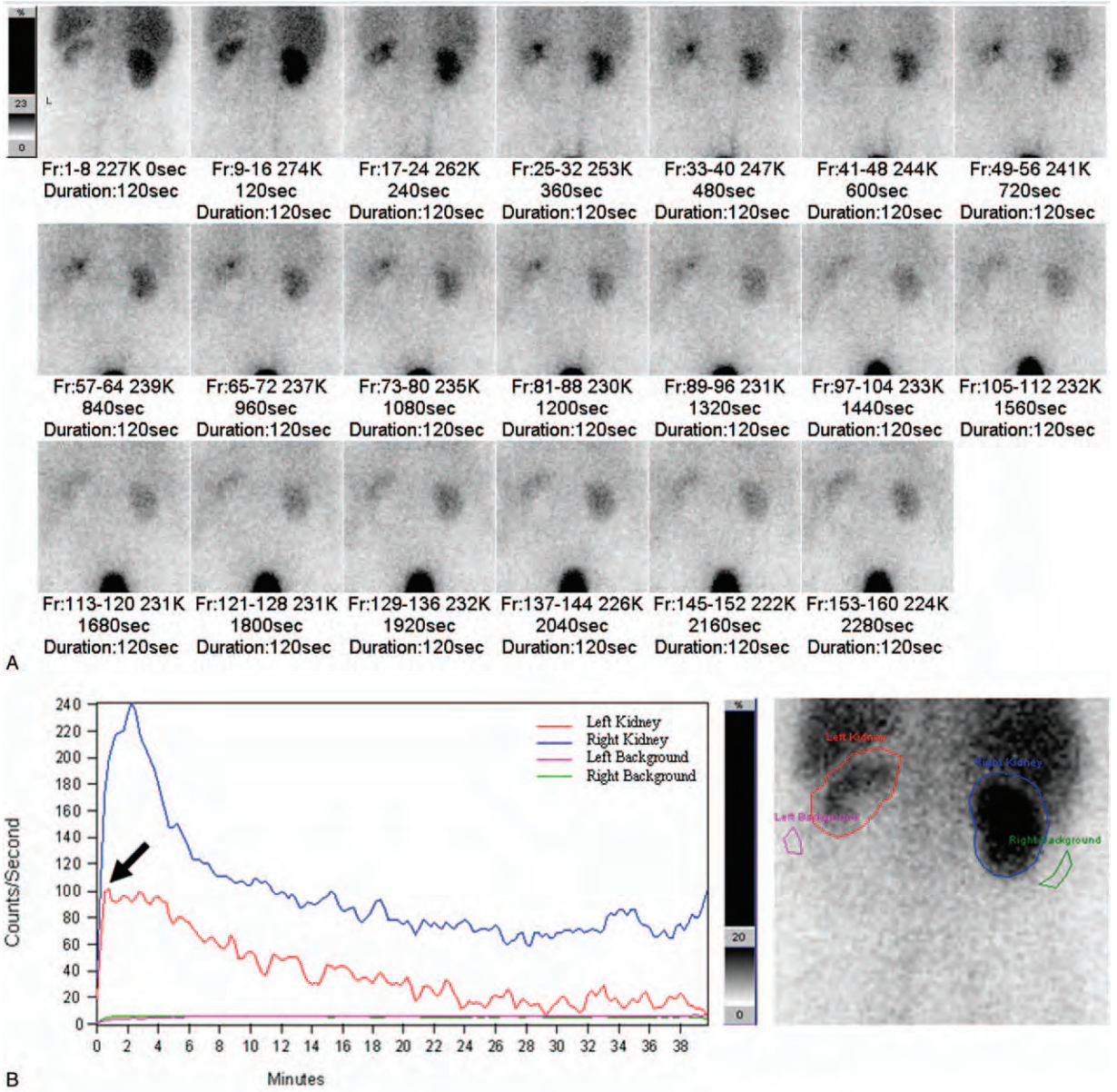

Figure 3. Renoscintigraphy with sequential scintiphotos (A) and time–activity curve (B) after operation disclosed improvement of renal flow of left kidney (arrow).

Table 1

Relevant tests.

	Before operation	After operation	Follow-up
Serum			
BUN (mg/dL)	19	11	16
Creatinine (mg/dL)	1.38	0.90	0.97
eGFR (mL/min/1.73)	72.2	118.2	108.4
Aldosterone (pg/mL)	912.9		
Renin (pg/mL)	460.4		
Blood pressure (mm Hg)	169/92	129/83	
Renoscintigraphy			
Total GFR (mL/min)	56.3	68.0	
Left GFR (mL/min)	6.53	19.6	
Right GFR (mL/min)	49.8	48.4	

BUN = blood urea nitrogen, GFR = glomerular filtration rate.
Normal range: BUN 7–20 ng/dL; creatinine 0.7–1.5 mg/dL; aldosterone 7.5–150 pg/mL; renin 3–33 pg/mL.

3. Discussion

Page kidney was first described in animal experiments by Dr. Irvine Page in 1939.[2] In the 1950s and 1960s, the human counterpart became evident. Page kidney has been reported in all age groups, including pediatric, adolescent, and adult patients.[1] There are various etiologies including trauma, iatrogenic intervention (following ureteral surgery, postrenal biopsy, lithotripsy, etc.), domestic violence, and renal parenchymal disease.[1,3] Spontaneous bleeding has been reported in patients with warfarin therapy, pancreatitis, and renal pathology (such as tumor, arteriovenous malformation, cyst rupture, glomerulonephritis, vasculitis, or polyarteritis nodosa).[1,4]

Multiple imaging modalities are available to diagnose Page kidney. Excretory urogram, computed tomography, and ultrasound are commonly used.[1,3] The gold standard for the diagnosis of Page kidney is selective renal arteriography to

exclude renovascular lesions and renal vein renin assays to confirm hyperreninemia.[5] Renoscintigraphy is of value for evaluating renovascular hypertension with pharmacologic interventions and predicting renal function recovery after intervention.[6] Renal function such as GFR is determined by the renal uptake of the radioisotope Tc-99m DTPA, which is injected into the vein and cleared by the renal glomeruli. The uptake of the radioisotope within the kidneys can be quantified by commercially available software of the imaging computer to calculate percent uptake, global and individual GFR. This noninvasive method does not require blood tests or 24 hours urine collection.

There are no specific guidelines for the management of Page kidney in the literatures. The aim of therapy is to preserve functioning renal tissue by relieving the external compression of the renal parenchyma and correcting high blood pressure. Close observation and appropriate medical therapy with antihypertensive agents are warranted for a reasonable period of time before surgical management because spontaneous resolution may occur.[5] Multiple decompression procedures have been demonstrated, including nephrectomy, capsulectomy, capsulotomy, open or percutaneous drainage of hematoma, laparoscopic interventions, and angioembolization.[1,3,7,8] Nevertheless, there is a trend toward less invasive procedures. In this case, renoscintigraphy played an important role in the determination of conservative or invasive treatment for Page kidney. It allowed quantitative estimation of renal blood flow, functioning parenchyma and excretion of "each" kidney. It was also helpful for clinical follow-up of renal function after the interventions.

4. Conclusions

The choice of therapy for Page kidney depends on the clinical presentation of each case. This case points out the significance of renoscintigraphy and surgery in the management of Page kidney.

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