Pediatr Radiol (1991) 21: 312–313

Pediatric Radiology

Sonographic evaluation of renal artery aneurysm in childhood

T. E. Bunchman, H. S. J. Walker, III, P. F. Joyce, M. E. Danter and M. J. Silberstein

Division of Pediatric Nephrology, Surgery and Radiology, Cardinal Glennon Children's Hospital, St. Louis University, St. Louis, Missouri, USA

Received: 11 July 1990; accepted: 18 September 1990

Abstract. We report a child presenting with renovascular hypertension and sonographic evidence of a renal artery aneurysm (RAA). The diagnosis of RAA was made sonographically by demonstrating vascular flow in an aneurysmal segment adjacent to but continuous with the right renal artery and externally compressing the inferior vena cava. Comparison of the sonographic studies and an abdominal angiogram illustrate the sensitivity of sonography in diagnosing this condition. We suggest that with renal doppler sonography, RAA may be diagnosed less invasively and possibly with greater frequency yet believe that the gold standard of angiography is necessary prior to surgical intervention.

Renal artery aneurysm (RAA) occurs at a varied rate from 0.015% to 1.32% as determined either by autopsies or arteriogram series [1]. Whereas this has been well described in the adult population [2], its occurrence is quite rare in children [3].

Etiologies of RAA include a myriad of diseases such as fibromuscular dysplasia, trauma, vasculitis such as polyarteritis nodosa, RAA stemming from infection, as well as RAA discovered in pregnancy [4].

The diagnosis of RAA is usually made by angiogram. This is usually undertaken after clinical symptoms of hypertension, abdominal pain or hematuria with the abnormal finding of delayed excretion of contrast by IVP. The diagnosis of RAA by renal doppler ultrasound has not been reported to date, but due to its increasing use and sensitivity it has potential application in this area. We report herein a child with RAA diagnosed by renal doppler ultrasound during an evaluation for hypertension.

Case report

A 5-year-old white male was admitted to Cardinal Glennon Children's Hospital after 3 days of vomiting with the finding of hypertension as evidenced by persistent blood pressures of 170/130 mmHg. Examination revealed evidence of mild dehydration, normal neurologic and cardiovascular exam, no evidence of cerebral or abdominal bruits, and equal blood pressures in the upper and lower extremities. Laboratory data revealed a urinalysis with + + protein and no hematuria, a serum creatinine of 38.12 μmol/L, while a random peripheral renin was 431 ng/dl/hour (normal for age 100–650 ng/dl/hour). Chest radiography revealed mild cardiomegaly while echo cardiography demonstrated left ventricular hypertrophy. A renal doppler sonography (Acuson 128) demonstrated a large dumbell-shaped hypoechoic lesion arising from the right side of the aorta at the level of the right renal artery (Fig. 1). The anterior portion of the lesion measured about 10 mm × 10 mm, and the posterior portion 15 mm × 10 mm. The lesion caused significant localized compression of the adjacent inferior vena cava (IVC). Doppler examination revealed arterial pulsation of the RAA (Fig. 2). The right kidney measured 7.1 × 2.6 cm while the left measured 8.2 × 3.6 cm. Both exhibited normal echo texture and corticomedullary differentiation.

A percutaneous angiogram was obtained in which the large dumb-bell shaped RAA was confirmed (Fig. 3). The proximal portion of the renal artery appeared irregular and somewhat beaded while the neck of the RAA was narrow. The left renal artery as well as the remaining abdominal arteries appeared normal.

At exploratory laparotomy the RAA was resected and replaced with a saphenous vein segment. Twelve weeks after surgery his blood pressure was 116/64 on Nifidipine therapy, serum creatinine was 0.4 mg/dl, and a doppler renal ultrasound demonstrated good blood flow bilaterally.

Pathological evaluation revealed a single RAA despite the radiographic appearence of

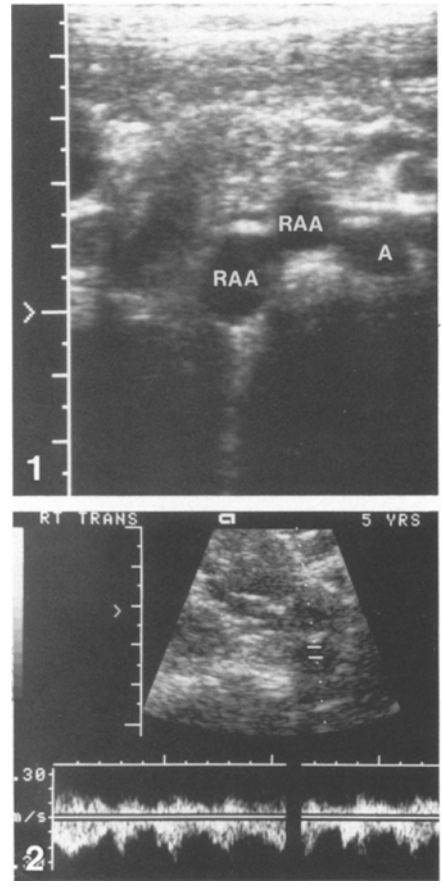

Fig. 1. Aorta (A) and dumb-bell appearance of renal artery aneurysm (RAA)

Fig. 2. Doppler renal ultrasound demonstrating systolic and diastolic blood flow within the renal artery aneurysm

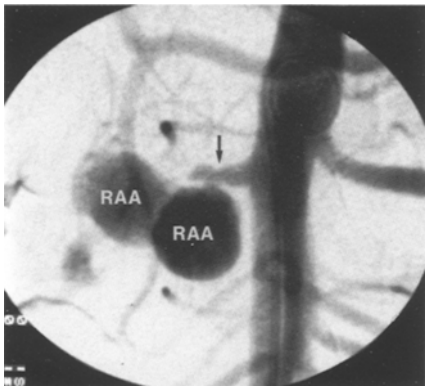

Fig. 3. Angiogram demonstrating the dumbbell shape of the renal artery aneurysm (RAA-correlating with Fig. 1) as well as renal artery stenosis *(arrow)*. Note there exists no evidence of aneurysms in the remaining abdominal vasculature

2 distinct aneurysms. Histological analysis revealed fibromuscular dysplasia in the RAA while the hypogastric demonstrated evidence of chronic hypertension.

Discussion

We describe herein a 5 year old presenting with renal vascular hypertension with the unusual finding of RAA secondary to fibromuscular dysplasia. The incidence of RAA, depending on the mechanism of investigation, has varied from 0.015% to 1.32% [1]. RAA have been divided into 4 distinct entities: 1) Fusiform, 2) saccular, 3) dissecting, and 4) intrarenal [2]. Typically, the fusiform RAA occurs at the bifurcation of renal arteries. The saccular form is seen most commonly in post-stenotic dilatation associated with renal artery stenosis such as in the fibromuscular dysplasia. Dissecting RAA have been seen as a result of trauma or extension from a dissecting aortic aneurysm. The intrarenal form has been seen more commonly in vasculitis.

The clinical presentation of RAA usually consists of a constellation of hypertension, abdominal pain, abdominal bruits (in 10% or less of the cases), and occasionally is diagnosed due to the finding of a palpable pulsating abdominal mass. Upon investigation, there appears to be a propensity for right sided aneurysms (2:1) while up to 50% of RAA will be calcified when diagnosed.

The indication for surgical intervention has varied depending on investigators. Most authors agree that RAA greater then 1.5 cm in diameter should undergo operative repair [5]. Further, others have advocated that the finding of hypertension, abdominal pain, persisting hematuria, RAA discovered in pregnancy, or increasing size of renal aneurysm by serial angiograms, are indications for surgery.

RAA found in childhood are quite rare. In reviewing the literature, only 4 other children, age range 9 months to 14 years, all presenting with hypertension have been diagnosed with RAA due to fibromuscular dysplasia as demonstrated by angiogram [3]. Treatment consisted in nephrectomy in all 4 with good blood pressure control in 3 and a perioperative death in the fourth.

In summary, we report a 5 year old boy with a RAA as diagnosed by renal doppler ultrasound. Although the angiogram was used to delineate the area of RAA, doppler renal ultrasound provided sufficient detail to detect the aneurysm. We suggest that in children undergoing evaluation for renal vascular hypertension, careful study by doppler ultrasound is indicated to look for RAA. Renal doppler ultrasound is non-invasive method for evaluation of renal size and flow and is a valuable tool in the investigation of hypertension. We further suggest, though, that the final discriminatory radiographic method for delineating the RAA remain in the "gold standard" of angiography.

Acknowledgement. The authors are indebted to D. Laws for her diligence in preparation of this manuscript.

References

1. Martin RS, Meacham PW, Ditesheim JA, Mulherin JL, Edwards WH (1989) Renal artery aneurysm: selective treatment for hypertension and prevention of rupture. J Vasc Surg 9: 26
2. Poutasse EF (1975) Renal artery aneurysms. J Urol 113: 443
3. Garritano AP (1957) Aneurysm of the renal artery. Am J Surg 94: 638
4. Smith DL, Wernick R (1989) Spontaneous rupture of a renal artery aneurysm in polyarteritis nodosa: critical review of the literature and report of a case. Am J Med 87: 464
5. Hageman JH, Smith RF, Szilagyi E, Elliot JP (1978) Aneurysms of the renal artery: problems of prognosis and surgical management. Surg 84: 563

T.E. Bunchman M.D.
Division of Pediatric Nephrology
University of Michigan
Taubman Health Care Center
Box 0318 – Rm 1924
1500 E. Medical Center
Dr. Ann Arbor MI 48109
USA