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Unusual Manifestations of Renal Artery Aneurysms

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Abstract. Two unusual cases of renal artery aneurysm are presented. The first, a 10.4-cm aneurysm, the largest yet reported, manifested as an abdominal mass in an otherwise asymptomatic patient. The second was associated with renovascular hypertension in a 6-month-old infant, the youngest patient yet reported.

Key words: Aneurysm, renal — Renal arteries, fibrodysplasia — Hypertension, renal.

Renal artery aneurysms are usually asymptomatic, often found incidentally at arteriography or autopsy. They may, however, lead to life-threatening hemorrhage and not infrequently are associated with hypertension.

We present herein two unusual cases of renal artery aneurysm which illustrate the spectrum of clinical presentation.

Case Reports

Case 1

A 50-year-old woman sought medical evaluation after noting right flank fullness while exercising. Physical examination revealed a vague mass in the right upper quadrant and a normal blood pressure of 130/82 mm Hg. Laboratory studies, including hematocrit, urinalysis, blood urea nitrogen, and serum creatinine were normal. An ultrasound examination showed a 10.4 × 8 cm complex mass medial and anterior to the right kidney. An eccentric sonolucent area was seen within the mass (Fig. 1). Doppler examination was not available. Computed tomography revealed a spherical mass in the region of the right hilum with rim calcification. An ellipsoid-shaped area within the mass, corresponding to the sonolucent zone on the sonogram, had an attenuation similar to contrast-enhanced blood in the aorta (Fig. 2). Arteriography showed changes of medial fibroplasia in the right renal artery associated with a giant saccular aneurysm that was partially thrombosed (Fig. 3). A magnetic resonance examination again demonstrated the aneurysm (Fig. 4). The patient underwent a right renal aneurysmorrhaphy and aneurysmectomy. A large amount of atheromatous plaque and thrombus was present in the aneurysm, and severe atherosclerotic changes were noted in the wall pathologically. The kidney appeared viable at the time

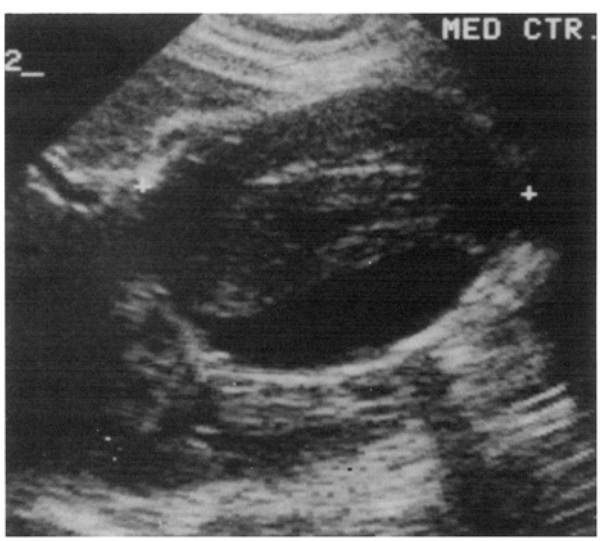

Fig. 1. *Case 1.* Sagittal image reveals a 10.4-cm complex mass, medial and slightly anterior to the right kidney. The mass contains echogenic thrombus and an elliptical sonolucent area posteriorly.

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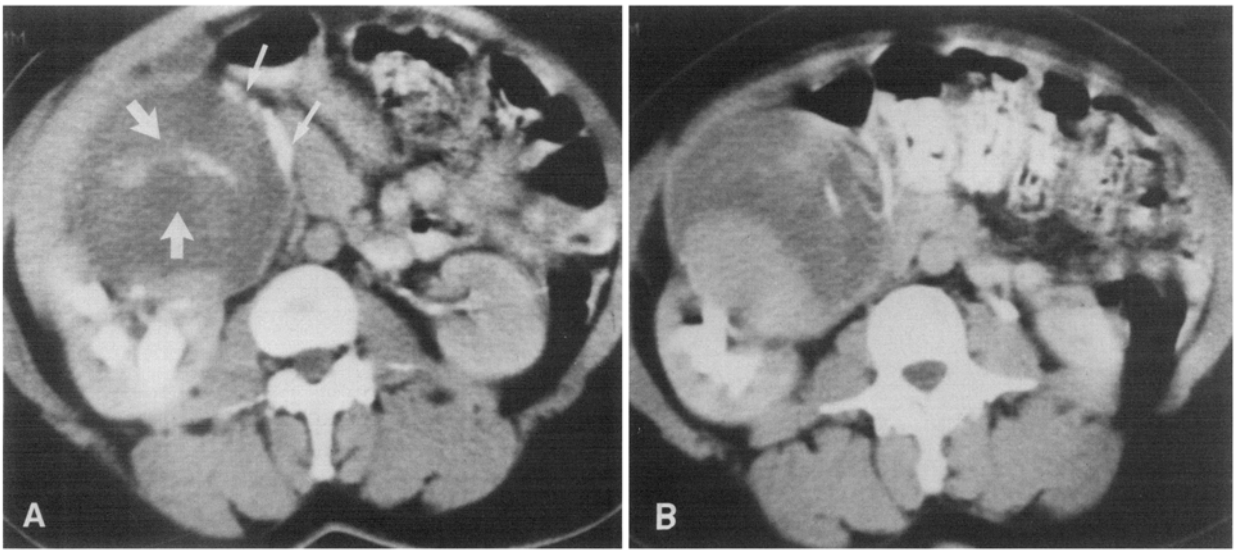

Fig. 2. *Case 1.* **A** Contrast-enhanced scan reveals a large mass just anterior to the right kidney, filled with low-density material (39.5 HU) consistent with thrombus (*thick arrows*). Calcifications are noted within the rim (*thin arrows*). **B** An image, 1 cm more caudal, shows an elliptical area of higher attenuation posterolaterally consistent with contrast-enhanced blood.

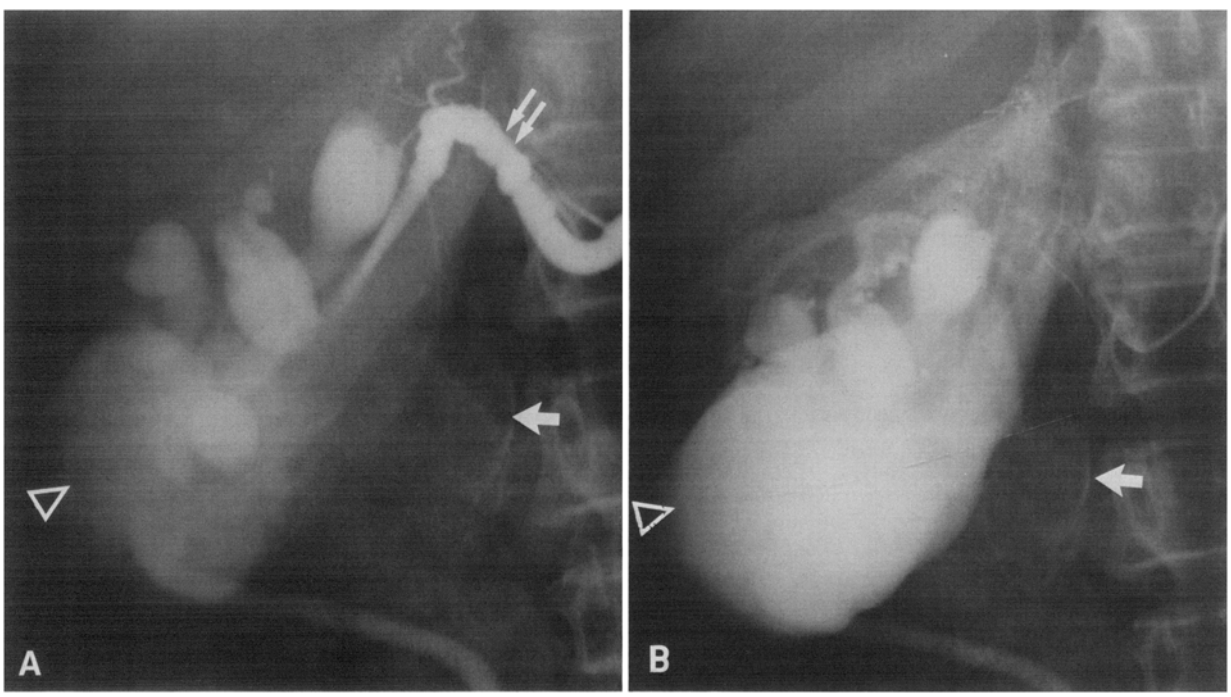

Fig. 3. *Case 1.* **A, B** Early and late films from a right renal arteriogram show changes of medial fibroplasia of the renal artery (*thin arrows*) and slow filling of the patent portion of the aneurysm (*arrowheads*). Calcifications are noted within the rim medially (*thick arrows*).

of surgery. However, a renal scan with Tc-99m DTPA 1 week after surgery showed no renal function.

Case 2

A 6-month-old infant was hospitalized because of severe hypertension (200/140 mm Hg), uncontrolled on three-drug therapy (Vasotec, 5 mg b.i.d.; Inderal, 5 mg t.i.d.; hydrochlorothiazide, 6.26 mg b.i.d.). He had no stigmata of neurofibromatosis. Echocardiography revealed no cardiac or aortic abnormality other than left ventricular hypertrophy. At sonography, the left kidney measured 53 mm and the right kidney 58 mm in length. An intravenous urogram showed symmetric renal function. Blood urea nitrogen and serum creatinine were normal. Digital aortography revealed a 5-mm saccular aneurysm along the inferior surface of the left renal artery, 5 mm from its origin (Fig. 5). There was delayed filling of the distal left renal artery and its

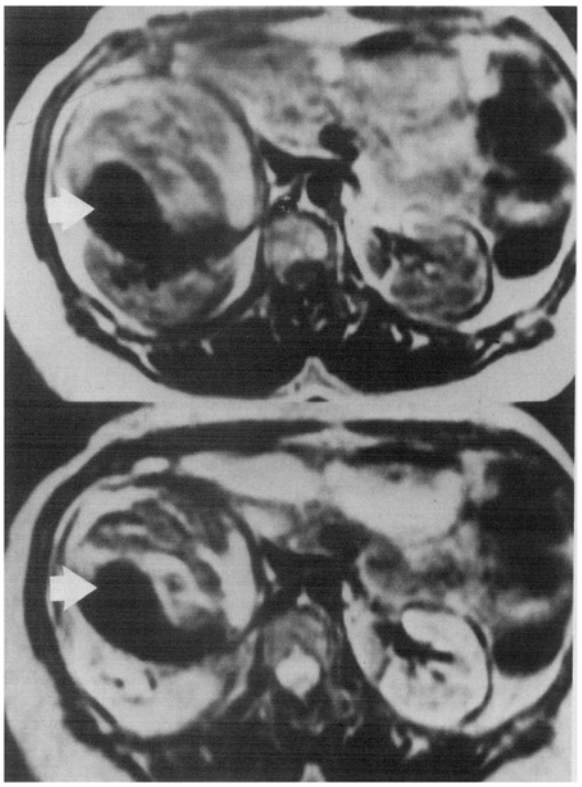

Fig. 4. *Case 1.* T1- and T2-weighted magnetic resonance images show signal void within the patent lumen of the aneurysm (*thick arrows*).

branches. Renal vein sampling demonstrated the renin level in the left renal vein to be twice that of the right (29.87 ng/ml versus 14.67 ng/ml). The kidney was considered unsalvageable at surgery and the patient underwent a left nephrectomy. Pathologic examination showed intimal and medial fibrodysplasia of the left renal artery with luminal narrowing in association with the aneurysm. The patient was discharged on the fourth postoperative day with a blood pressure of 110/60 mm Hg.

Discussion

Renal artery aneurysms were once believed to be extremely rare with an incidence of 0.01% on autopsy studies [1–3]. Angiography has demonstrated a higher incidence, between 0.3% and 1.0% in several series [4, 5] with an increased incidence among hypertensives and in patients with neurofibromatosis [6].

Most aneurysms are asymptomatic and are found incidentally. Presenting symptoms may include microscopic or gross hematuria, flank pain (sometimes mimicking renal colic), hypertension, urinary tract infection, acute congestive heart failure secondary to arteriovenous fistula, and hypovolemic shock due to rupture. Renal artery aneurysms rarely present as a palpable mass, unless associated with rupture, since aneurysms greater than 5 cm are extremely unusual. In several review articles the largest was 7 cm and the largest reported prior to our paper was 10 cm in diameter [7–9].

The pulsatile nature of the mass may not be appreciated on physical examination because of the large amount of thrombus within the aneurysm, as with our case 1. Recognition of the lumen of the aneurysm is necessary to prevent the erroneous diagnosis of neoplasm. Ultrasound with Doppler capability should greatly facilitate the diagnosis, although computed tomography and magnetic resonance imaging may also be useful. Angiography, however, is still necessary to delineate the precise arterial anatomy and to evaluate associated areas of arterial stenosis [10, 11].

The relationship of renal artery aneurysms and hypertension is somewhat controversial. Several large series have shown an incidence of hypertension as high as 79% in patients with renal artery aneu-

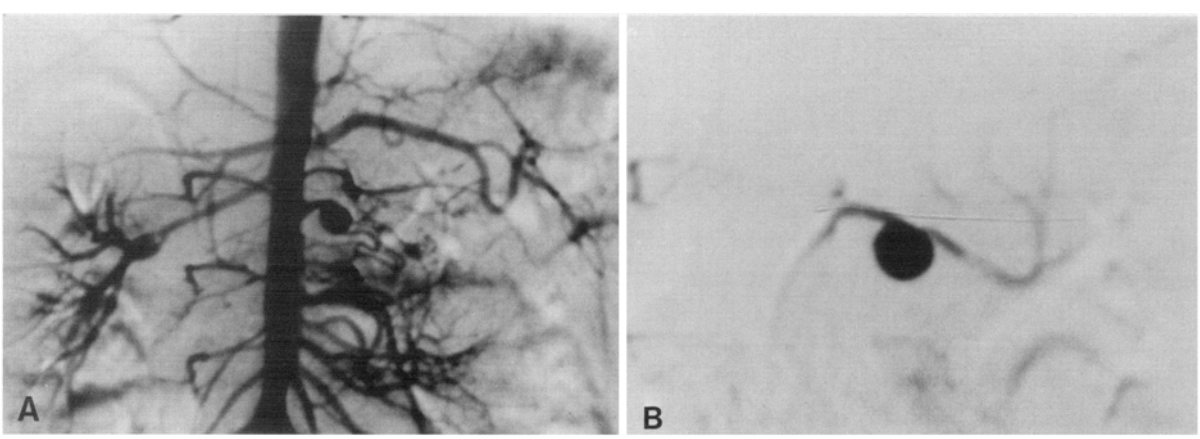

Fig. 5. *Case 2.* **A, B** An abdominal aortogram and a selective left renal arteriogram reveal a saccular 5-mm aneurysm arising from the left renal artery.

rysms [12, 13]. In many incidences, associated areas of renal artery narrowing due to atherosclerotic disease or arterial fibrodysplasia probably accounts for the hypertension. However, in cases with no demonstrable stenosis, other theories including distal arterial embolization from thrombus, nonpulsatile flow die to turbulence, compression of adjacent branch arteries, and kinking of the renal artery by the aneurysm have been proposed [12–14]. Renin sampling should be obtained to establish the causal relationship between the hypertension and aneurysm. This relationship was substantiated in our 6-month-old patient (case 2), the youngest reported case of renal artery aneurysm we could find. Most aneurysms are found in patients over 40 [4], and the youngest previously reported was 9 months [2].

The most common aneurysm, comprising 60% to 93%, is the saccular aneurysm [4, 15, 16]. It generally arises at the origin or bifurcation of the main renal artery. Atherosclerotic changes are often an associated finding, although it is difficult to determine whether these are the cause of the aneurysm or are secondary to hemodynamic changes related to the aneurysm. Our patient with the giant aneurysm (case 1) had calcification in the wall on computed tomography, and severe atherosclerosis of the wall with abundant plaque was found pathologically. At angiography, however, no other atherosclerotic vessels were visualized, and typical changes of medial fibroplasia were seen in the renal artery adjacent to the aneurysm.

Fusiform aneurysms are the next most common type, arising distal to stenotic areas. Although seen in atherosclerotic narrowing, these are often associated with fibromuscular dysplasia. These aneurysms may reach sizes three to four times the diameter of normal vessels [16].

Dissecting aneurysms may be found as an extension of an aortic dissection (in 10% to 13%) although they may be isolated [17]. These may also be secondary to trauma. Aneurysms have also been reported in association with polyarteritis nodosa and neurofibromatosis [18].

Rupture or impending rupture is the most important indication for surgery, in view of an 80% mortality with spontaneous rupture [4, 19]. Aneurysms less than 2 cm rarely rupture and can be followed [10, 16]. The management of aneurysms greater than 2 cm in the asymptomatic patient is less clear, as they also rupture infrequently. However, there does appear to be a higher incidence of rupture during pregnancy [6, 19].

Additional surgical indications include pain, hematuria, renovascular hypertension as in our case 2, arteriovenous fistula formation, and renal infarction secondary to a thromboembolic event [16, 20].

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