1. Introduction

Congenital renal arteriovenous malformations (AVMs) are abnormal communications between the renal arterial and venous systems through a vascular nidi that forms a cluster of multiple, enlarged, tortuous arteriovenous communications. They are uncommon, with a prevalence of < 1% among the general population. The clinical presentation, diagnostic imaging examinations, and management of renal AVMs are described below.

2. Case report

A woman 42 years of age received a physical check-up at our hospital. Sonography of the abdomen revealed a cluster of tortuous engorged vascular structures with low resistance of arterial flow and venous flow. A vascular malformation in the right kidney was the impression.

Fig. 1. (A) Sonography of the right kidney showing a hypoechoic lesion at the right renal sinus; and (B) Doppler examination showing a cluster of tortuous engorged vascular structures with low resistance of arterial flow and venous flow. A vascular malformation in the right kidney was the impression.
engorged vascular structures in the right renal sinus, and a Doppler examination demonstrated low resistance of arterial flow and venous flow; a vascular malformation in the right kidney was the impression (Fig. 1). Computed tomography (CT) of the kidneys revealed a tangle of vascular structures with engorged and tortuous veins, which drained into the inferior vena cava at the right renal sinus, and an AVM of the right kidney was the impression (Fig. 2). She was admitted to our ward for further management. After admission, a physical examination revealed normal findings except an operative scar on the lower abdomen due to a Cesarean section and an operation for an ectopic pregnancy. Laboratory examinations revealed normal findings. Right renal arteriography was done which revealed arteriovenous malformation in the right kidney (Fig. 3). Then, embolization with several microcoils and an n-butyl cyanoacrylate (NBCA) injection were performed. Immediate follow-up right renal arteriography revealed total obliteration of the AVM of the right kidney and preservation of the function of the uninvolved parenchyma of the right kidney (Fig. 4). Follow-up renal sonography revealed the total disappearance of the AVM of the right kidney. She was discharged in a stable condition, and outpatient clinic follow-up was recommended.

3. Discussion

Congenital renal AVMs are uncommon, with a prevalence of < 1% among the general population. Renal AVMs are abnormal communications between the renal arterial and venous systems through a vascular nidus that forms a cluster of multiple, enlarged, tortuous arteriovenous communications. Three types of congenital renal AVMs are the cirrhotic, angiomatous, and aneurysmal types. The cirrhotic AVM is the most common type, is comprised of multiple dilated feeding arteries and draining veins with a knotted, tortuous appearance of numerous vessels, and multiple arteriovenous interconnections, is > 1 cm in diameter, and is located adjacent to the collecting system. Angiomatous AVMs are < 1 cm in diameter and are peripheral. Aneurysmal AVMs are composed of a single feeding artery and a single draining vein with aneurysmal dilation; they are > 1 cm in diameter and are located near the renal hilum. Clinical manifestations of renal AVMs can be an asymptomatic presentation, hematuria, flank pain, a perinephritic hematoma, a flank mass, flank bruit, hypertension, and high-output heart failure.

Sonography reveals hypoechogenic cystic or tubular-like structures of varying sizes, and a Doppler examination demonstrates multidirectional, turbulent, high-velocity flow, and color mosaic patterns with color aliasing and apparent flow reversal. Contrast-enhanced CT demonstrates the presence of numerous abnormal tortuous vessels through a vascular tangle with early opacification of the draining veins. Magnetic resonance imaging (MRI) demonstrates serpiginous flow-related signal voids within the lesion and prominent draining veins, and contrast-enhanced MRI demonstrates enhanced vascular malformation during the early arterial phase with early draining veins. Angiography remains the gold standard imaging examination for diagnosing renal AVMs as it can demonstrate the main arterial supply to the vascular malformation, the presence of a nidus, the size of the arteriovenous shunting, and the draining veins. Endovascular embolization is considered the choice for treating renal AVMs because it allows permanent occlusion of all feeders and the nidus, and preservation of the uninvolved renal parenchyma. Embolic agents include absolute ethanol, coils, and NBCA glue. Immediate postembolization follow-up angiography is necessary to check for successful embolization, and regular follow-up imaging...
examinations are also necessary to check on the cure or recurrence of renal AVMs.

**Conflicts of interest statement**

The author declares that he has no financial or non-financial conflicts of interest related to the subject matter or materials discussed in the manuscript.