

Acute Flank Pain Due to Renal Infarction: Limitations of Unenhanced CT

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A fifty-two-year-old woman developed severe right flank pain; she had an initial non-contrast CT, which was inconclusive. Subsequently, contrast enhanced CT showed subtotal infarction of the right kidney and occlusion of the right main renal artery. The current trend is using unenhanced helical CT for the diagnosis of acute flank pain; therefore, the diagnosis of acute renovascular occlusion is delayed. Although unenhanced helical CT can show other abdominal conditions such as appendicitis, diverticulitis, adnexal disease and aortic rupture, it cannot show acute renal artery occlusion.

Contrast-enhanced CT was done to arrive at the final diagnosis, as the laboratory results were not conclusive and the patient had continuous flank pain for 48 hours.

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Acute renal infarction is a rare condition with an incidence of 0.004% to 0.007% at emergency department visits and 1.4% at autopsy¹. Diagnosis and initiation of appropriate treatment are often delayed due to low index of suspicion by physicians and non-specific nature of presenting symptoms which are often confused with those of renal colic. Because of the current trend of using unenhanced helical CT for the evaluation of acute flank pain, the diagnosis of renal infarction is often overlooked². An early diagnosis is important for prompt initiation of treatment with anticoagulants or embolectomy to prevent irreversible renal damage³. The possibility of renal infarction should be considered in the setting of undiagnosed flank pain with normal findings on unenhanced CT especially in patients with risk factors for this disease. A contrast enhanced CT should be performed early to confirm the diagnosis.

We report a case of a 52-year-old female who presented with intense flank pain following knee replacement, and in whom a diagnosis of acute renal infarction was confirmed by contrast enhanced CT of abdomen.

THE CASE

A fifty-two-year-old woman was admitted for a unilateral compartmental knee

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replacement. She is a known asthmatic and diabetic. The pre-anesthetic evaluation showed non-specific ECG changes and 2D echo was normal. On the third postoperative day, she developed acute right flank pain.

The WBC was $13.9 \times 10^9/l$ (85 percent polymorphs). Urine analysis showed red cells of 4-6, white blood cells 10-12, WBC casts and few granular casts. The laboratory result showed no evidence of thrombophilia or coagulation abnormalities. Ultrasound abdomen was unremarkable.

Unenhanced CT of the abdomen and pelvis showed the kidneys of normal position and size, see figure 1. There were no renal or ureteric calculi and the rest of the abdomen was unremarkable.



Figure 1: Non-Contrast CT Shows Symmetrical Renal Size and Attenuation

After 48 hours of onset of flank pain, the patient continued to be symptomatic. A contrast enhanced CT of the abdomen and pelvis was then performed, and it showed no enhancement of right kidney, see figure 2. The left kidney was normal. The right main renal artery showed normal enhancement at its ostium, with abrupt change in its density about 20 mm from the origin, see figure 3. A small area of wedge shaped enhancement was seen in the subcapsular region representing perfusion from capsular arteries. These CT features were consistent with acute renal artery occlusion with subtotal infarction of right kidney. No angiographic intervention was attempted because the infarction occurred nearly 48 hours prior to diagnosis. The patient was treated with low molecular weight heparin.



Figure 2: Contrast Enhanced CT Shows Absence of Enhancement of Right Kidney



Figure 3: Multiplanar Reconstruction Image Shows Abrupt Change in Enhancement Pattern of Right Renal Artery Indicative of Occlusion and Persistently Non Enhancing Right Kidney. Focal Area of Enhancement Is Seen in Subcapsular Region due to Perfusion by Capsular Arteries

DISCUSSION

Acute flank pain is a non-specific symptom associated with a wide array of disease processes, both renal and extra-renal. Non-contrast Helical CT of abdomen is often the study of choice in these patients especially to diagnose calculus related renal disease. Many extra-renal causes of flank pain such as acute appendicitis, diverticulitis, biliary tract disease, leaking aortic aneurysm and gynecological conditions like adnexal masses are also diagnosed by non-contrast CT. Acute renal infarction due to thromboembolic occlusion of renal artery is a rare condition which has somewhat similar presentation as renal colic, but is completely missed on non-contrast CT leading to delay in diagnosis and irreversible damage to the kidney. A contrast enhanced CT plays a vital role in establishing an early diagnosis of this condition.

Acute renal infarction due to thromboembolic occlusion of renal artery was first reported by Traube in 1856 in Germany; since then many other case reports and case studies have appeared in the medical literature⁴. The incidence of renal infarction in an autopsy study has been reported to be 1.4%, whereas clinical diagnosis has been made only in 0.014% of the studied patients¹. Because of the lack of specific clinical signs and symptoms, acute renal infarction is apt to be missed and hence has a “low incidence.”

In the majority (94%) of these patients, systemic emboli commonly originate in the heart. Among contributing cardiac disorders, atrial fibrillation, myocardial infarction (post infarction thrombi) and rheumatic mitral stenosis are the most important⁵. In some patients, there is no discernible structural or arrhythmic cardiac disease and they are classified as idiopathic group. Bolderman et al studied twenty-seven patients with non-traumatic CT documented acute renal infarctions and in sixteen of them (59%) no cardiac disease was detected⁶. Therefore, this diagnosis should be considered in a patient with flank pain, even if there are no risk factors for thromboembolic disease.

Patients with acute renal infarction commonly present with abrupt flank pain accompanied by nausea, vomiting and fever. Physical examination reveals costo-vertebral angle tenderness which is a characteristic sign of acute renal infarction.

The common laboratory findings include leukocytosis, hematuria, proteinuria and raised LDH. An elevated blood LDH is quite helpful in suspecting this condition as it is indicative of tissue necrosis. In patients with triad of flank pain, elevated LDH and hematuria, a contrast-enhanced CT should be performed early to confirm this diagnosis. A non-opacified kidney of normal or increased size with non-dilated pelvicalyceal system is considered diagnostic of renal artery occlusion. Sometimes a cortical rim sign is seen which represents opacification of a rim of functioning nephrons supplied via capsular collaterals surrounding the non-functioning kidney⁷. In patients with branch occlusion, a wedge-shaped area of non-enhancement is noted.

Anticoagulation, thrombolysis and embolectomy are the treatment options available to minimize the loss of renal function. Therapy in acute renal infarction typically consists of giving intravenous low molecular weight Heparin followed by Warfarin and low dose aspirin. Selective intra-arterial thrombolysis is considered for unilateral renal infarction. The success of the intervention is limited by the duration of the ischemia. If complete necrosis of kidney occurs due to delay in the diagnosis, nephrectomy has to be performed.

CONCLUSION

A high degree of clinical suspicion is crucial for the early diagnosis of acute renal infarction. Thromboembolic occlusion of renal arteries is known to occur in individuals with no apparent risk factors. In patients presenting with flank pain, hematuria and proteinuria, a contrast enhanced CT should be obtained especially if serum LDH levels are elevated. Early anticoagulation therapy reduces symptoms and helps preserve kidney function.

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