

Aortic Dissection or Renal Infarction – Multislice Computed Tomographic Angiography Can Tell

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SUMMARY

Introduction Acute renal infarction as a consequence of renal artery occlusion often goes unrecognized, mostly due to the non-specific clinical features. A quick diagnosis, ideally within three hours of presentation, is a key to renal function recovery.

Case Outline A 62-year-old male patient was admitted with a sudden abdominal pain, right flank pain and nausea. He had a diastolic hypertension at admission and his previous medical history showed atrial fibrillation. Initial clinical diagnosis was aortic dissection. Laboratory findings included elevated lactate dehydrogenase (LDH) and serum creatinine levels. There were no signs of aortic dissection or aneurismatic lesions registered during a multislice computed tomographic (MSCT) angiography. However, MSCT angiography demonstrated left "upper" renal artery thrombosis and renal infarction – avascular area of the upper two thirds of the left kidney sharply demarcated from the surrounding parenchyma. Both kidneys excreted the contrast. Anticoagulant therapy was initiated, along with antiarrhythmic and antihypertensive medications. The follow-up by computed tomography was performed after nine weeks, and it showed a partial revascularization of the previously affected area.

Conclusion Concomitant presence of flank/abdominal pain, an increased risk for thromboembolism and an elevated LDH suggested a possibility of renal infarction. MSCT angiography is a non-invasive and accurate method in the diagnosis of renal artery occlusion and the resulting renal infarction.

Keywords: renal infarction; computed tomography; angiography

INTRODUCTION

Acute renal infarction as a consequence of renal artery occlusion is underdiagnosed, mostly due to the non-specific symptoms (flank pain, abdominal pain, nausea, fever, hematuria) which mimic other diseases with a higher incidence, such as nephrolithiasis, pyelonephritis or cholelithiasis. In case of a sudden and intensive abdominal pain accompanied by hypertension, aortic dissection is included in the differential diagnosis.

Multislice computed tomographic (MSCT) angiography is an adequate imaging test for visualization of renovascular elements, since it provides accurate three-dimensional images of renal anatomy. A number of software packages for the image processing, such as volume rendering, improve the visualization and result in a precise diagnosis [1]. MSCT angiography is non-invasive, unlike arteriography, which is considered the diagnostic gold standard. MSCT angiography is also quick and generally available. However, it requires the use of iodinated radio contrast agent which can be associated with contrast induced nephropathy, particularly in patients with pre-existing kidney disease. The risk is lower with the non-ionic hypo-osmolar or iso-osmolar contrast agents [2]. Alternative imaging tests include Doppler ultrasonography, radionuclide renography and MR angiography [3]. Still, Doppler ultrasonography is highly operator-dependent

and time consuming, while MRI is not generally available and requires gadolinium contrast, which is associated with nephrogenic systemic fibrosis [2].

CASE REPORT

A 62-year-old male patient was admitted at the Cardiology Department with complaints of sudden abdominal pain, right flank pain, nausea and vomiting. The patient's past medical history included arterial hypertension and atrial fibrillation. He had a predominantly diastolic hypertension at admission (TA 160/120 mmHg), while electrocardiography showed atrial fibrillation with a rapid ventricular response (HR 160/min). Initial clinical diagnosis was an aortic dissection. Laboratory findings included leukocytosis ($10.3 \times 10^9/l$), anemia (Hgb 100 g/l), elevated transaminases (AST 62 IU/l ALT 78 IU/l) and lactate dehydrogenase ($15.6 \mu\text{kat/L}$). Hemolytic screening (bilirubin, direct Coombs test and haptoglobin) was negative. Serum creatinine was elevated (140 mmol/l – estimated glomerular filtration rate calculated by *Cockcroft-Gault* was 61 ml/min). Electrolytes were normal. Urine examination showed hematuria. Table 1 shows pathologic laboratory findings and initial differential diagnosis.

Chest radiography showed an enlarged heart shadow and patchy opacities in both lower

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Table 1. Initial differential diagnosis based on pathologic laboratory findings

| Laboratory findings | Differential diagnosis | Additional tests to confirm/exclude alternative diagnosis |
|-------------------------|-------------------------|---|
| Leukocytosis | Urinary tract infection | Absence of bacteriuria, pyuria, normal procalcitonin |
| Anemia and elevated LDH | Hemolysis | Bilirubin normal, direct Coombs test negative, haptoglobin normal |
| Hematuria | Nephrolithiasis | Normal kidney-ureter-bladder (KUB) radiography |
| Elevated AST, ALT | Heart failure | Pro-brain natriuretic peptide (pro-BNP) normal |



Figure 1a-b. Avascular area of the left kidney sharply demarcated from surrounding parenchyma, consequently to left “upper” renal artery obstruction on maximum intensity projection (MIP) 3D images and axial slices.



Figure 2. Comparative view – partial revascularisation of the left kidney on MIP reconstructed images

lung fields. Echocardiography revealed impaired systolic function of the left ventricle (EF 45%) and a hypokinetic anterior wall of the left ventricle. Initial workup included a kidney-ureter-bladder radiograph, which was normal. Abdominal ultrasound was not performed due to techni-

cal reasons. Computed tomography of chest and abdomen was performed. The latter revealed that the patient had two renal arteries on each side, as shown in Figure 1a. There were no signs of aortic dissection or aneurismatic lesions on the three-dimensional (3D) MSCT angiography

and lumen views. However, MSCT angiography demonstrated left “upper” renal artery thrombosis and renal infarction – avascular area of the upper two thirds of left kidney sharply demarcated from the surrounding parenchyma (Figure 1b). Both kidneys excreted the contrast.

The patient was transferred to the Nephrology Department where anticoagulant therapy was initiated along with antiarrhythmic and antihypertensive medications. Additional thrombophilia screening turned out to be negative. The patient was discharged and during the follow-up his blood pressure remained under control. Electrocardiography still showed atrial fibrillation, but satisfactory rate control was achieved (HR 78/min). The follow-up computed tomography was performed after nine weeks, and it showed a partial revascularization of the previously affected area (Figure 2). Serum creatinine level was 102 mmol/l – estimated glomerular filtration rate calculated by *Cockcroft-Gault* equation was 80 ml/min. Urine examination showed minimal proteinuria. Dynamic renal scintigraphy was planned, but the patient was lost for further follow-up.

DISCUSSION

The usual renovascular anatomy implies that there is one renal artery on each side. They originate from the aorta at the level of L2 vertebrae, above the origin of the upper mesenteric artery. Both renal arteries stretch slightly posteriorly and laterally. The right renal artery also stretches slightly downwards, since the right kidney is positioned lower than the left one. The left renal artery runs horizontally. Renal artery variations are common in the general population and the frequency of variations shows social, ethnic, and racial differences. The variations are more common in Africans (37%) and Caucasians (35%), and less common in the Hindus (17%) [1]. The variations are explained by the abnormal development of mesonephric arteries, which form a vascular net feeding the kidneys, suprarenal glands and gonads on both sides of the aorta during the intrauterine period. Over time, these arteries degenerate, leaving only one mesonephric artery, which vascularises the kidneys [4]. To our knowledge, there are no data on possible correlation between renal arteries anatomic variations and renal artery thrombosis. Study of Özkan et al. [4] included 855 patients, and 76% of them had one renal artery on each side, while only 5% had bilateral variations. There was no statistical significance in the number of variations on each side.

Acute renal artery occlusion is usually unilateral. A rapid, total occlusion for 30 to 60 minutes results in re-

nal infarction [5, 6]. Two major causes of renal infarction are thromboemboli, which usually originate from a thrombus in the heart or aorta, and in-situ thrombosis of the renal artery, which is less common [7]. Although seemingly non-specific, persisting flank/abdominal/lower back pain has proved to be one of the important indicators of potential acute renal infarction. These symptoms may mimic aortic dissection, as well as pyelonephritis or even nephrolythiasis. Another indicator is the presence of risk factors for thromboembolism (atrial fibrillation, previous embolism, mitral stenosis, hypertension and coronary disease) [8]. Also, elevated LDH and/or hematuria are common [5, 6, 8]. Therefore, presence of the listed indicators necessitates MSCT angiography as soon as possible to confirm or rule out the diagnosis of renal infarction. MSCT angiography has been suggested as the initial imaging modality of choice because of its ability to quickly differentiate between various acute abdominal conditions [5, 6]. Unlike arteriography, it is a non-invasive procedure and does not carry numerous risks associated with arteriography, such as atheroembolism, damage of blood vessels, excessive bleeding, hematoma, infection or injury to the nerves at the needle puncture site. In comparison with ultrasonography, it is less operator-dependent and less time consuming. Finally, MSCT angiography is more widely available and less costly than MRI/MRA [2, 3].

Acute renal infarction is underdiagnosed; thus, it is difficult to determine its true incidence. According to the current data, the prevalence ranges from 0,007% in general population to 2% in patients with risk factors for embolism [7, 8, 9].

Early diagnosis of this rare condition is important for renal function recovery [3, 7, 8, 10]. Patients presenting within three hours from onset of symptoms may benefit from fibrinolytic therapy. Surgery to restore vascular patency may be an option for patients with traumatic renal artery thrombosis. However, there are still no clear treatment guidelines due to a small number of the reported cases and inability to conduct a large randomized trial. All patients with thromboembolic disorder require anticoagulation. Sometimes, an extensively infarcted kidney must be removed if revascularization is not expected to result in functional recovery.

Sudden intensive abdominal pain and hypertension may mimic, among other conditions, an aortic dissection. Concomitant presence of flank/abdominal/lower back pain, an increased risk for thromboembolism and an elevated LDH should prompt urgent evaluation by MSCT angiography, which is non-invasive, generally available and accurate method for the diagnosis of renal artery occlusion and resulting renal infarction.

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Дисекција аорте или инфаркт бубрега – открива вишеслојна компјутеризована томографска ангиографија

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КРАТАК САДРЖАЈ

Увод Акутни инфаркт бубрега као последица оклузије реналне артерије често прође неопажено, превасходно због неспецифичне клиничке слике. Брза дијагноза, постављена најбоље у прва три сата, кључна је за опоравак функције бубрега.

Приказ болесника Мушкарац стар 62 године примљен је због акутно насталог интензивног бола у трбуху, бола у десном слабинском пределу и мучнине. На пријему је дијагностикована дијастолна хипертензија, а одраније је постојала атријална фибрилација. Радна дијагноза била је дисекција аорте. У лабораторијским налазима забележене су и повишене вредности лактат-дехидрогеназе (*LDH*) и креатинина. Током прегледа вишеслојном компјутеризованом томографском (*MSCT*) ангиографијом нису уочени знаци дисекције аорте, нити анеуризматска проширења. Међутим,

MSCT ангиографијом су установљени тромбоза леве "горње" реналне артерије и инфаркт бубрега – неваскуларно подручје горње две трећине левог бубрега оштро демаркирано од околног паренхима. Оба бубрега су лучила контрастно средство. Антикоагулантна терапија је започета уз антиаритмике и антихипертензивне лекове. Контролни *СТ* снимак је начињен након девет недеља, када је забележена делимична реваскуларизација претходно захваћеног подручја. **Закључак** Истовремено постојање бола у слабинском делу и у трбуху, повећан ризик од тромбоемболије и повишен ниво *LDH* указали су на могућност инфаркта бубрега. *MSCT* ангиографија је неинвазивна и прецизна метода за дијагностиковање оклузије реналне артерије и последичног инфаркта бубрега.

Кључне речи: инфаркт бубрега; компјутеризована томографија; ангиографија

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