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Case Report

Renal artery coil embolization of a non-functional kidney: A novel method to treat resistant hypertension in paediatric patients

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ABSTRACT

Hypertension in children is often secondary to underlying renal disease and is difficult to manage with anti-hypertensive medications without intervention. We report a case of resistant hypertension in a child aged 4 years with non-functioning right kidney who was successfully treated with renal artery coil embolization (RAE), as he was high risk for surgical nephrectomy owing to the presence of severe left ventricular dysfunction. In our case the right renal artery had an acute angle with the aorta, hence we used Simmons catheter which is very useful in such cases. This percutaneous intervention enabled immediate and sustained blood pressure control which was maintained at 6 months of follow up. Coil embolization of non-functional kidney for refractory hypertension as a bail out procedure in high surgical risk paediatric patients has never been reported previously in paediatric age group and is an acceptable percutaneous strategy.

1. Introduction

The sustained hypertension is one of the most common sequel of chronic kidney disease (CKD) in children.[1] The most critical determinant the rate of the progression of renal failure[2,3] and cardiovascular mortality in children is the level of blood pressure control obtained.[4] Appropriate anti-hypertensive management contributes to better renal preservation and survival with onset of CKD in childhood. The other treatment modalities for resistant renovascular hypertension due to end stage renal disease (ESRD) include surgical nephrectomy, medical nephrectomy, and radiofrequency ablation of renal nerve supply. Surgical nephrectomy has high rates of recurrent pain, infection, bleeding and is technically demanding whether performed in an open or laparoscopic manner especially in patients having significant left ventricular dysfunction. Non-surgical nephrectomy by coil embolization is feasible, safe and successful as an alternative to surgery especially in high risk cases.

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2. Case description

A 4 years old 10 kg male child presented with excessive sweating and generalized weakness of 20 days duration. There was no history of fever, decreased urine output or altered colour of urine, swelling of lower limbs, facial puffiness, palpitations, headache or giddiness. Blood pressure was 240/120 mmHg in right upper limb and 250/126 mmHg in lower limb, despite the maximum dose of oral furosemide, amlodipine and metoprolol. The examination of other systems was normal.

The investigations showed normocytic normochromic anaemia with normal electrolytes. The blood urea was 26 mg/dl and serum creatinine was 0.5 mg/dl. The urine specific gravity was 1.015 and routine urine examination and microscopy was normal. Electrocardiogram revealed left ventricular hypertrophy (LVH) with strain pattern. 2D echocardiogram showed concentric LVH with severely reduced LV systolic function (ejection fraction – 30%) and mild mitral regurgitation. The LV dysfunction was possibly related to the uncontrolled hypertension. The ultrasound of the abdomen revealed a small right kidney with an increase in resistive index (0.97) on Doppler suggestive of renal parenchymal disease. The left kidney was 6.8 × 4.1 cm and right kidney was 4.8 × 2.4 cm.

The renal angiogram showed normal left renal artery and the long segment diffuse narrowing μof the right renal artery not suitable for balloon angioplasty. The renal DTPA demonstrated <10% functioning of right kidney and 80% functioning of the left kidney. Despite high optimal doses of three antihypertensive drugs, the patient continued to have very high blood pressure (240/120 mmHg). The plasma renin levels were very high (102 μ IU/ml) which was much higher than the upper limit of normal. In view of the resistant hypertension, the paediatric nephrologist referred the patient for surgical nephrectomy. But the paediatric surgeon deferred surgery because of severe LV dysfunction and uncontrolled hypertension and referred the patient for possible nonsurgical coil closure.

3. Procedure

The procedure was done under ketamine sedation and local anaesthesia. Through the right femoral artery approach, descending aortogram done with the pigtail catheter showed normal left renal artery and a small diffusely diseased right renal artery. The selective renal artery angiogram revealed long segment diffusely narrow right renal artery with a very minor aberrant renal artery supplying the lower pole. The renal artery morphology was such that it was not suitable for device closure and the size of the artery was too small for a device and large to be closed with gelfoam or alcohol. The right renal artery was entered over the Terumo guide wire with a 5F Simmons catheter (Fig. 1, video 1). The Cooks 3 × 4 mm and 3 × 5 mm embolization coils were deployed at the distal end of the right main renal artery using the 0.035 straight guide wire to push the coils in position. Check renal angiogram showed complete occlusion of the right renal artery with the coils in situ (Fig. 2, video 2). The aberrant renal artery was too small to catheterize or embolize.

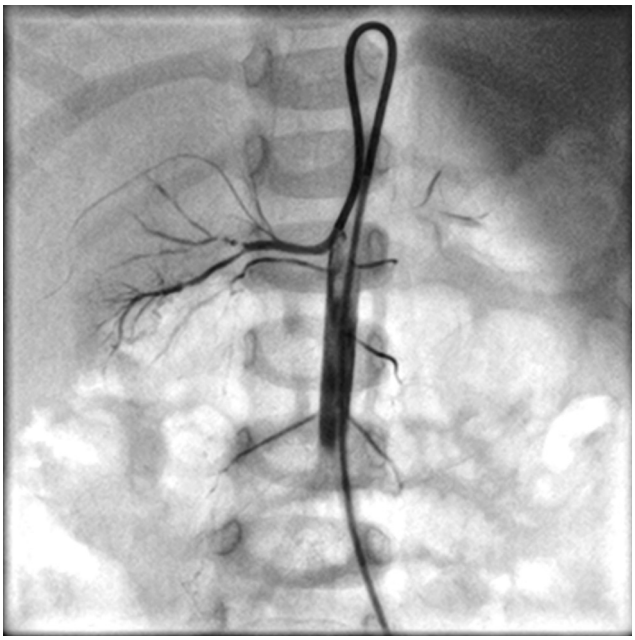

Fig. 1 – Selective angiogram with Simmons catheter shows diffusely narrow right renal artery with multiple blocks.

Supplementary data related to this article can be found online at http://dx.doi.org/10.1016/j.jicc.2015.04.001.

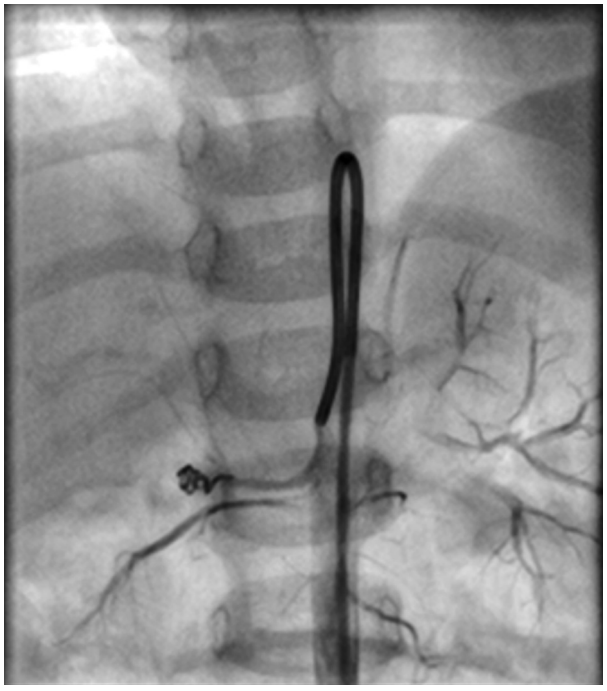

Fig. 2 – Check angiogram shows 5 × 3 and 3 × 4 embolization coils in situ with complete closure of right renal artery and visualization of small aberrant renal artery to lower pole of right kidney.