DAHİLİ BİLİMLER / *MEDICAL SCIENCES*
Case Report / Olgu Sunumu

Congenital Renal Arteriovenous Malformation: Diagnosis With MDCT Angiography

Konjenital Renal Arteriyovenöz Malformasyon: MDCT Anjiografi ile Tanısı

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Renal arteriovenous malformations are a rare cause of haematuria. To the best of our knowledge, this is the only case reported so far in the diagnosis of the congenital RAVM using multidetector row computed tomography angiography. We suggest that when surgical or interventional therapy is not considered, renal multidetector row computed tomography angiography should be performed to diagnosis of the AVM.

Key Words : ***Arteriovenous Malformation, Kidney, Multidetector CT***

Renal arteriyovenöz malformasyonlar nadir rastlanan hematüri nedenlerindendir. Bildiğimiz kadarıyla bugüne dek, multidetektör sıralı bilgisayarlı tomografi anjiografi kullanılarak tanısı konulan tek konjenital arteriyovenöz fistül vakasıdır. Biz arteriyovenöz malformasyon tanısı için, cerrahi veya girişimsel tedavi düşünülmediğinde renal multidetektör sıralı bilgisayarlı tomografi anjiografinin yapılması gerektiğini düşünmekteyiz.

Anahtar Sözcükler: ***Arteriyovenöz Malformasyon, Böbrek, Multidetektör BT***

Renal arteriovenous malformations (RAVM) are a relatively rare congenital malformation (1¬7). They usually remain asymptomatic during lifetime. Most published studies reported on sonographic and color Doppler findings (2,7), angiographic studies (1,4) or computed tomographic findings (11,13). Herein we present a case of congenital RAVM which was diagnosed by multidetector row computed tomography angiography (MDCTA) and a brief review of the literature. To the best of our knowledge, this is the only case reported so far in the diagnosis of the congenital RAVM using MDCTA.

Case Report

A 41-year-old woman was referred for evaluation of pain in her right flank which had appeared a few days earlier. 2 years ago, she had a attack of renal colic accompained by microscopic haematuria. Some investigations of the urinary tract, i.e. intravenous pyelography (IVP) and ultrasound (US) could not disclose the cause of haematuria. Because spontaneous resolved of the right flank pain and haematuria, the patient is being treated conservatively. At latest admission, clinical examination showed no abnormailities. No abnormal bruit was heard during abdominal auscultation. Blood presurre, urinanalysis and culture, and serum hematologic and biochemical indices were within normal limits. The patient had no history of trauma, biopsy or renal disease/injury. Renal US and color-duplex Doppler US were performed with a Toshiba US unit (Aplio 80, Toshiba, Tokyo, Japan). US images of the right kidney showed anecoic cystic mass in the upper pole (Figure 1). The color Doppler image demonstrated a high blood flow and a mosaic-like vascular area with posterior color spots (tissue vibration) which seemed compatible with a vascular malformation (Figure 2). Spectral analysis with pulsed Doppler sound increased velocity and decreased resistance in the feeding artery and arterial pulsations in the draining vein. Renal MDCTA was

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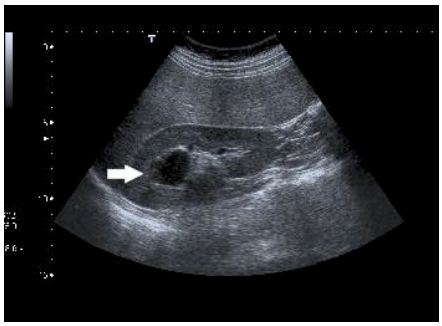
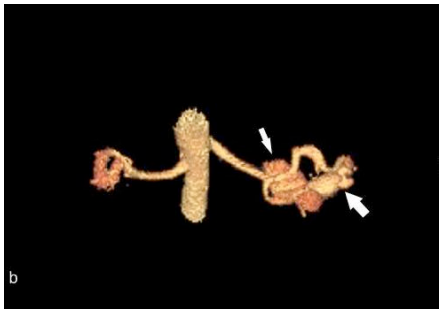


Figure 1. US image of the right kidney shows anecoic cystic mass in the upper pole (arrow).

Figure 2. Longitudinal color Doppler image of the upper pole of the right kidney shows a blood flow-rich area (thin arrow) with posterior color spots (tissue vibration, thick arrow)

performed with a 16 channel MDCT scanner (Lightspeed 16, GE Medical Systems, Milwaukee, WI, USA). The scan parameters were 16x 1.25-mm detector configuration, 1,25 mm section thickness, 1,25 mm reconstruction interval, gantry rotation time 0.5 s, pitch 0.938, 400 mAs, 120 Kv. The region of interest for scanning was adjusted from suprarenal abdominal aorta to the iliac artery bifurcation. After insertion of 18 –gauge catheter in to an antecubital vein, 120 mL of ioversol 300mg I/mL (Optiray, Mallinckordt, St. Louis, MO, USA) was injected with an automatic injector at a rate of 4 mL/s. All CT data were transferred to a Workstation (Advantage Windows 4.2, GE Medical Systems)) for three-dimensional (3D) reconstructions (multiplanar reformat, maximum intensity projection and volume rendering). MDCT angiography was revealed early opacification of the right renal vein and inferior vena cava. Also enlargement of the interlobar renal artery branch was noted. In the upper pole of the right kidney, a cirsoid type RAVM approximately 3 cm in diameter was demonstrated (Figure 3a, b) MDCT

Figure 3. Contrast-enhanced MDCT image demonstrates RAVM (thick arrow). Also early opacification of the right renal vein (thin arrow) and inferior vena cava is seen. Axial thick-slab maximum-intensity projection (a) and volume-rendered reconstructed display seen from oblique posterior perspective (b).



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renal angiography confirmed the diagnosis and thus no additional imaging was obtained. Because the patient had no further symptoms and refused the treatment, we could not perform arterial embolization. In the follow-up 3 months after, the patient remained free of symptoms. We will continue follow-up her.

Discussion

RAVMs are a rare cause of haematuria (1). RAVMs consist of multiple tortuous communications between arteries and veins without interlaying capilleries. These tortous, varix-like vessels are immediately beneath the urothelium, leading to haematuria as the presenting finding in as many as 72% of cases (5). The reported prevalance of RAVMs is as low as 0.04 % (8), but the true prevalance might be higher because many RAVMs remain clinically asypmtomatic. Other presentations may be systolic or diastolic hypertension and may also present as high output cardiac failure (4). Our patient never had hypertension or cardiac failure symptoms. Macmillan and Robinette proposed a clinical classification of congenital RAVMs, including three subtypes based on location and size: an angiomatous type with a size smaller than 1 cm and a peripheral location; a cirsoid type with a size larger than 1 cm and peripelvic location; and an idiopathic type with a hilar location and size larger than 1 cm. The first and second types seem to correspond to true AVMs differing in size and location, and the third type seems to be identical to arteriovenous fistulae (1). Naganuma et al (2) demonstrated that RAVM exhibit findings similar to postbiopsy arteriovenous fistulas. The reported findings of postbiopsy arteriovenous fistula are (i) an area of color mosaic appaerence with tissue vibration, ii) increased flow velocities and decreased resistive indexes in the supplying artery, iii) arterialization of the draining vein, and iiii) no abnormalities or small cystic lesions on gray-scale US. Regardless of whether the renal AVM was spontaneous or secondary, they found that gray-scale and color Doppler US showed similar findings. Also they concluded that US was not diagnostic and color Doppler US should be performed immediately in patients with hematuria. They were able to identify cirsoid AVMs in five of five patients with Doppler US before the performance of catheter angiography. Importantly, no lesions were detected with gray-scale US alone, even with the knowledge of the location of the AVM. The lesions in this series were all identified on CT, but definition regarding the communicating renal artery and draining vein was poor (5). Angiographically, a true RAVM has a characteristic cirsoid apperance, with tortuous small channels and multiple fistulous connections. The main angiographic feature is the simultaneous appearence of contrast in the main renal artery and vein. RAVMs usually re-

ceive blood supply from two or more lobar vascular tributaries (11).

On CT, RAVM is imaged as a mass of vascular density located in the renal sinus and surrounding the pelvicaliceal system. In addition, the renal vein and left gonadal vein were often dilated. However, CT presentation of these lesions depends on the level of contrast medium in the blood stream, the speed of infusion, the amount of contrast material used, and the time elapsed until images are taken (11). Few studies regarding imaging of AVMs exist and most series are small (5). To the best of our knowledge, diagnosis of RAVMs with MDCTA has not been reported. MDCT offers many advantages for image quality in comparison with single slice CT. MDCT scanners allow for fast investigation with high spatial resolution. Small slice thickness improves the detection of small structures and allows better discrimination of solid and cystic structures as partial-volume effect diminish. Different phase of contrast-uptake can be differentiated (arterial, cortico-meduller, nephrographic and excretory phase). For this reason, MDCT of the kidney has become very valuable tool in urology, but a careful protocol stategy is mandatory (9). MDCT represents an important clinical tool that is replacing, in many institutions, catheter based angiography in the evaluation of renal vasculature (14). DSA has been considered the gold standart for evaluation of renal arteries; nevertheless, this procedure may carry some complications which should also be considered for patients with seconder hypertension. A noninvazive imaging technique is therefore desirable. Thus, MDCTA is currently the preferred modality. Management of congenital RAVMs is generally conservative. Most congenital AVMs are small and asymptomatic, and some close spontanenously. Transcatheter arterial embolization is the treatment of choice if the RAVM is accompained by significant hematuria, severe hypertension, hemorrhage, or high-output cardiac failure. Large congenital AVMs may require surgical removal (7). Kubota et al (10) emphasized the necessity of careful follow-up, because spontaneous regression of RAVM may ocur relatively rarely.

In conclusion, RAVMs are a rare cause of haematuria. We suggest that when surgical or interventional theraphy is not considered, renal MDCTA should be performed to diagnosis of the AVM.

REFERENCES

1. Defreyne L, Govaere F, Vanlangenhove P et al. Cirsoid renal arteriovenous malformation treated by endovascular embolization with n-butyl-2-cyanoacrylate. Eur Radiol 2000;10:772–
2. Naganuma H, Ishida H, Konno K et al. Renal arteriovenous malformation: sonographic findings. Abdom Imaging 2001;26:661–63
3. Minetti E, Montoli A. Bilateral renal arteriovenous malformation. N Engl J Med 2004;351:e9
4. Tarif N, Mitwalli AH, Samayer SA et al. Congenital renal arteriovenous malformation presenting as severe hypertension. Nephrol Dial Transplant 2002; 17:291–94
5. Brown D, Brandes SB. Radiofrequency ablation of a recanalized renal arteriovenous malformation. J Vasc Interv Radiol 2005;16:403–6
6. Wakefield MR. Renal arteriovenous malformation. emedicine 2007. Topic 2861
7. King BF, Hattery RR. Congenital cirsoid renal arteriovenous malformation (AVM) involving lower pole of the kidney. Radiographics 1990;10:1101–4
8. Allie DE, Hebert CJ, Walker CM. Multidetector Computed Tomography Angiography. Endovascular Today 2004 March
9. Coppenrath EM, Mueller-Lisse UG. Multidetector CT of the kidney. Eur Radiol 2006;16:2603–11
10. Kubota H, Sakagami H, Kubota Y et al. Spontaneous disappearance of a renal arteriovenous malformation. Int J Urol 2003;10:547–49
11. Honda H, Onitsuka H, Naitou K et al. Renal arteriovenous malformations: CT features. J Comput Assist Tomo 1991;15:261–4
12. Mishal J, Leibovici O, Bregman L et al. Huge renal arteriovenous malformation mimicking a simple para-pelvic cyst. Urol Int 2001;66:49–50
13. Turkeri LN, Daudi I, Abraham JL et al. Cirsoid arteriovenous malformation of kidney presenting as a mass suggestive of malignancy. Int J Urol 1998;5:96–9
14. Fraioli M, Catalano C, Bertoletti L, Nardis P. Multidetector-Row CT of Renal Arteries. In: Catalano C, Passariello R, ed. Multidetector-Row CT Angiography. Springer-Verlag Berlin Heildeberg, 2005;177–86